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Spatial occupational structure and local human capital spillover effects in Britain

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ABSTRACT

Employment polarisation in developed countries has been of central focus for research and policy circles. An important question that has not been explored extensively is the spatial dimension of this polarisation and the underlying processes that generate it. This is the main research topic of this thesis and is examined empirically for Britain over three papers.

The first paper examines the spatial patterns of employment polarisation for Britain in the past decade. Econometric techniques are used to investigate whether employment polarisation happens within regions or just across regions and whether it is a predominantly urban phenomenon. The main result found is that all regions experience some degree of employment polarisation during the 1990s. Remarkably, London appears unique in terms of the magnitude of its employment polarisation. It experiences disproportionately higher growth in the employment share of both high-paid jobs and low-paid jobs compared to the other regions.

Amongst the various proposed explanations for employment polarisation, the consumer demand mechanism has been relatively under-researched. According to this account, the presence of high educated, high income individuals in a locality boosts the demand for local low-skill, low-pay services. Since these services are non-traded and given an upward sloping labour supply, the increased labour demand would induce an upward effect on the wages and employment of the relevant low-pay occupations in the localities with higher human capital.

In that context, the second and the third paper of the thesis examine how high human capital in a locality affects the labour market outcomes of the individuals of the locality in terms of wages and employment respectively. Different econometric specifications are employed in order to shed light on the positive effect found and discern the existence of a consumer demand mechanism in contrast to plausible production driven accounts (productivity spillovers and production complementarities). The strong significant effect on the local low-skill individuals compared to the other skill groups is suggested as preliminary evidence of the existence of the consumer demand mechanism.

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To Anastasia, Andreas, and Hara

And in memory of my grandparents Kiki, Nikos, Mata and Giannis

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CHAPTER 1: Introduction

Few people would doubt the importance of employment for the economy and the society as a whole, as it is fundamental for economic growth, vital for social cohesion and the main root out of poverty for individuals and families. And the current crisis has drawn everyone's attention to the jobs being lost whether white-collar or blue-collar ones. But the type and quality of jobs an economy generates should not be overlooked. They deserve investigation as they can shed light on the underlying economic processes and the relevant earnings distribution. It is exactly the type of jobs the economy generates and the underlying processes analysed in a spatial context that this thesis aims to turn the attention to. Empirical evidence has been provided that the job distribution in the developed economies in the recent decades was characterised by a polarising trend. The economies appeared to generate greater numbers of high skill, high paid jobs like managers, bankers and programmers but also greater numbers of low-pay sector type of jobs like sales assistants, cleaners and bar staff. On the contrary, jobs in the middle of the pay distribution like manufacturing and clerical jobs shrunk. The empirical evidence comes from the literature on polarisation for US (Bluestone and Harrison, 1986; Costrell, 1990; Ilg, 1996; Wright and Dwyer, 2003; Autor et al., 2006) but also from a number of studies for European countries (Goos and Manning, 2003; OECD; 2003; Spitz, 2006; Dustmann et al., 2009; Goos et al., 2008).

There are only few studies that have considered the spatial dimension of employment polarisation and they have mainly focused on US (Manning, 2004; Mazzolari and

Ragusa, 2007; Autor and Dorn, 2008). This thesis attempts to contribute to the relevant stream of research providing evidence for the UK. The thesis examines the period before the current crisis like the 1990s and the mid 2000s when the UK economy experienced (almost uninterrupted) sustained growth and job creation. The thesis finds that the economy in the pre-crisis period generated growing numbers of high-paid and low-paid jobs compared to a shrinking of middle-paid jobs and this polarising pattern was geographically differentiated. The nature of recent technological change and consumer demand linkages are argued to be important elements of such analysis. The thesis analysis and findings might be useful not just for understanding that pre-crisis period but also relevant for the post-crisis recovery period.

The thesis extends over three empirical papers. The first empirical paper examines the geographical pattern of employment polarisation that emerged in Britain in the 1990s (Chapter 3). The rationale behind a spatially differentiated outcome for polarisation lies on a proposition based on consumer demand that serves as a working hypothesis for this thesis and is presented below. The chapter finds that polarisation takes place within regions rather than between regions and all regions have experienced polarisation to some extent. London was found to have the strongest employment polarisation amongst all regions in Britain for that period. It is vital to understand the processes that generate such polarisation and therefore the next two empirical papers (Chapter 4 and 5) are looking for relevant evidence at the local labour market level. Analysing Annual Survey of Hours and Earnings (ASHE) and Labour Force Survey (LFS) individual microdata, the thesis examines how high human capital in a locality

affects the labour market outcomes of the individuals of the locality in terms of wages and employment respectively.

Before sketching an overview of the structure of the thesis, let's go back to the consumer demand mechanism that was referred earlier and discuss briefly how it can intermingle with characteristics of the recent technological change in order to produce geographically differentiated outcomes. In a nutshell, the city's successful bankers, consultants and professionals demand leisure and personal services due to lifestyle and consumption preferences but also because their value of time is much higher and they prefer to outsource housework activities. Since these services are non-traded and need to be consumed on spot, the result is an increase in demand at the local area for the relevant low-pay occupation workers like cleaners, waiters/waitresses, bar staff, sales assistants and carers.

The role of technology here is crucial since the need for hand-eye coordination tasks as in cleaning or personal communication skills as in care work and waitressing has meant that technological capital has not managed to replace human labour in conducting these typically low-pay jobs. This proposition that there are limits to productivity increases in sectors less favoured by technology goes at least back to Baumol's work in 1967. It has received increased attention after a recent nuanced approach by Autor, Levy and Murnane (2003) who examined the changing task content of occupations due to technological change and Goos and Manning (2003) who argue that the non-routine tasks, which cannot be substituted by technology, are increasingly found in high-paid cognitive jobs, like managerial and creative occupations, but also in low-paid jobs. In contrast, technology has managed to replace

human labour in middle-wage jobs that involve routine tasks, whether cognitive (e.g. clerical jobs) or manual (e.g. manufacturing jobs).

Another crucial issue to consider is not only if technology has managed to replace human labour but also if it has managed to displace it geographically. For example, communication skills that are irreplaceable by technology and needed to operate an internet provider's technical support phone line entail that call centres are still labour intensive; however, improvements in telecommunications have displaced them to low-wage countries like India. In that respect, the consumer demand mechanism generates local spatial manifestations to the extent that the relevant activities of the low-pay jobs are non-traded; i.e. they cannot be codified and transmitted in order for the work to be outsourced to low wage countries.

These low-pay service jobs are conveniently called 'low-skilled' but easy use of the term needs caution. Many of these activities require skill to be performed and even somebody with a PhD could end up being an average performer. This was the account of the journalist Barbara Ehrenrich who tried to live working on six different low pay jobs in the US and says "[t]he first thing I discovered is that no job, no matter how lowly, is truly 'unskilled' "(cited by Perrons, 2004, p.67; Ehrenreich, 2001). In any case, what is less debatable is that these jobs are lowly remunerated and demand few/low educational qualifications to get employable.

Overview of the structure of the thesis

Chapter 2 offers the contextual background within which the three empirical papers of the thesis lie. It starts with examining the rise in earnings inequalities in the recent decades. Polarisation is suggested as one of the contributing forces to this inequality and is analysed further. An overview of the early polarisation literature that is traced at the 1980s-90s 'job quality debate' is offered. Subsequently I present the 'routinisation' hypothesis of Autor et al. (2003) and the revival of the polarisation debate that followed the work of Goos and Manning (2003). Since this stream of research has been largely aspatial, approaches from urban geography and economics that offer useful insights on the spatial dimension of polarisation are discussed. Drawing from this literature, the working hypothesis for a specific explanation that may account for geographically differentiated patterns of polarisation, the consumer demand mechanism, is sketched. Finally, the literature on human capital externalities, as an alternative account on the empirical observations of the thesis is briefly outlined.

Chapter 3 examines the spatial patterns of employment polarisation in the 1990s. Quadratic regressions and other techniques are used in order to investigate whether employment polarisation happens within regions or just across regions and whether it is a predominantly urban phenomenon. The strongest polarisation found for London is further investigated. Empirical analysis of various subgroups of the labour force can reveal interesting points about the spatial patterns of employment polarisation.

Chapter 4 turns to research on individual microdata from the ASHE dataset for the period 1997-2001. Applying wage regressions, it examines how individuals' wages change as the share of top-paid occupation workers in the travel-to-work area change over time. Splitting the sample on different occupational quintiles defined by pay, the differential wage impact found for each of these quintiles is used to shed light on the underlying causes. The chapter attempts to discern a consumer demand mechanism from production related ones, like production complementarities and wider productivity spillovers. Different econometric specifications are used to try to aid identification. Specifically, I control for within-industry effects and also apply the analysis for a subsample of low-pay occupations that can be closely associated with consumer demand effects.

Chapter 5 investigates how local human capital is associated with the employment chances of the individuals of the locality. I use a probit model to examine how the employment probability of otherwise similar working age males is associated with the population share of high-skilled in the local area. The empirical strategy aims to discern consumer demand effects from production related effects. In that respect, the analysis is repeated for different educational groups and the variable of interest, the share of the high skilled is estimated for both residents and workers of the local area. The residence based analysis is argued to be more informative on the consumer demand effects while the workplace analysis on production related effects.

Chapter 6 discusses briefly the findings of the thesis and attempts to contextualise their contribution and relevance within the related literature. The limitations of the

current study and possible extensions and points for further research are indicated where possible. Finally, the policy relevance of the research is briefly sketched.

CHAPTER 2: Literature review on employment polarisation and relevant human capital accounts

2.1. Introduction

Following stable wage structures for most of the 20th Century, earnings inequality in many Western economies started to rise from the mid-1970s onwards and drew the attention of researchers and policy makers. There has been an extensive stream of research, mainly on US and UK rising inequality, that documents its trends and looks into possible causes (Katz and Autor, 1999; Machin, 2008). Besides institutional explanations, economists have mainly examined market forces explanations that attribute the rise in inequality to a shift in the relative demand for skilled labour that outstrips the supply. There have been three main explanations put forward for this shift in demand, namely: deindustrialisation, globalisation and skill-biased technological change (SBTC). The consensus view shared by most economists has been the SBTC explanation, mainly for accounting in a satisfactory way the observed within industry skill shifts and the trends in the non-traded sectors compared to the other accounts.

Although SBTC might be able to explain the processes at the upper-tail of the wage distribution, recently economists started to challenge its capacity to adequately account for the processes at the lower tail of the wage distribution. In particular, they document trends of rising job polarisation in UK and US that the SBTC explanation

would fail to predict (Goos and Manning, 2003; Autor et al. 2006). There was already an important relevant research in the 1980s and 1990s looking into polarisation of employment, but since it was mainly associated with the deindustrialisation thesis, it suffered the same criticisms with it and received less attention over the years. The revival of the interest in polarisation came after a nuanced view on technological change offered by Autor, Levy and Murnane (2003) (ALM henceforth) and taken forward by Goos and Manning (2003) on their work on polarisation in UK.

However, these accounts on polarisation do not have a specific spatial element. Therefore this thesis examines a relatively less researched explanation that is based on a consumer demand mechanism and has spatial considerations. According to this account, the presence of high income high educated individuals in a local area boosts the demand for local low-skill, low-pay services. Since these services are non-traded and given an upward sloping labour supply, the increased labour demand would induce an upward effect on the wages and employment of the relevant low-pay occupations in the localities with high human capital. Therefore this account has the potential to explain differences in employment polarisation between spatial units with different skill or occupational compositions. In that respect, it is argued that it may be able to account for the broader regional patterns of polarisation that are examined in Chapter 3.

Looking for evidence in favour of the consumer demand story, Chapters 4 and 5 examine how high human capital in a local area affects the labour market outcomes of individuals of the area in terms of wages and employment. However, the positive observed effects might not come through a consumer demand mechanism but through

a production function mechanism, like productivity spillovers or production complementarities. Regarding the production side accounts, there is an extensive literature on human capital externalities that examines how workers in localities with high human capital might be more productive than their individual returns to human capital would account for.

This was a brief overview of the relevant arguments and literatures presented in this chapter. This chapter attempts to set the contextual background within which the empirical chapters 3, 4 and 5 are developed. In that sense, it covers quite different literatures and debates, many of which are not linked directly to each other.

Structure of the chapter

Having in mind this brief overview, let's see now how the sections and subsections of the chapter are structured. Section 2.2 discusses the literature on rising earnings inequality and the three main theses offered to explain it, deindustrialisation, globalisation and SBTC. Since the leading thesis in explaining inequality, SBTC, explains wage and/or employment growth at the upper-tail of the wage distribution but not at the lower-tail, Section 2.3 examines employment polarisation that explicitly focuses on the lower-tail of the wage distribution and presents its relevant literature.

Since this polarisation literature is largely aspatial, Sections 2.4 and 2.5 attempt to bring attention to the spatial dimension of the processes taking place at the lower-tail of the wage distribution. Section 2.4 presents the different literatures that can offer

spatial insights in the process of polarisation. Firstly, I present the urban geography literature on global cities that offers a theorisation of polarisation in cities. Then I give an overview of the urban economics literature that examines cities as centres of consumptions. Finally, I spend more attention on two contributions that are directly relevant to the consumer demand mechanism (Manning, 2004; Mazzolari and Ragusa, 2007), as well as a spatial extension of the ALM proposition (Autor and Dorn, 2008). Drawing from these literatures, Section 2.5 gives a brief outline of the consumer demand story, which can potentially generate spatially differentiated polarisation and will serve as a working hypothesis for this thesis. Section 2.6 examines the human capital externalities literature as a potential alternative account to the consumer demand story. Section 2.7 sketches a way to examine and potentially differentiate between consumer demand and production side externalities, that will be taken forward in the empirical papers. Section 2.8 concludes.

2.2. Recent rise in earnings inequalities

Earnings inequality has been documented to rise substantially in most OECD countries in the last quarter of the previous century. The rise in inequality was more striking for countries like US and UK and many studies examined their temporal patterns (see Machin, 2008 for a recent review). Although there is an agreement in the literature that inequality has increased, there is substantial debate about the underlying causes of this rise.

The explanations for the rising inequality can be generally divided into two main categories; the ones that pertain to institutional factors and the ones that relate to the change in the market forces. The market forces explanations attribute the rising earnings inequality to a shift in the relative demand for skilled labour that outstrips the relative supply. Consequently, the skilled workers wages and their employment rise relatively to the unskilled ones. The rise in the skill premium and skill intensity that the model predicts is consistent with the findings of the empirical observations. Three main theses have been suggested to cause the outward shift in the demand for skilled labour; namely, deindustrialisation, international competition and skilled-biased technological change.

The deindustrialisation thesis pertains to the shift from manufacturing to more skill intensive sectors such as services (Bluestone and Harrison, 1988a, 1988b, 1990; Juhn, 1994). It suggests that between-industry demand skill shifts driven by shifts in the composition of demand for the final product are to be held responsible for the rise in the demand for skilled labour. International trade is often suggested to be the primal cause of the industrial shifts, reflecting a change in trading volumes or patterns (Katz and Autor, 1999; Johnson and Stafford, 1999; Gottshalk and Smeeding, 1997a). However, the empirical evidence is not very supportive of this thesis, particularly due to findings of stronger skill shifts within industries rather than between industries (Johnson and Stafford, 1999). Nevertheless, comparison on metropolitan areas and states of the US has revealed a strong positive association between the extent of the decline of manufacturing and the wage inequality (Juhn, 1994; Katz and Autor, 1999).

Juhn (1994) examines the fall in manufacturing in US states and its relevance in explaining the increase in overall wage inequality. She argues that since the manufacturing sector employs workers with middle skills, the displaced middle-skill workers would seek employment in low paid jobs increasing the relevant supply and reducing the relative wages. In other words, it is the falling relative wages at the bottom rather than an expansion of this sector (as the polarisation thesis would suggest) that raises wage inequality.

International trade has also been proposed to account for the increased demand for skilled labour (Wood, 1995). Two models are mainly relevant for this theoretical approach. The factor content model which appeals particularly to labour economists suggests that the change in composition of trade in terms of the skill value embodied alters the demand for skilled labour. Specifically, imports in the advanced countries that have larger unskilled component embodied than skilled will tend to increase the relative effective supply of unskilled labour and thus lower its relative wages. The second model is favoured by trade theory economists and pertains to exogenous output price changes. Its basis lies in the Stolper-Samuelson theorem according to which openness to trade with developing countries that are relatively less skill abundant than the domestic country will lead to a fall in the relative price of the less skill intensive good and a decline in the wages of the unskilled labour in the domestic economy (Katz and Autor, 1999; Johnson and Stafford, 1999; Gottshalk and Smeeding, 1997a).

One of the main criticisms of the internationalisation approach is the inability to reconcile it with the observed rising skill intensity in the non-traded sectors (Machin,

2008). According to its implications, we should expect non-traded sectors to get less skill intensive since they would hire the displaced unskilled workers from the traded sectors at relatively lower wages (Desjonqueres et al., 1999). On the contrary, there is evidence of within-industry skill shifts to more skilled workers even for non-traded sectors (such as hotels and restaurants) (Desjonqueres et al., 1999), although to a less extent than the traded industries (such as manufacturing). Specifically, for US in the period 1979-1989, the annual rate of growth of the employment of the skilled over the unskilled in manufacturing grew by 4.4% and by 2.8% in the non-manufacturing sector (Johnson and Stafford, 1999).

At best, the consensus has been that trade can only account for a small part (if any) of the rise in earnings inequality at the last quarter of the previous century, *inter alia* due to the small trade volumes at that time. Nevertheless, this appeared to be the dominant view in the literature during the 1990s before the great rise of China and India as leading partners in the world trade (Machin, 2008). It is left to be seen if and how trade has impacted on the wage structure of the developed economies in the recent years.

One of the leading contenders to account for the increased demand for high-skilled workers is the so called 'skill-biased technological change' (SBTC) proposition (Bound and Johnson, 1992; Katz and Murphy, 1992; Mincer, 1991). It suggests that technological change is biased towards higher skills and that recent rapid technological change and particularly the "computer revolution" have induced an increase in productivity of the skilled labour and thus a higher demand for it. In the early literature, SBTC used to be grasped by a residual in the production function or a

time trend, but subsequently research uses direct measures of technological change and examines its impact on the relative cost share of skilled workers (Machin, 2008). Numerous studies for US and UK have found that demand skill shifts were stronger within the more technologically advanced sectors and substantiated the evidence in favour of SBTC (for US, Berman, Bound and Griliches, 1994; Autor, Katz and Krueger, 1998; for UK, Machin and Van Reenen, 1998). In terms of what lies behind the relation between technology and skill, various approaches have been suggested; most notably, increased capital intensity combined with complementarity between capital equipment and skilled workers (Krusell et al. 2000), and technologically induced organisational changes (Bresnahan, Brynjolfsson and Hitt, 2002).

SBTC has until recently been the most preferred explanation among the economists both for tackling theoretically the issues of within industry skill shifts, as well as the non-traded sector skill shifts, and because of the volume of supportive evidence from US and UK. The main criticism of SBTC is that of the timing of the technological change. For US, it has been suggested that the rise in wage inequality was an episodic event of the 1980s, attributed to institutional changes like the falling minimum wage, and since then wage inequality has stabilised despite rapid technological growth (Card and DiNardo, 2002; Lemieux, 2006). The debate has continued with recent research against this 'revisionist literature' and in favour of a nuanced version of SBTC that considers the changing task content of occupations and is presented at section 2.3 of this chapter (Autor, Levy and Murnane, 2003; Autor, Katz and Kearney, 2008).

Since the demand and supply explanations cannot explain the large differences in the trends of wage inequality between different countries that have faced largely similar trade and technological shocks, the role of the labour market institutions that pertain to each country is argued to be important (Fortin and Lemieux, 1997; Katz and Autor, 1999). In this respect, the higher unionisation rates, the more centralised wage setting, higher minimum wages and generally the more regulated labour markets of Continental Europe are suggested to prevent these countries from experiencing sharp wage inequalities as in US and UK. Nevertheless, most economists believe that market forces are still in effect but their outcome is mitigated and differentiated by institutional factors.

2.3. Employment polarisation

Most of the above literature in earnings inequality evolved in the 1990s when researchers were analysing the patterns of the previous decade. It has been documented recently that although upper tail inequality (the 90-50 wage differential) continued to grow during the 1990s in US and UK, there has been a stabilisation or even contraction of the lower-tail inequality (the 50-10 wage differential) (Machin, 2008 for UK; Autor et al. 2006 for US). In that respect, employment polarisation has been suggested to emerge that takes account of the documented trends in the employment and wages of low-skill occupations. The next subsection discusses the early literature in employment polarisation before moving on to the more recent literature.

Early literature on employment polarisation and the job quality debate

The early literature focused mainly on US and debated on the quality of the new jobs that economy creates (Bluestone and Harrison 1986, 1988a, 1988b; Kosters and Ross 1987, 1988). Since the expansion of the low pay sector of the economy contributes to wage inequality, this debate was central in explaining the rise in US inequality in the 1970s and 1980s. Researchers mainly employed two approaches to test for the emergence of polarisation; the first examined the wages of the new jobs created in the economy ('wage polarisation') and the second examined the occupational structure of the economy ('job polarisation' or 'employment polarisation').

Under the first approach, low and high cut-off points are assigned to the earnings distribution, and the number of workers falling in each earnings stratum – that is, above the high cut-off point, between the high and the low cut-off points and below the low cut-off point – are counted each year. Developing this methodology, Bluestone and Harrison (1986, 1988a, 1988b), who were prominent adherents of the deindustrialisation thesis that was discussed earlier, argued that the number of low-paid jobs in US increased between the mid 70s and the mid 80s. Plotting the low-wage share of the year-round full-time workforce over time for 1963 to 1986, a U-shaped curve emerged, with levels falling up to 1969 and rising after 1978 (1988b). This pattern was observed to different degrees for most demographic groups, most regions and most sectors of the economy. Controlling for business cycles, they tested for the determinants of low-wage proliferation and found rising productivity to be associated with declines in the low-wage share, while the fall in manufacturing employment led to a higher low-wage share. Baby booms and increased female

labour force participation were not significant as independent variables. All the above factors accounted only for 40 per cent of the variation in the cyclically adjusted low-wage trend and Bluestone and Harrison (1988b) therefore point to institutional explanations for the remainder of the rise in the low-wage share. On the contrary, Kosters and Ross (1987, 1988) had also used a similar methodology with different deflators and cut-off points for defining low and high wages and found no evidence of growth in the low-pay sector. That debate focused mainly around the deflators and earnings cut-off points used and referred to US data. There have also been studies in UK that followed a similar approach (like Hamnett and Cross's (1998) for London and Fitzner's (2006) for UK) and found no evidence of wage polarisation.

However, there has been criticism of such an approach. Costrell (1990) points out that it is sensitive to deflators and the endpoints used and therefore suggests an alternative approach that is independent of the earnings distribution. Specifically, he categorises industries according to average pay (in the mid 1980s) and subsequently estimates the net employment gains in these industry cells. Using this more conventional ranking of job quality, he presents empirical evidence for the US (for the early 70s to mid-80s) that new jobs have been created increasingly in industries that pay lower wages.

In a similar vein, Ilg (1996) uses occupation-industry cells and ranks them according to pay in order to group them into high-, middle- and low-wage categories. In the US in the early 1990s the high-wage and to a lesser degree the low-wage categories gained employees while the middle-wage category declined. More recently, the OECD Employment Outlook reports of 2001 and 2003 showed that in the 1990s the UK, Netherlands, Denmark and Belgium experienced growth in the high- and low-

wage sectors, while there was a decline in the middle-wage sector. Of note, for the period 1993 to 2001 in the UK, growth was stronger in the low- than the high-wage sector (OECD 2003).

Wright and Dwyer (2003) argue that examining the growth of different job categories, defined by pay, is a preferable method as it portrays the earning potential embodied in the job creation rather than simply the changing patterns of individual earnings. Comparing the 1960s with the 1990s, they consider the possibility of elements of a 'servant' class arising in the future, as employment growth in the 1990s is mainly in well-paid high-tech jobs and in low-paid jobs in the retail and personal services sectors. Additionally, they provide evidence of increasing polarisation according to race in employment growth in the US. Most of the growth at the bottom tier of the occupational distribution consists of immigrants, especially Hispanics.

Acknowledging the limitations of pay as a measure for job quality, researchers have attempted to incorporate additional job characteristics into their analysis. Notably, Gittleman and Howell (1995) use labour segmentation theory. They found that the two highest 'contours' of jobs, created using cluster analysis, in terms of job quality[1], were gaining employees in US in the 1980s, the two middle ones were losing and the lowest two remained roughly at the same level. Similarly, Meisenheimer II (1998) argues that focusing only on pay might portray service jobs as bleaker than they are (also see OECD 2001). He also considers job characteristics such as employee benefits, job security, occupational structure and occupational safety to point out that the shift to services does not mean a shift to bad jobs. However, even using this

[1] Besides pay, this considers factors such as benefits (health insurance, pensions), skill requirements, working conditions (physical, environmental conditions), employment characteristics (unemployment, involuntary part-timing, working hours), institutional characteristics (public sector, unionisation).

enhanced job quality measure, Meisenheimer's research shows that the service industry includes not only some of the 'best jobs' but also some of the 'worst jobs'. Such characteristics that refer to the content of work might be important if the interest is in job quality, but if the interest is in inequality then pay remains the most crucial job attribute.

The 'routinisation' hypothesis and the revival of the polarisation debate

The job quality debate in the 1980s and 1990s was largely preoccupied with deindustrialisation and the rise of services as the main factor behind polarisation. Therefore it did not offer a convincing conceptualisation of technological change that would account for the observed within industry skill shifts. On the other hand, SBTC's success in explaining within industry shifts to higher skills led most researchers to examine educational and job upgrading rather than polarisation. It was only after Autor, Levy and Murnane's study in 2003, who offered a nuanced view on how technology affects labour demand, and Goos and Manning's job polarisation work for UK (2003) that research in polarisation started to flourish again (Autor et al., 2006, 2008; Spitz, 2006; Autor and Dorn, 2008; Dustmann et al., 2009; Goos et al., 2008).

However, an insightful discussion of technological change that is relevant to the polarisation hypothesis was offered already in 1967 by Baumol. Baumol (1967) argues that technological progress favours specific sectors in the economy, with adverse effects on the survival of sectors that have limited scope for productivity

increases, which may shrink or in extreme cases vanish completely. Alternatively, if the level of output of sectors less favoured by technology is to be maintained, then a growing share of the labour force would have to be employed in them. Baumol argues that maintaining such a relative output ratio could only happen if there were either price-inelastic and/or income-elastic demand (in the retail sector, for example), or government support (for hospitals, for example).

Autor, Levy and Murnane (2003) argue that the concept of skill-biased technological change (SBTC) that predicts a rise in the demand for skills, as productivity of the high-skilled increases, needs refining in order to account for the processes affecting the task composition of work. They examine the task composition of jobs and how it has changed by the recent technological change. They distinguish between routine tasks that computerisation can substitute for human labour and non-routine tasks that computerisation cannot. Routine tasks are either cognitive, like record-keeping and calculation type activities, or manual like the typical repetitive work at the factory's assembly line. Since they can be coded in a fine set of rules, computers/machines are capable of performing them and can substitute for human labour. Non-routine cognitive tasks refer to complex problem-solving and communication tasks that technology complements human labour in their execution. Finally, non-routine manual tasks are activities that might require hand-eye-foot coordination like cleaning or motoring and therefore cannot easily lend themselves to substitution. Autor et al. (2003) document that the most 'routinised industries' (in terms of being intensive in labour input of routine tasks) in the 1960s were also the ones that showed the highest adoption of computerisation while at the same time labour input substituted away

from routine tasks to nonroutine ones. Similar task composition changes are documented at all educational levels and also within occupations.

Bulding on the Autor, Levy and Murnane proposition (ALM henceforth), Goos and Manning (2003, 2007) argue that nonroutine tasks are not only found in high-skilled occupations but also in the low-skilled ones that do not become obsolete with technological progress. They document that the non-routine tasks, which cannot be substituted by technology, are increasingly found in high-paid cognitive jobs, such as managerial, financial and creative occupations, but also in low-paid manual jobs like cleaning and bar work. In contrast, technology has managed to replace human labour in middle-wage jobs that involve routine tasks, whether cognitive (for example, clerical jobs) or manual (for example, factory jobs). Therefore, they argue that technological progress favours employment growth in both high- and low-paid jobs, while disfavouring the middle-paid jobs, and a polarisation of work emerges.

In one of the few empirical pieces of research focusing on Britain, Goos and Manning (2003) found evidence of increased polarisation in Britain in the period 1975-1999. Their approach could be situated within the same tradition with the earlier literature of Costrell (1990) and Ilg (1996) as they look at employment growth at different occupation and occupation-industry[2] categories. Using regression analysis, they found a U-shape curve relating employment growth to job wages: in other words, greater employment growth in high-paid and low-paid jobs, accompanied by relative shrinkage in employment in average-paid jobs. Furthermore, they found evidence that employment polarisation alone can explain between roughly 30 and 50 per cent of the

[2] This classification has both occupation and industry disaggregations. For example, it distinguishes between a manager in a fast food outlet and a manager in an IT company.

rise in wage inequality in Britain in the last quarter of the previous century, measured as the 90-50 and 50-10 percentile log wage differentials respectively.

When looking at changes in the demographic composition of labour supply, increased feminisation of employment, educational upgrading and changing age structure fall short of explaining fully the emergence of polarisation. While there might be some explanatory power in them especially for some occupations, Goos and Manning adhere to technological change and the "ALM routinisation" hypothesis as the most plausible account for polarisation. They also examine the shift towards nonmanual jobs that predominantly takes place within industries and is suggested as evidence of SBTC. Their main criticism is that this binary distinction between nonmanual (high-skilled) and manual (low-skilled) jobs hides more subtle polarising occupational trends. Their analysis shows occupational categories at the bottom of the skill distribution (like personal, protective service and sales occupations) that experience rising employment shares both within and between industries. The within industries rise is interpreted in the context of the inability of technology to substitute for them, while the between industries as a shift towards services. The within industries element of their analysis is that takes forward the polarisation debate from the more limited discussion of deindustrialisation in the previous decades.

They present a competitive model with three different types of labour low-, medium- and high-skilled in order to explain the observed trends. The problem they encounter is how to interpret the observed fall in the relative wages of the low-skilled labour. In contrast to this observed trend, a competitive model with a stable upward sloping supply curve predicts that a rise in labour demand due to a technological shock

generates a shift along the supply curve and hence higher wages and employment. They argue that their competitive model could produce the observed trend of falling relative median wage of the low-skilled if supply curve becomes "back-ward bending" after a point or "an increase in the high-skill wage raises the supply of low-skill workers" (p.56). They dismiss both explanations as not attractive enough[3]. Therefore, Goos and Manning offer two alternative explanations to account for the rise in lower-tail inequality. First, they argue that the shrinkage in the middle-skill sector of the economy can mean that only the best workers in terms of human capital and ability remain and the displaced workers who are the less productive move to the low-skill sector, producing the fall in the wages of the low-skill segment relative to the middling one. Second, they refer to non-competitive accounts like Acemoglu's (2001) model in which "supply generates its own demand" or institutional changes like the fall in unionisation and the minimum wage.

Autor, Katz and Kearney (2006) examine the recent trends in US wage inequality and argue that employment polarisation has emerged in the 1990s. After two decades of steady growth, wage inequality slowed down in the post 1990 period. Specifically, the upper-tail inequality (90-50 wage decile ratio) continued with secular growth, while lower-tail inequality (50-10 wage decile ratio) declined compared to the late 1980s. They examine how employment changes of occupations have been related with their initial skill level, as proxied by median years of schooling or median hourly wages. For the 1990s, the relevant plot of employment growth by occupation skill

[3] The latter explanation can have some validity within the context of consumer demand account for polarisation (discussed in a subsequent section (2.5)) combined with spatial migratory patterns. If products intensive in low-skilled labour input are also highly income elastic then an increase in the wages of the high-skilled could generate an increase in the demand for low-skill workers through a consumer demand mechanism. If low-skill migrants migrate in vast numbers to such areas with rising wages of the high-skilled in order to benefit of the available employment opportunities, then supply could outstrip demand and cause a fall in the relative wages of the low-skilled.

percentile presents an approximate U-shape, indicating rise in employment shares of high-skilled occupations, stabilisation or rise of the low-skilled occupation shares and shrinkage of the middle-ones. This is huge contrast to the plot for the 1980s that shows a strong monotone employment growth by skill level, with increases for the high-skilled occupations and decline for the low-skilled ones. Similarly, a polarising pattern for the 1990s compared to a monotone one for the 1980s is also documented when looking at changes in wages by wage percentile. Again, the turning point appears to be around the late 1980s and this analysis appears robust to different data used and broader time periods[4].

In their 2006 paper, Autor et al. build on the ALM routinisation work and present a model to account for this polarising trend that depends on a falling price for computerisation and the substitutability between computerisation and routine tasks. They use an aggregate Cobb-Douglas production function which distinguishes between non-routine cognitive tasks, routine (cognitive or manual) tasks and non-routine manual tasks that correspond to high-, middle- and low-skilled occupations respectively. Low-skilled workers can perform either the routine or the non-routine manual tasks, while high-skilled workers perform the non-routine cognitive tasks. Computer capital substitutes for low-skilled labour in performing the routine tasks and its price is falling at an exogenous rate. The falling price of computerisation and consequently of the wages of the routine tasks drives low-skilled labour to work increasingly in the non-routine manual tasks. The model also predicts rising wages for the high-skilled workers, while the wages of the low-skilled can either rise due to complementarities with the routine tasks or fall due to the increased labour supply.

[4] They find similar polarising and monotone patterns comparing 1988-2004 with 1973-1988 using Current Population Survey data (Autor et al. 2006) and comparing 1990s with 1980s using Census data (Autor et al. 2008).

The authors argue that this is consistent with the empirical evidence of rising upper-tail inequality throughout the period and lower-tail inequality rising in the 1980s due to dominant labour supply effects while falling in the 1990s when complementarity takes over. This polarisation model has some similarities with a much earlier model that accounts for deindustrialisation and was mentioned in the previous section (2.2) (Juhn, 1994). However, Juhn did not consider complementarity of middle-skilled and low-skilled sectors that would predict a rise in the employment shares at the bottom of the skill distribution.

Besides US and UK, a number of recent papers document evidence of job polarisation along similar lines for the former West Germany (Spitz, 2006 and Dustmann et al., 2009). Using data for 16 European countries, Goos et al. (2008) find evidence of European wide job polarisation similar to US and UK. Their results are in line with the ALM routinisation hypothesis for the changing task content of occupations. Furthermore, they provide recent evidence of offshoring of routinised occupations, although its effect is argued to be smaller than that of technical change.

2.4. Spatial considerations on polarisation: relevant accounts in the literature

As seen in the previous section, the stream of literature stemming out of the routinisation proposition of Autor, Levy and Murnane in 2003 has been influential and documents polarisation in the national level for the relevant countries. Nevertheless, it does not have a specific spatial aspect and therefore does not inform on processes that lead to polarisation at the subnational level. Attempts to offer

variants or alternative accounts of employment polarisation with an explicit spatial dimension are considered in this section.

Urban Geography/Urban Sociology contributions on 'World Cities'

In this subsection, I refer to research from disciplines other than economics – mainly from urban geography and sociology– that have also examined the issue of employment polarisation and offered a number of important theories with more insight into the spatial dimension (Friedman and Wolf, 1982; Mollenkopf and Castells, 1991; Sassen, 1991; Perrons, 2004; Datta et al, 2007). Specifically, it has been suggested that the changing nature of the global economy leads to the formation of 'world cities', whose economies are boosted by the growth of the financial services and the new economy sectors[5]. Although, these world cities are characterised by great economic dynamism and prosperity, they also feature social and economic polarisation. Saskia Sassen (1991) has been one of the most prominent researchers to develop this argument, the main idea being that the proliferation of a high-income workforce in the large metropolitan centres generates a consumer demand for goods and services that are supplied by low-paid workers.

In more detail, Sassen (1991, 2001) argues that there has been a change in contemporary social and employment norms that tends to increase the number of low-paid jobs needed by the new growth sectors and to shape work processes in more

[5] These include newer, high-growth industries and business sectors on the cutting edge of technology, such as IT, internet and biotechnology.

informal and casual forms of employment. Specifically, globalisation and deregulation of financial markets have boosted producer services and the finance sector, resulting in major increases in their profits. These new growth sectors concentrate in global cities, where global command functions are strategically situated to take advantage of the available infrastructure and facilities. The consequent expansion of the high-income workforce has led to residential and commercial gentrification and engendered a new culture of consumption in these cities, associated with high demand for expensive, non-standardised, non-mass-produced goods and services. In Sassen's words, "high income residential and commercial gentrification is [labour] intensive and raises the demand for maintenance, cleaning, delivery, and other types of low-wage workers" (2001, p.286).

Perrons (2004) argues that care and reproductive work is labour intensive and issues of power and gender relations intermingle so that it ends up being lowly remunerated. Furthermore, due to changes in labour organisation and management practices, companies increasingly offer reproductive services to their employees such as meals, cleaning, shopping and childcare services (Perrons, 2004). In that respect, the consumer demand effects that this thesis discusses can be thought to arise even in the workplace to the extent that they can be broadened to encompass general reproductive services offered at the workplace and otherwise would have been consumed at home or the neighbourhood. This distinction between consumer demand effects at the local area of the residence or the workplace will be discussed later in the empirical analysis and will be particularly relevant in Chapter 5, where information is available both for the residence and the workplace of the individuals.

Urban Economics literature on 'Consumer City'

An interesting relevant discussion is offered by a number of papers in the urban economics literature (Glaeser et al. 2001, Glaeser and Saiz, 2004; Glaeser and Gottlieb, 2006; Shapiro, 2006). Although they do not examine polarisation as such, it is worth presenting them here as they raise interesting points on the high and low-skill sectors of the cities. In that respect, this stream of research is very relevant to the consumer demand story, which is presented in the following section (2.5).

Glaeser et al. (2001) offer an important theorisation of the rise of city as a centre of consumption. Their main aim is to investigate the economic success of cities and argue that their role as consumption centres in an era of rising incomes has been crucial for the demand for cities and the recent urban resurgence. Urban areas provide a large variety of services and consumer goods (like theatres and restaurants) that are non-traded and therefore attract increasingly rich workers. Attracting richer and better educated workers fosters the economic success of cities and therefore may benefit the poorer city residents as well. Glaeser and Gottlieb (2006) provide empirical evidence from a US large sample life style survey that college graduates are keener to visit a museum, go to a restaurant or a concert or similarly make use of the available urban amenities than other educational groups. Shapiro (2006) makes similar arguments when he investigates the positive relationship between the concentration of human capital in a metropolitan area and its employment growth. One of the explanations that he examines refers to the expansion of consumption amenities in areas with more educated populations. Specifically, he finds that metropolitan areas with higher

human capital concentrations experienced higher growth of restaurants per capita in the 1990s in US.

Recent contributions by economists

I discussed earlier that there has been a small literature emerging on polarisation after the work of Autor et al. (2003) and Goos and Manning (2003). Most of these contributions did not have any spatial considerations, but more recently economists have started to conduct research at the city or commuting zone level for US finding empirical support for polarisation (Manning, 2004; Mazzolari and Ragusa, 2007; Autor and Dorn, 2008). While having a non-monotone impact of technological progress as their starting point, these approaches posit that low-skill consumer services demanded by the high-skilled are non-traded and physical proximity of consumers and producers is required. In that respect, they are reminiscent of elements of the urban economics literature on consumer cities and their predictions also echo the polarising global/world cities, although based on different fundamentals. Autor and Dorn's analysis (2008) depends on the rapid productivity growth in the goods sector due to technological shocks along the lines of the routinisation hypothesis, while Manning (2004) and Mazzolari and Ragusa (2007) analyses lie on high-skilled individuals employing low-skilled labour for services that they would normally do themselves like housework and childcare.

Manning (2004) considers a simple model with two types of labour, skilled and unskilled, and two sectors, a traded and a non-traded housework sector, that predicts

increased employment prospects and wages in cities with higher shares of skilled workers. Skilled workers can either do the housework themselves or employ someone to do it. A higher share of skilled workers in the city would generate increased demand for non-traded services. Similarly, higher wages of skilled workers (e.g. due to SBTC) would mean higher purchasing power and therefore higher demand for non-traded services. The model then predicts that a rise in demand for non-traded services by the skilled labour would raise the wages of the unskilled and hence the employment of unskilled labour in the non-traded sector. Manning (2004) provides empirical support for the predictions of this model using data from US and UK. For both countries, low skill labour has been employed increasingly in the non-traded sector and decreasingly in the traded one over mid-1980s to mid-2000s. Furthermore, in a panel of cities over 1994-2002 for US, he finds that the employment rate of the less-educated group depends positively on the share of college graduates in the city. This impact declines for the employment rate of the medium educated groups and turns to zero for the highly educated themselves. The positive impact on the less-educated group remains significant even when restricting the variable of interest to college graduates over the working age. Since individuals over the age of 65 are unlikely to work, the positive coefficient of the variable of interest captures predominantly consumer demand effects rather than human capital externalities that could arise through workplace interaction. Section (2.6) discusses further the human capital externalities literature in relation to this thesis analysis. Finally, Manning (2004) finds that a higher share of college graduates in a city affects positively the employment of the less-educated in the non-traded sector and negatively in the traded sector. This pattern is not documented for medium and higher educational groups.

Mazzolari and Ragusa (2007) build on Manning's approach and discern a 'home services' sector in order to investigate "consumption spillovers" from skilled workers in US. In their account, skilled workers' rising wages in the recent decades have increased their value of time and led to greater outsourcing of home production activities. In support of that, they present consumer expenditure data showing that the more educated or the richer is a household, the greater its budget share spent on home services. Additionally, employing a panel of US cities over three time periods (1980-90; 1990-00; 2000-05) they find a positive relationship between the growth of relative wages at the bottom and the growth of relative wages at the top of the distribution. This association rises with the share of low-wage workers employed in home services but not with the share employed in other non-traded sector activities. This is interpreted as evidence in favour of the outsourcing of housework services approach rather than a more general income effects approach (like the 'consumer demand hypothesis' that suggests that high income, high educated individuals spend a larger share of their income on local low-skill services). Furthermore, the association between the growth of the relative wages at the top and the bottom of the distribution (relative to median) does not increase with the share of college graduates in the city. Mazzolari and Ragusa (2007) interpret that as evidence against the existence of production complementarities or human capital spillovers as alternative accounts to the 'consumption spillovers'. However, this is a strong case to make out of their city-year panel regressions that do not include any additional controls besides city effects and the variables of interest.

Both Manning (2004) and Mazzolari and Ragusa (2007) theoretical accounts lie on the outsourcing of non-traded housework activities by the high-skilled that generates

increased demand for low-skilled workers in the home services sector. In the empirical part, Manning provides evidence for the broader non-traded sector (e.g. including retail), which is more in line with the "consumer demand hypothesis" as presented in the following section (2.5), while Mazzolari and Ragusa distinguish between the broader non-traded sector and the home services sector finding evidence just for the latter. However, Autor and Dorn's model (2008) does not depend on either this substitution effect of housework for market services or demand for services being highly income elastic (as in Clark, 1957; Baumol, 1967; Leonardi, 2008). Rather it resembles the Autor et al. (2006) model discussed earlier amended by introducing a separate goods and services sector. Key to the predictions of the model is the extent of complementarity between labour and capital and the elasticity of substitution between goods and services. Since the services output is non-traded and labour mobility is limited, especially for the low skilled, this approach offers spatially differentiated outcomes and predicts employment and wage polarisation within regional labour markets. Their main assumption is that different levels of specialisation in routine tasks amongst the commuting zones imply different potential for utilisation of computer capital. Therefore, higher initial levels of routine task activity in a commuting zone would result in an increase in services occupation employment and rising wages of the high-skilled relative to the middle-skilled. Given sufficiently high complementarity between goods and services, low-skill service jobs wages will rise as well. Autor and Dorn present empirical support for the model's predictions by analysing 722 US commuting zones for the period 1980-2005.

2.5. Brief outline of the consumer demand story

This section presents the working hypothesis of the consumer demand story. The conceptualisation of this hypothesis draws from the literatures that were presented in the previous section. I argue that the consumer demand story might be able to explain the spatial patterns of polarisation that are empirically observed and presented in Chapter 3. Furthermore, I suggest that the consumer demand story might be able to explain the positive wage and employment effects on low-skill individuals that are found in areas with growing human capital, as it is examined in Chapters 4 and 5 respectively. This is not the only possible account that can explain these positive effects and the next section presents accounts through a production function mechanism. In that respect, to keep things simple I will tend to refer to 'consumer demand' *vis-à-vis* 'production side' explanations for the rest of the thesis.

In a nutshell, high-income, high-educated residents spend more in absolute terms, but also spend a greater share of their income, compared to the other income and educational groups, for services that are not necessities, like leisure activities and personal services, that are income and education elastic. Albeit not all, most of these services share three main characteristics: they are non-traded, human labour is irreplaceable by technology in their provision and they are generally regarded to be relatively low-skilled. Notable examples are cleaning and security services as well as services that require personal contact e.g. bar staff, sales assistants and care workers. This hypothesis predicts that a proliferation of high income, high educated population in a local area would boost the demand for low-skill local consumer service jobs.

Given an upward sloping supply curve, wages and employment in these service jobs would increase for these areas.

The question that arises is what may cause spatially differentiated growth of high income, high educated workforce in different areas of the country. A plausible response is to think that cities attract high-skilled workers due to the urban amenities and the productivity benefits that they offer. A brief flavour of the former was given earlier in the short urban economics presentation, while the latter is discussed in the next section on human capital externalities. The urban or cultural amenities that cities offer might attract high-educated individuals that value them higher than other educational groups and this might generate a spatial sorting of human capital in the country. From another standpoint, economies of agglomeration might operate in cities or local labour markets that enhance the productivity of high-skilled workers more than elsewhere and thus raise their relative labour demand. As a result, there is going to be an increased influx of high-skilled individuals in the areas with stronger agglomeration effects due to the higher wages and increased employment opportunities that they offer. Besides influxes of high-skilled migrants, spatial differentiation in human capital can come from local youth cohorts acquiring greater levels of education and entering high-skilled, high-paid occupations. For example, increasing individual returns to human capital due to agglomeration benefits might encourage local youth cohorts to receive higher education and attend university. This spatial differentiation of human capital in combination with the consumer demand story might be able to explain the emergence of polarisation in urban areas with rising incomes and educational levels.

Let's see now the characteristics of these low-skilled service jobs. While, they are conveniently referred as 'low skilled', a caveat should be placed here as some require great skill like care occupations. In any case, it is less debatable that they are poorly paid and employ to a large extent workers with low or no qualifications. Although skill requirements are low for these jobs, the great advances in technology in the recent decades have not made them obsolete yet. Human labour still forms the main part of their activity, since technology has not managed to replace labour for tasks that require hand-eye-foot coordination like cleaning or services that require personal contact like bartendering. These are the non-routine tasks found in low-paid manual jobs that Autor et al. (2003) and Goos and Manning (2003) referred to. There is also a parallel line with the so called "technologically non-progressive" sectors of Baumol (1967), that have limited scope for productivity increases.

Besides referring to jobs that are irreplaceable by technology, the other crucial factor for the consumption driven mechanism to work is that they are non-traded. Most of these consumption services need to be consumed and produced locally and therefore require physical proximity between the consumers and the producers. In that respect, globalisation has not impacted yet on dislocating them to low labour cost countries in the developing world. Good examples are cleaning services, security and services offered by bar staff, sales assistants. Future improvements in technology and change in social habits might impact on their potential for outsourcing but there might still be a large share that would have to be delivered and consumed on spot. For example, e-shopping might become increasingly popular in the future but it might not wither away the pleasure some people derive from shopping down a street with small

boutique shops or visiting a mall. As long as this is the case, the demand for sales assistants will still be there.

Table 2-1 attempts to summarise how technological improvements and the non-traded nature of the services interact with each other in the context of the consumer demand mechanism. The top left shaded cell refers to the jobs that we are interested in. According to the consumer demand hypothesis, a rise in the share of high-income high-educated individuals in a locality will boost demand for these low-skill services that are consumed and produced locally. Given an upward sloping labour supply curve, we should expect an increase in wages and employment for these jobs and this is going to be empirically investigated in Chapters 4 and 5. Let's look now at the jobs that fit in the other cells of Table 2-1. Bottom left corner includes jobs that technology cannot substitute for successfully and that are traded. Think of the increasing amount of services provided by call centres, which are labour intensive. They require communication and personal skills that technology has not made redundant yet, but improvements in telecommunication have led to their outsourcing to low labour cost countries or regions. Top-right corner includes jobs that technology has substituted for human labour but they are non-traded. Examples are petrol stations and vending machines that sell soft-drinks or snacks. Although the consumption is localised, automation has reduced human labour in these sectors of the economy. Finally, the bottom right corner considers sectors of the economy that are traded and human labour plays an increasingly minor part (e.g. manufacturing, e-shopping).

To conclude, this section has offered a theorisation of the consumer demand story, which will serve as a working hypothesis for the empirical part of the thesis.

According to this hypothesis, cities have complementarities with high-skilled individuals and increasing returns to human capital or local urban amenities might lure growing numbers of high-skilled individuals to cities. High-income, high-educated individuals spend more (in absolute and relative terms) for local, low-skilled services that are income and education elastic. As these service jobs are labour intensive and technology cannot easily substitute for human labour in their performance, there will be increased demand for the relevant low-skill service occupations. Therefore, this consumer demand mechanism has the potential to create polarisation outcomes that differ across urban areas depending on the growth of the high-skilled individuals. It may be expected that urban areas or city regions with faster growing shares of high-skilled individuals will experience greater polarisation. This hypothesis is examined in Chapter 3, where the employment polarisation of different regions is compared. Furthermore, the consumer demand story suggests that low-skilled individuals' wages and employment chances in an area will respond positively to changes in human capital of the area, given an upward sloping labour supply. This hypothesis is examined in Chapters 4 and 5. However, this positive relation between labour market outcomes of individuals and human capital changes might arise from the production side rather than the consumption. The following section discusses in more detail the relevant production accounts.

2.6. Human capital externalities and their relevance

Let us now consider in more detail the alternative explanations to the consumer demand story that are production related. These can be distinguished to human capital

externalities and production complementarities between low skill and high skill workers. According to the former, workers in localities with high human capital benefit from increased productivity to a greater extent than their individual returns to human capital would account for. An important literature stemming from Marshall's seminal work (1890) on agglomeration economies attempts to explain the nature of the interactions between firms/workers in the workplace or the city level and their impact on the productivity of individuals (Ciccone and Hall, 1996; Glaeser, 1999; Glaeser and Mare, 2001; Duranton and Puga, 2004; Rosenthal and Strange, 2004; Combes et al., 2008). Almost a century later, Lucas (1988) was arguing that some form of formal or informal interactions between workers generate external effects of human capital and enhance productivity of fellow workers. Subsequently, a strand of mainly empirical research has emerged trying to estimate these external effects of human capital (Rauch, 1993; Acemoglu and Angrist, 2000; Moretti, 2003, 2004; Ciccone and Peri, 2006).

Although, these two literatures, the agglomeration and the human capital externalities, have evolved separately, there are clearly linking points between them (Halfdanarson et al, 2008). Cities or local areas are the obvious place to look for interactions of individuals that generate external effects to human capital. In the human capital externalities literature, researchers have often employed wage regressions that control for individual characteristics and human capital and include the level of human capital at the city level as an additional variable, in order to capture its external effects. But the source of the externalities that this exercise estimates might come from the kind of interactions that the agglomeration literature examines (see Duranton, 2006 for such an argument). Before turning to this point,

let's see briefly the main points that the literature on agglomeration makes on the nature of interactions between firms and workers that generate the productivity externalities.

Marshall's original contribution referred to the sources of external effects that firms accrue from agglomeration in space. Firms agglomerate in space as they can gain productivity benefits from economies of scale due to local input sharing, labour market pooling and knowledge spillovers. Specifically, firms may face lower costs for specialised non-traded inputs that are shared locally in a geographical cluster. Furthermore, firms can gain from reduced labour acquisition and training costs in thick local labour markets with abundant specialised labour force. The precise mechanism through which knowledge spillovers between firms and individuals are transmitted and foster innovation and productivity is not entirely clear and a large stream of literature attempts to shed light on it (Krugman, 1991; Porter 1990; Gordon and McCann, 2005). It is argued that face-to-face contact can enable tacit knowledge spillovers through increases in the intensity of the interactions with other firms or individuals (McCann and Simonen, 2005; Porter, 1990; Storper and Venables, 2004). In that respect, geographical proximity is crucial in fostering face-to-face contacts and interactions and can give rise to distinct spatial patterns of agglomeration.

According to Hoover's (1948) original classification, localisation economies that are internal to the industry but external to the firm can arise from sectoral agglomeration of firms in a locality, while urbanisation economies that are internal to the city/region and external to the firm arise from wider urban agglomeration. Although, this classical classification has its shortcomings (McCann, 1995), it might be useful in the

empirical analysis of Chapter 4 where sectoral controls are used and it is argued to capture some type of localisation economies; *albeit* with caveats as well.

As seen, in the agglomeration literature productivity benefits come from sectoral and/or urban agglomeration rather than higher human capital in a spatial unit[6]. Nevertheless, there exists a clear link of the sources of agglomeration (local input sharing, labour market pooling, knowledge spillovers) with the human capital externalities story that is put forward as an alternative account in this thesis and empirically assessed in Chapters 4 and 5. It is reasonable to expect that locations with high human capital would offer increased provision of specialised inputs and reduced labour matching frictions due to the availability of appropriately skilled labour (Duranton, 2006). Furthermore, there is empirical evidence that cities with higher human capital favour communication interactions, which foster productivity (Charlot and Duranton, 2004).

The relevant issue coming from this literature for the purposes of this thesis is that externalities arising from human capital concentration cause productivity increases for workers. Then there is a clear link with the main empirical investigation of Chapters 4 and 5 and the competing consumer demand hypothesis, since an increase in the productivity of workers would shift the labour demand for them and thus increase their corresponding wages and employment given an upward sloping labour supply curve. When the focus is not the workplace but the neighbourhood, the

[6] There is interesting research in the agglomeration literature on the 'urban wage premium' that has not been covered here. Researchers examine whether the observed urban wage premium comes from productivity benefits due to cost savings from the denser economic activity or human capital accumulation that occurs over time (see Glaeser and Mare (2001) and Yankow (2006)). For our purposes, it is more relevant to think of the urban wage premium as a lure for high-skilled individuals to migrate to cities.

productivity increases of individuals can be argued to arise through localised neighbourhood and peer effects as it has been documented from UK (Gibbons, 2002; Gibbons and Telhaj, 2006).

A prominent study in human capital externalities literature was offered by Rauch (1993). Rauch provides empirical evidence for the existence of human capital externalities at the city level for the US. He employs Mincerian wage regressions adding average schooling as an additional explanatory variable and finds it has a significant positive impact on the individuals' wages. Acemoglu and Angrist (2000) are sceptical of the direction of this relationship and therefore use variation in child labour laws and compulsory attendance laws to instrument for average schooling in US states. They conclude that external returns to secondary education are small and not significantly different from zero. More relevant to the empirical analysis of this thesis is the approach of Moretti (2004) that examines human capital externalities from larger shares of university degree holders in metropolitan areas. As seen below in this section, Moretti finds positive human capital externalities for this measure of human capital, that focuses on the high-educated rather than those with secondary education.

Productivity spillovers should be expected to arise for all educational groups to one extent or another (Moretti, 2004). On the other hand, if we make the reasonable assumption of imperfect substitutability between different skill groups, then productivity increases could arise without the need for a greater productivity spillover effect. In a standard neoclassical model of perfect competition with two types of labour, skilled and unskilled, an increase in the numbers of skilled labour would raise

the productivity of the unskilled labour just because of production complementarities (for relevant research see Moretti, 2004; Ciccone and Peri, 2006; Kremer and Maskin, 1996; Murphy and Welch, 1992). Manning (2004) assumes perfect substitutability between skilled and unskilled labour in his model so that labour demand for unskilled workers can arise from consumer demand without the need for production complementarities. Moretti (2004) focuses on human capital externalities from the production side and offers a useful distinction between productivity spillovers and production complementarities. In the empirical part of this thesis, I follow Moretti's (2004) distinction between productivity spillovers and production complementarities, while I also consider the possibility of consumer demand spillovers (as those discussed in the previous section). The following section gives an overview of the relevant empirical strategy that I will follow. Before that, I summarise below Moretti's approach as it is of interest to see how exactly he has tackled the complementarities issue.

Moretti (2004) finds that the wage premium that individuals gain in cities with higher shares of college graduates decreases when one moves up the educational ladder. In that respect, low skilled workers benefit the most from large numbers of college graduates in the city, while medium and high skilled workers gain less. He explains this as the simultaneous effect of productivity spillovers and production complementarities. For the lower skilled groups, productivity spillovers and production complementarities both work in the same direction and raise their productivity. For the higher skilled groups, productivity spillovers increase their productivity while the higher supply of the skilled workers works in the opposite direction having a negative wage effect as predicted by a downward sloping labour

demand curve, leaving the direction of the final wage effect indecisive. The empirical pattern that arises for US is very consistent with the simultaneous effect of these two mechanisms, producing a decreasing wage premium when one moves up the educational ladder. Specifically, 1% rise in the share of college graduates in the city increases the wages of high-school drop-outs by 1.9%, of high school graduates by 1.6%, of graduates with some college education by 1.2% and of college graduates by 0.4%.

2.7. Overview of the empirical strategy

This section gives a short overview of the empirical strategy of the thesis. In Chapter 3, I examine employment polarisation in the regions of Britain to find out whether it has any distinct spatial patterns. I suggest that the spatially differentiated polarisation that is observed might arise from a consumer demand mechanism, amongst other explanations. In Chapters 4 and 5, I investigate whether the consumer demand story has some validity. In particular, I examine how low-skilled individuals' wages and employment chances in a local area respond to changes in the human capital of the area (measured by occupational composition or qualifications). Since the positive effects that are found might arise from both consumer demand and production side explanations, I examine the wage and employment effects for different skill groups in order to aid identification.

The rationale for expecting different outcomes for different skill-groups is the following. There are three competing accounts that can all generate wage and

employment effects on individuals from higher human capital in a local area; namely, the consumer demand story, that was presented in Section 2.5, and the productivity spillovers and production complementarities, that were presented in Section 2.6. Firstly, the consumer demand story suggests that higher shares of high income, high educated individuals in a local area would raise labour demand for local low-skill consumer jobs. Given an upward sloping supply curve, wages and employment in these service jobs would increase benefiting mainly low-skill individuals. Secondly, if low-skill and high-skill individuals are imperfects substitutes, then production complementarities would generate increased labour demand for low-skill individuals in areas with higher human capital. Wages and employment effects should affect the low-skill sector of the economy, again assuming an upward sloping labour supply curve. Thirdly, productivity spillovers that arise in areas with higher human capital (through interactions with high-skilled individuals or some sort of agglomeration) are expected to increase productivity of all skill-groups and their corresponding labour demand[7]. Now, given upward sloping labour supply curve, wage and employment effects arise for all skill groups. Table 2-2 summarises this relationship between the three different accounts and their expected impact on different skill groups.

Let's discuss now the supply side and how it can mitigate the wage and employment effects that are expected from the three accounts. Increased demand for specific occupations would change the wages and employment depending on the elasticity of the relevant labour supply. A positively sloped upward labour supply curve in combination with an outward shift of the demand curve would produce both higher wages and total employment. In the short run, supply can be expected to be more

[7] A model like that discussed by Moretti (2004) could generate productivity spillovers that affect similarly all skill groups and production complementarities that affect only the low-skilled.

inelastic (steeper curve) causing stronger wage effects and weaker employment ones; while in the long run it can be assumed that there is plenty of time for labour market adjustments so that supply is more elastic (flatter curve) and therefore wage effects are muted and employment effects stronger.

As mentioned, Chapters 4 and 5 examine how growing human capital in a local area affects the wages and employment chances of the individuals of the locality respectively. In the context of the earlier simple supply-demand model, the growing human capital causes an outward shift of the relevant labour demand curve and depending on the elasticity of the labour supply wages and employment effects are expected. Assuming a relatively inelastic (but not vertical) supply curve, which is a plausible assumption for the one year intervals used, both wage and employment effects can be expected. These effects are at the aggregate level and are assumed to generate the change in the individuals' labour market outcomes that are captured in Chapters 4 and 5.

2.8. Conclusion

This chapter has briefly presented the main literatures that are relevant to the empirical papers of this thesis and also sketched the contextual background and rationale for the empirical analysis. As discussed, in trying to explain the rise in earnings inequality since the 1970s, economists have mainly looked to the skill biased technological change explanation. Although SBTC succeeds in explaining employment and/or wage growth at the upper-tail of the wage distribution, it fails to

predict employment and/or wage growth at the lower-tail of the distribution that has been documented. It was argued that employment polarisation explanations might be more adequate to describe what is happening at the lower-tail of the wage distribution. In that respect, there is an important research stream on job polarisation that has recently revived and can give us useful insights. An important question that has not received as much attention in that literature is the spatial dimension of this polarisation. In Chapter 3, the geography of employment polarisation in Britain is empirically examined. Then Chapters 4 and 5 attempt to shed some light on the processes that might generate this polarisation. In particular, it is examined how individuals' wages and employment chances in an area might respond to changes in the human capital of the area. The empirical strategy employed tries to differentiate between consumer demand and production side explanations (like productivity spillovers and production complementarities).

2.9. TABLES

Table 2-1. Trade and technology: classifying occupations

	Labour is irreplaceable (labour dominant in the activities performed)	**Labour is replaceable** (technology substitutes for human labour)
Non-traded	Cleaners; Care work; Bar staff	Petrol pump forecourt attendants; vending machines
Traded	Call centre staff	Manufacturing; E-shopping

Table 2-2. The impact of the three accounts on different skill groups

	Mechanism	**Impacts on**
Consumption story	Consumption	Low skilled
Production complementarities	Production	Low skilled
Productivity spillovers	Production	All

CHAPTER 3: The geography of employment polarisation in Britain

Abstract

Employment polarisation in developed countries has been of central focus for research and policy circles. An important question that has not been explored is the geography of this polarisation. This paper aims to address this issue, by examining empirically the spatial patterns of employment polarisation for Britain in the past decade. In the empirical part of the paper, econometric techniques are used to investigate whether employment polarisation happens within regions or just across regions and whether it is a predominantly urban phenomenon. New Earnings Survey data are used for this purpose. The main result found is that all regions experience some degree of employment polarisation during the 1990s. Remarkably, London appears unique in terms of the magnitude of its employment polarisation. It experiences disproportionately higher growth in the employment share of both high-paid jobs and low-paid jobs compared to the other regions.

3.1. Introduction

One of the main economic challenges for developed countries is how to increase employment, and governments have directed a vast amount of resources and policy thinking towards meeting this goal. The UK government can feel some satisfaction in the pre-crisis period, as total employment reached a record high of 29.04 million[8] and the working age employment rate increased to 74.5% in the last quarter of 2006 (up from 70.4% in 1992). While increasing the employment rate is a clear sign of success, the importance of the quality of the new jobs that are created should not be underestimated. Although there is an overall increase in the quality of employment, evidence has been found that a growing number of people are employed in low-paid jobs. It appears that our economy needs not only more managers, engineers and programmers, but also more sales assistants, waiters and cleaners.

The empirical evidence comes mainly from research in the US (Bluestone and Harrison 1986, Costrell 1990, Ilg 1996, Wright and Dwyer 2003, Autor et al 2006) but it has been shown recently that this might be applicable to European countries too. Two recent OECD reports (2001, 2003) found an increase in employment shares of high- and low-paid jobs and shrinkage in middle-paid jobs for the UK, Netherlands, Denmark and Belgium. Goos and Manning (2003) produced similar evidence and argued that polarisation in employment has emerged in Britain in recent decades, with more growth occurring in high-paid and low-paid jobs than in middle-ranking occupations.

[8] As measured from 1971, the period for which comparable figures have been available.

However, an important question that has not been explored so far is the geography of these changes. This chapter aims to address this issue, through empirical examination of the patterns of employment polarisation at the regional level in Britain over the past decade.

The paper starts with a brief discussion of the data and provides a working definition for job quality for the rest of the paper. In the empirical part of the paper, econometric techniques are used to investigate spatial patterns of job polarisation in Britain. Specifically, I examine whether employment polarisation happens within regions or just across regions, and whether it is a predominantly urban phenomenon. New Earnings Survey (NES) microdata that span a long time period and are workplace-based are used for this purpose. The main finding is that all regions experienced some degree of employment polarisation during the 1990s. London appears to have experienced greater employment polarisation compared to other regions.

The paper also investigates if there is an urban specificity in these processes by examining whether employment polarisation is stronger in metropolitan areas than in areas that are less urbanised. The main hypothesis here is that low-quality jobs, defined either as low-paid or low-skilled, depend increasingly on the growth in high-quality jobs, as suggested by the consumer demand mechanism of Chapter 2. According to this mechanism, the presence of a growing high-income workforce in the economy generates demand for consumer services, leading to an increase in low-skilled, service-related employment. As these services apply mainly to the non-traded sector of the economy, this hypothesis implies close physical proximity of the low-skilled and high-skilled jobs. If large metropolitan areas have growing shares

relatively of high-income workforce compared to the other geographical areas, this would lead to proliferation of low-wage service employment in these areas.

The empirical results do not entirely support this hypothesis, although there is evidence of strong employment polarisation in London compared to other regions. Therefore, the paper also addresses the differential performance of London in terms of employment polarisation. Analysis for different subgroups of the labour force such as male and female workers, as well as full-time and full-time male workers, is presented. It is suggested that the increasingly polarised female employment in London contributes more compared to men to the pattern that arises for all workers and amplifies the distinction between London and rest of Britain. In relative terms the distinction between London and rest of Britain is greater for women than men. In the following section, results from other time periods are presented for purpose of comparison, together with robustness checks and suggestions for future research. Conclusions are presented in the final section.

3.2. Examining employment polarisation in Britain

The work of Goos and Manning (2003) considered employment polarisation in Britain at the national level only. The empirical analysis below extends their approach and methodology to explore regional and broader geographical patterns in employment polarisation. The available data sources are presented first, followed by empirical investigation.

Data sources

The main survey used for this research is the New Earnings Survey (NES) that has microdata information on wages and jobs as far back as 1975. The NES is the largest survey on labour statistics with information on approximately 160,000 employees each year. It is an employer-based survey and covers employees whose National Insurance (NI) number ends with a specific pair of digits, which amounts to approximately 1% of the NI pool. The same pair of digits is used each year and therefore in the panel data of the survey (the New Earnings Survey Panel Data or NESPD), individuals can be tracked over the years.

There are some disadvantages to the NES, however. For example, it does not cover employees whose weekly pay is below the lower threshold for paying National Insurance contributions, or those who simply do not have to pay NI or who work in the informal sector, which means there is an under-representation of low-paid workers. This is problematic, especially as it means many part-time employees are excluded. The NES also misses employees who change jobs between January, when the sampling frame is conducted each year and April, when the actual survey takes place.

Another problem arises from the fact that in 1991 the Office for National Statistics (ONS) changed the occupational coding it used for the NES (to 'SOC90'), after which it was not possible to make a full comparison with the earlier codes. For this reason, this report mainly focuses on the period 1991-2001, the latest available time series data from NES that has a consistent occupational coding over a long timescale.

For comparison purposes, the years 1975-1990 are also examined. Results for 1975-2001 have been produced using a probabilistic mapping algorithm[9], although these results should be considered with some caution and used only for comparison purposes.

The NES has geographical information for the area of the workplace. To look at geographical disaggregation, the 11 Standard Statistical Regions (SSRs) of Britain are used as the main reference point. The NES areas are smaller geographical units (based on counties) and are aggregated to compile these 11 regions. Larger clusters, such as Metropolitan and non-Metropolitan Britain as well as London and Rest of Britain, are composed from these NES areas in order to investigate broader spatial patterns in employment polarisation. For all the results in this paper, the sample of the NES employees is restricted to those of aged between 16 and 64.

Defining job quality

First, it is important to examine the concept of 'job quality'. There is an interesting literature on various definitions of job quality and corresponding measurements (see Gittleman and Howell 1995, Meisenheimer 1998, OECD 2001 and the relevant discussion in Section 2.3). Besides pay, a long list of job characteristics including job security, employee benefits, health and safety in the workplace, work organisation and job satisfaction are all important determinants of job quality. Nevertheless, pay remains important and has been considered to be a simple proxy for job quality

[9] Devised by Steve Gibbons

(Wright and Dwyer 2003). It is a key attribute and it is imperative that it is examined on its own. Pay determines to a large extent the income of the worker and as a result his or her standard of living, while at the same time at the macro level it affects the wage inequality of the economy. Furthermore, to the extent that pay is correlated with skill level, looking at employment changes in the wage distribution can provide information on the employment prospects of different skill groups.

For these reasons as well as availability of data, this paper uses median pay in order to rank occupations and classify them in 'job quality categories'. Employing the three-digit standard occupational classification (SOC90) for the base year 1991, a ranking of 366 occupation cells according to median hourly pay is obtained (see Tables 3-1 and 3-2). A ranking of the occupations according to the incidence of low pay is also attempted as an alternative to the main ranking according to median pay. It should be stressed that a low or high 'job quality category' corresponds only to the pay aspect of the quality of the occupation and to wider job attributes only to the extent that pay is proxy. As discussed also in Chapter 1, there are low-pay jobs that might require remarkable skill like care occupations. Therefore, a low-skill job in the context of this chapter should be better seen as one that requires few qualifications, and a high-skill job one that requires more.

Employment polarisation is defined as an increase in the number of individuals employed in low-paid and high-paid occupations in the labour market relative to 'average-paid' occupations. So it is necessary to investigate whether employment in the occupation cells classified as low- and high-paid has grown alongside a reduction in the size of mid-pay occupation cells.

In this section results are presented according to the median pay ranking. This occupation pay rank does not change much over time: the correlation coefficient of the rank in 1991 and 2001 is 0.95. The few changes that do occur are mainly in occupations with small samples and they do not much affect the regression results of the following sections which are weighted for size.

Table 3-1 shows occupations that are at the bottom of the pay ranking in 1991, along with their employment growth over the following 11 years. It can be seen from the table that 'job quality category 1' is made up mainly of occupations that are related to low-skill services, as well as care occupations. Many of these, especially those that employ large numbers of people, grow faster over this 11-year period. For example, the 'bar staff' occupational cell increased its employment share by 32% and 'childcare occupations' by 20%. The 'sales assistants', which is the most sizeable occupation cell out of all 366 ones (in terms of employment), increased its share by 47%.

In Table 3-2, the top occupations by pay that are of considerable size are presented. Most of these are in business and finance as well as the new economy sectors. Most experienced an increase in employees between 1991 and 2001, with the exception of educational occupations. The occupational categories that experienced most growth were marketing and sales managers (employment share rise of 54%) and financial institutions managers (73%).

Most of the occupation cells at the lowest end of the pay scale are labour intensive. A simultaneous increase in the employment shares of both the highest paid and the lowest paid occupations in the same geographical area would be consistent with the hypothesis of a growing high-income workforce boosting the demand for low-paid services. The rest of this paper goes on to investigate this in more detail.

Empirical investigation

This paper uses regression analysis and other techniques to estimate the amount of employment polarisation into low-paid jobs and high-paid jobs.

Each of the 366 occupation cells under the three-digit SOC90 classification is ranked from worst to best according to median hourly pay and then grouped into 'job quality categories', with each category containing 10% of the employees nationally for 1991. On this basis, 'job quality category 1' (or 'occupational decile 1') contains workers from the lowest paid occupations comprising 10% of all workers in Britain in 1991. If in 2001 the number of workers in these specific occupations has increased or decreased relative to workers in other occupations, then 'job quality category 1' will form a larger or smaller share of the labour force than the initial 10%. Similarly, if in one region the 'job quality category 1' forms a larger part than 10%, this means that the workers of the lowest paid occupations are overrepresented in this region.

Tables 3-1 and 3-2 show, respectively, the occupations that constitute the bottom and the top 'job quality categories' according to pay. The percentage point change of the

employment share of the different job quality categories is presented in Table 3-3 and Figure 3-1. Over the period 1991-2001 for the whole of Britain, it can be seen that the share of 'good' jobs increased, as did to a lesser extent the share of 'bad' jobs, while the share of mid-quality jobs declined.

For the purposes of this thesis, it is more interesting to see what happens at the regional level. Generally, with the exception of East Anglia, high- and low-paid jobs are increasing their share and the mid-paid share is decreasing. Out of all the regions, London has the greatest growth in high-paid jobs but also a significant increase in low-paid jobs. This pattern is weaker for the other regions and for some the growth in low-paid jobs is very small. In Figure 3-1, the changes in Britain overall, London and the South East are compared.

Table 3-4 shows the employment shares of job-quality categories 1 (lowest pay) and 10 (highest pay) that are tracked annually from 1991 to 2001. Using correlation coefficients, the paper investigates whether the lowest and highest pay categories are moving together and if this relationship is stronger for some regions than others. The correlation was shown to be strongest for London with a coefficient of 0.95, followed by the South West with 0.87. This simply tells us that there is more co-movement of employment in job quality categories 1 and 10 for London than for the other regions. Specifically, the employment share of job quality category 1 was 9.1% of the London labour force in 1991, which rose steadily each year, until it reached 11% in 2001. Job quality category 10 experienced a similar but faster growth from 14% in 1991 to 19.4% in 2001. This simultaneous increase in the lowest and highest paid occupations

over this 11-year period shows that our result is not sensitive to the selection of two specific points in time.

Regression analysis of employment polarisation

The dependent variable in this paper's regressions is the percentage growth of the employment share of the occupational cell, as discussed above. The regressor is the rank of the occupational cell according to median pay in the initial year of the period under analysis (1991). Regressions are weighted by occupational cell size in the initial year. Using a quadratic form in the regression, a U-shape relationship of the change in employment and rank can be detected. Experimenting with higher degree polynomials has not given statistically significant results for the higher degree coefficients, for example when including a cubic term. Therefore this paper focuses on the quadratic regression presented below and in a subsequent section the results from a higher degree polynomial and a kernel density regression are presented as robustness checks.

$$\Delta n_i = \beta_0 + \beta_1 q_{i0} + \beta_2 q^2_{i0} \quad \text{(i)}$$

Δn_i : percentage growth in employment share of occupational cell i;

q_{i0} : rank according to pay in 1991 of occupational cell i

In Table 3-5, the national regression for 1991–2001 finds the coefficient of the rank (β_1) to be negative and the coefficient of the square of the rank (β_2) to be positive,

implying a U-shape relationship between growth of employment shares of the occupations and the initial occupation pay rank (taken in 1991)[10]. This is the case for the whole Britain and the 11 Standard Statistical Regions to which separate regressions have been applied. The linear and the quadratic terms are significant for all regions, although for some regions the quadratic regression seems to have more explanatory power than others. Higher values for the quadratic term and lower values for the linear term indicate a stronger U-shape and therefore stronger employment polarisation. The significance of these coefficients and the R^2 provide information on the explanatory power of the employment polarisation proposition.

It appears that London is the region with the strongest U-shape, followed by the West Midlands and the rest of the South East. In contrast, the North and Wales appear to have flatter U-shapes and the evidence for employment polarisation is weaker for these regions. In Figure 3-2, which shows fitted regressions curves for all regions, the curve for London stands out in terms of steepness, but it is harder to tell the difference between the other regions.

Figure 3-3 presents scatter plots of the growth of employment share by occupation and pay rank for London and the South West. The U-shape curve is evident for both regions, although the increased polarisation for London is hard to notice just from the scatter plots unless the size of the occupational cells in 1991 is taken into consideration.

[10] This verifies the findings of Goos and Manning (2003) of an emergence of employment polarisation in Britain. Their study used log median wages as regressors and examined an earlier time period (mid 1970s to late 1990s).

As London appears to be distinct from the other regions in terms of the magnitude of its coefficients and their high explanatory power, hypothesis testing is employed to examine this further. When doing a regression with London as the basis allowing for interactions of the coefficients for the other regions, the β_2 coefficient for London is significantly different than those for East Midlands (10% significance level), Yorkshire (10%), the North West (5%), the North (1%) and Wales (1%). This suggests a 'London specificity' approach (which is further tested below).

A pooled regression with regional fixed effects is given in the last row of Table 3-5. However, the regional fixed effects for the regions are not found to be jointly significant.

$\Delta n_{ij}=\beta_{j0}+\beta_1 q_{i0}+\beta_2 q^2_{i0}$ (ii)

(β_{j0}: regional fixed effect)

In sum, this analysis shows that employment polarisation appears in all regions but to different degrees. The empirical evidence does not support the theoretical possibility that employment polarisation can arise at the national level only, because some regions are gaining high-paid jobs and others are gaining low-paid jobs. London is found to have the strongest employment polarisation; this is explored further in the following section.

Urban-specific or London-specific?

Explanations that rely solely on technological progress, like the one proposed by Autor, Levy and Murnane (2003), do not have a spatial element and therefore may account for the national job polarisation but not for the distinct strong pattern of polarisation that has emerged for London. Therefore, explanations with a spatial mechanism should also be used to account for geographical patterns.

To address whether employment polarisation is urban-specific, stronger in areas that are predominantly metropolitan, the NES areas have been classified as metropolitan and non-metropolitan, and separate quadratic regressions applied. Here, 'metropolitan' Britain consists of Greater London (33 local authorities) and the six former metropolitan counties of the West Midlands, South Yorkshire, West Yorkshire, Greater Manchester, Merseyside, and Tyne and Wear. In 1991 these areas accounted for 32% of the British population. 'Non-metropolitan' Britain encompasses the remaining 58 NES areas.

The results are presented in Table 3-6. The regressions predict a steeper U-shape curve for employment growth for metropolitan than non-metropolitan Britain. Nevertheless, both the quadratic and the linear term are not statistically different across the two. This applies to a large extent for all workers and the various subgroups of the labour force that have been looked at (men, women, full-time workers, full-time male workers). As a result, strong evidence to support the urban specificity proposition is not found from these regressions.

The differential performance for London is now addressed. Table 3-7 shows similar separate regressions for London alone and for Britain excluding London ('rest of Britain'). As expected, the U-shape curve predicted for London is much steeper than that for the rest of Britain, indicating stronger employment polarisation in London. This is the case for all workers and the various subgroups examined, though to differing degrees (Figures 3-4i to 3-4v).

The differences in the coefficients of the linear term (β_1) and the quadratic term (β_2) between London and the rest of Britain are much more notable than between metropolitan and non-metropolitan Britain (Table 3-6). Hypothesis testing verifies this; specifically, the hypothesis that the coefficients of the linear and the quadratic term are jointly equal for London and the rest of Britain is rejected at the 5% significance level. This applies for all the subgroups examined. The coefficient of the square of the rank (β_2) was found to be significantly different between London and the rest of Britain for all workers, for women and for full-time workers.

Examining the various subgroups of the labour force using the regression tables also reveals interesting patterns (Table 3-7). There is no employment polarisation among female workers in the rest of Britain – as shown by the way the curve is slightly J-shaped and the linear and quadratic terms are not significant. Nevertheless, in London there is increased employment polarisation among women, as shown by a strong U-shape curve. For men too, the U-shape curve is steeper for London than for the rest of Britain. However, in relative terms the distinction between London and rest of Britain is greater for women than men. Therefore, it seems that the increasingly polarised

female employment in London contributes more here to the pattern that arises for all workers.

Considering only full-time employment, interesting points can also be addressed. It needs to be investigated whether the polarising pattern also applies for full-time workers only. It is commonly asserted that where polarisation occurs, it may be due to increased employment of part-timer workers in low-paid jobs. However, my findings refute the hypothesis that polarisation is a part-time sector driven phenomenon. Applying similar regressions for the full-time workers sub-group, employment polarisation is observed at the national level as well as at the London level and at the rest of Britain level. In Figure 3-4iv, London is shown to have greater employment polarisation for full-time workers than the rest of Britain. Nevertheless, when we exclude full-time female workers from the sample, the relative growth of employment in low-paid occupations compared with average-paid occupations appears to be the same in London and the rest of Britain (Figure 3-4v).

A similar analysis considering only part-time employees has been attempted, with the caveat that there is under-sampling of the part-time workers in the NES dataset. For this group, the quadratic regression appears to have very low explanatory power and the coefficients are insignificant. Checking for a linear relationship by omitting the quadratic term in the regression specification (i), a significant negative relationship is found between the pay rank of the occupation and the growth of the employment share. In other words, there were more part-timer employees in low-paid occupations and fewer part-timer employees in high-paid occupations in 2001 compared to 1991. This was the case for both London and the rest of Britain.

This analysis has shown that although it is true that there has been an increase in low-paid, part-time jobs, the occurrence of employment polarisation is not dependent on this being the case, as polarisation can also arise regarding full-time workers. This finding is strengthened by looking at the employment share of occupation in terms of labour-hours rather than number of employees. In the regression specification, the dependent variable is now the percentage growth in the share of the labour-hours of the occupation, out of the total number of labour-hours. The results are roughly the same (Table 3-8), with polarisation again occurring. London still appears to experience higher employment polarisation than the rest of Britain, although the significance of this differential performance is in this case weaker (p-value is just 0.13 when comparing the quadratic terms).

The above analysis suggests that employment opportunities in the lowest paid jobs, which are mainly associated with local consumer and leisure-related services aimed at affluent workers, are growing faster in London than in the rest of Britain. If it is expected that low-skilled workers would fill these positions, then it follows that employment prospects for the low-skilled are growing faster in London (of course, this argument ignores supply side considerations). The analysis in Chapter 5, that examines the employment chances of low-skilled workers, is very relevant to this point.

Other time periods and robustness checks

I have also experimented with other time periods and have obtained qualitatively similar results. Specifically, for the periods 1992–2001 and 1991–2000, London appeared to experience stronger employment polarisation than the rest of Britain.

It is interesting to examine whether employment polarisation occurred in earlier decades, and look at its geographical patterns. To that end, similar quadratic regressions were employed for 1975–1990, presented in Table 3-9. This uses 428 occupations in total, using the KOS (Key list of Occupations for Statistics) coding. Although employment polarisation appears to emerge nationally, the evidence is weak for London unlike for Rest of Britain. The quadratic regression does not perform well for London, as the linear term is not significant and the quadratic term is only weakly significant. Therefore, there is the possibility that employment polarisation does not adequately describe the processes in London for 1975–1990 and alternative explanations should be examined, such as skill-biased technological change or Hamnett's account (1996) of the 'professionalisation' of London.

International migration could be key to the differential performance between the two decades; as Buck et al. (2002) suggest, the absence of abundant migrant labour in London in the 1980s may explain why London did not experience a 'global city' type polarisation like that which occurred in New York. Buck et al. (2002) argue that the increased influx of foreign workers into UK in the 1990s may have changed that situation and "contributed to a faster rate of consumer service employment growth during [that] decade" (p.362). Wills et al. (2008) have developed this notion and theorised that there is a new migrant division of labour emerging in London, which

they back by evidence from interviews with low-paid migrant workers and analysis of LFS data (see also Datta et al., 2007; Wills et al., 2008). Another plausible explanation might be based in the partial success that the UK government had in the 1990s, bringing previously economically inactive people back into employment. Whether or not this might explain the spatial patterns that emerged will be left to future research.

Regional regressions for the period 1975–2001 have also been performed, producing evidence of employment polarisation for all regions, with the strongest appearing for London and the West Midlands. But, as previously explained, the lack of a fully consistent mapping of the occupational codes from before 1990 to after that year has made it necessary to focus this research on the period 1991–2001.

Figure 3-1 should make clear why a quadratic regression provides the best fit but I have also experimented using higher degree polynomial regression specifications. Repeating the exercise for London and the rest of Britain with higher degree polynomials, the higher degree coefficient is never significant (see Table 3-10 for a third degree polynomial). In Figure 3-5, a kernel estimate regression of the mean change in employment share of the occupations on the rank is presented. Both curves have an approximate U-shape and it can be seen that the London curve is above the rest of Britain curve at the point of both tails, revealing stronger relative employment growth for the low-paid and high-paid occupations.

An alternative method for the ranking of occupations has also been tried, looking at the incidence of low pay. Occupations have been ranked according to their percentage

of employees earning less than the national median pay in 1991. The lower is the percentage, the higher the rank of the occupation. For the few occupations that had no employees in that category, their rank was determined by the percentage of individuals earning less than double the national median pay in 1991. The correlation of the rank obtained this way and the rank obtained by the median pay of the occupation is remarkably high (0.973). As expected, applying similar quadratic regressions, the results do not change much (see Table 3-11). Employment polarisation is found to be stronger for London than the rest of Britain. The significance of the difference now is weaker, as the p-value when comparing the linear and the quadratic terms jointly between London and the rest of Britain is 0.11.

Finally, the main regression was repeated for London and the Rest of Britain using the LFS dataset, as a robustness check. Pay data from the LFS is available from 1993 onwards and in order to have a consistent occupational coding (SOC90), the period 1993–2000 has been used. The results are presented in Table 3-12. Employment polarisation appears to emerge for London but evidence is much weaker for the rest of Britain. This might be due to the shorter time period that is used now – eight years, while previously an 11-year period was used with the NES dataset, as well as the reduced number of occupations in the regression. The latter is caused by the smaller sample of individuals with information on pay at the LFS that means that some occupations have no workers and drop from the created occupation pay rank.

3.3. Concluding remarks

Although employment growth was a clear sign of the success of government policies, the quality of the jobs generated and the possible emergence of employment polarisation should also be part of the discussion. In this paper, the spatial patterns of employment polarisation in Britain have been examined. Rather than some regions gaining high-paid jobs and other regions gaining low-paid jobs, employment polarisation is found to emerge in all regions to some extent. London appears unique in terms of the magnitude of its employment polarisation. It experiences disproportionately higher growth in the employment share of both high-paid jobs and low-paid jobs compared to other regions. In that respect, employment opportunities in the lowest paid jobs, mainly associated with local consumer and leisure-related services, are growing faster in London than in the rest of Britain. If it is expected that low-skilled workers would fill these positions, then it follows that employment prospects for the low-skilled are growing faster in London.

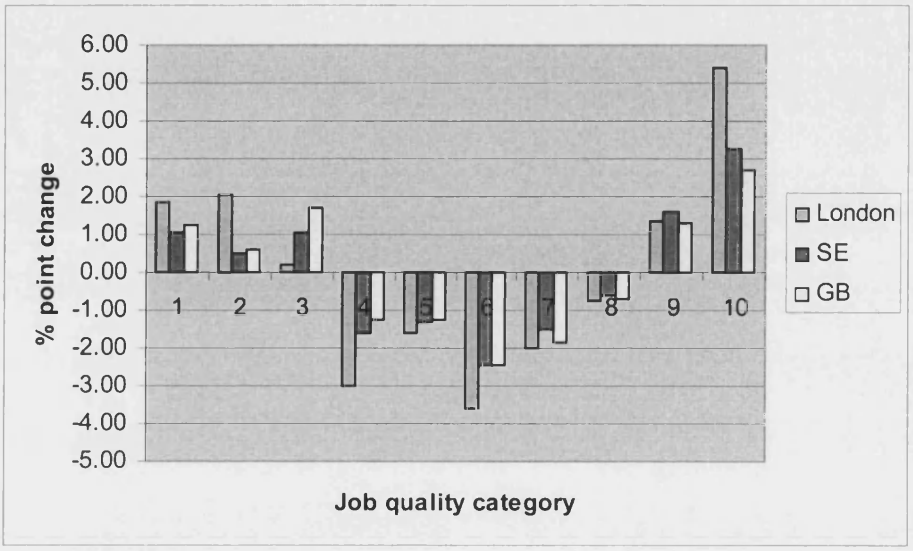
Explanations based solely on technological progress, like the ones that followed Autor et al. (2003), do not have a spatial element and therefore they may account for job polarisation that emerges nationally but not for the distinct stronger pattern of polarisation present in London. Therefore, to account for the geographical patterns observed, explanations with a spatial mechanism should also be examined alongside the ALM proposition.

The empirical evidence does not entirely support a simple urban specific thesis for increased employment polarisation in areas that are predominantly metropolitan.

Other explanations, like world city or global city propositions based on consumption-driven demand, or international outsourcing of mid-paid occupations being stronger in London, might account more for London's distinct employment polarisation pattern and further research is needed to inform that. Empirical analysis of various subgroups of the labour force can reveal interesting points about the spatial patterns of employment polarisation; employment polarisation seems not to be driven solely by the part-time sector, as it also emerges for the full-time workers sub-group. Additionally, it appears that the increasingly polarised female employment in London contributes more to the pattern that arises for all workers. Last but not least, employment polarisation is found to emerge in London in the 1990s rather than in earlier decades, pointing to international migration as a plausible important factor in understanding polarisation, which warrants further investigation.

3.4. FIGURES

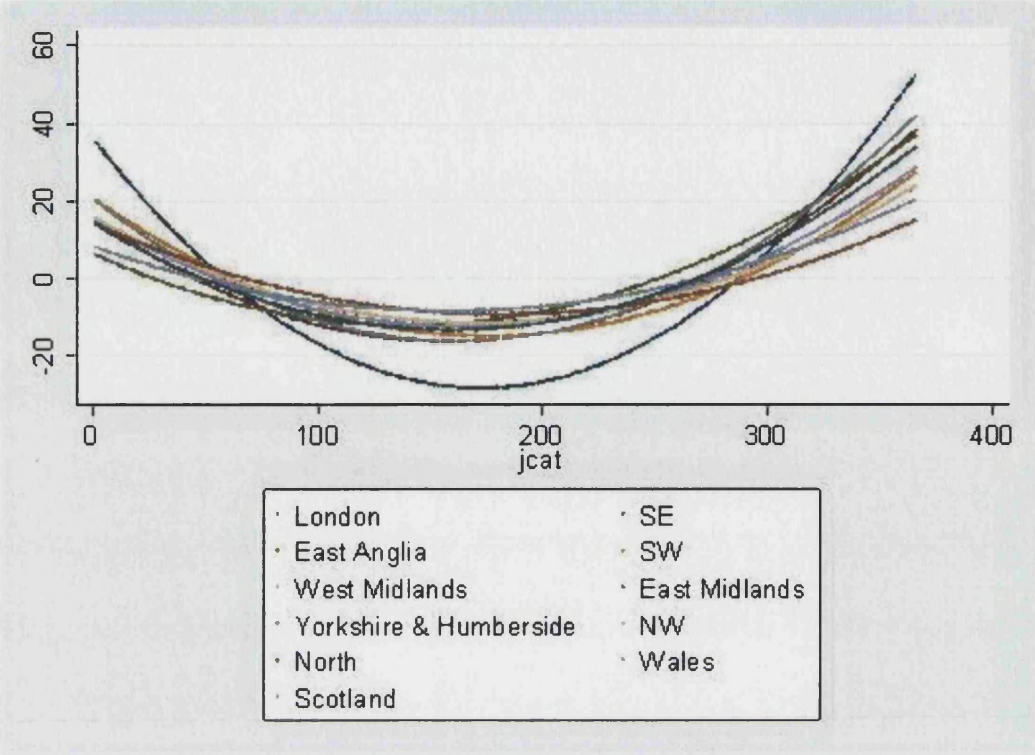
Figure 3-1. Percentage point change in employment shares of the job quality categories: London, South East and Great Britain, 1991–2001



Source: NES dataset.

Each of the 366 occupation cells (3-digit SOC90) is ranked from worst to best according to median hourly pay in 1991 and then grouped into 'job quality categories' so that each category contains the 10% of the employees nationally for 1991. On this basis, job quality category 1 contains workers from the lowest paid occupations and category 10 of the highest paid ones. While the employment share of each category is approximately 10% for GB in 1991, it can be less or more for the individual regions depending if that category is under- or over-represented in the region.

Figure 3-2. Fitted regional regressions, 1991-2001

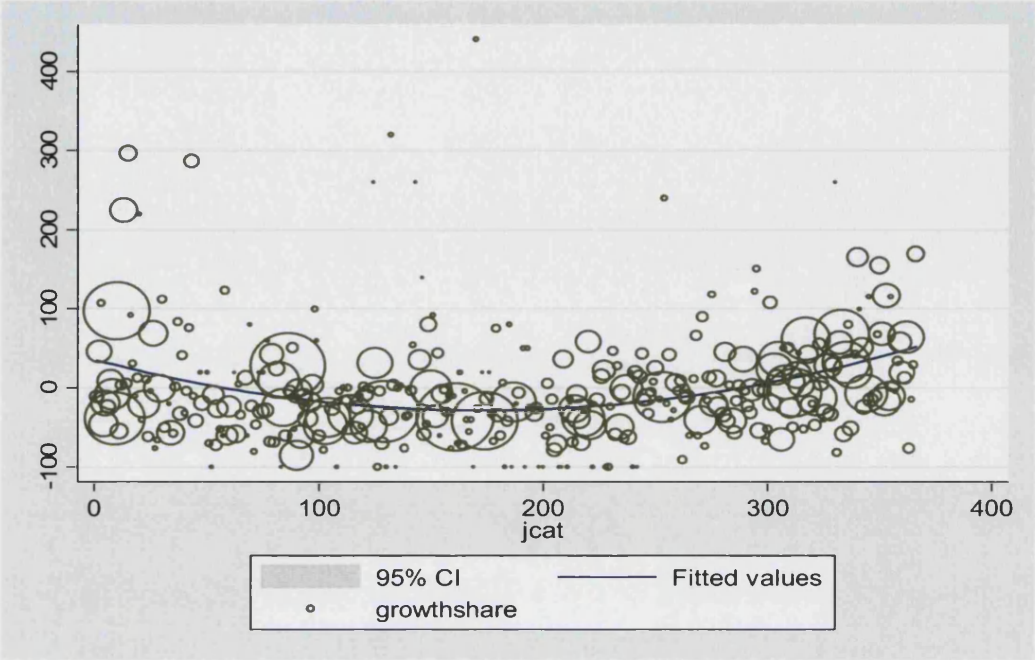


Source: NES

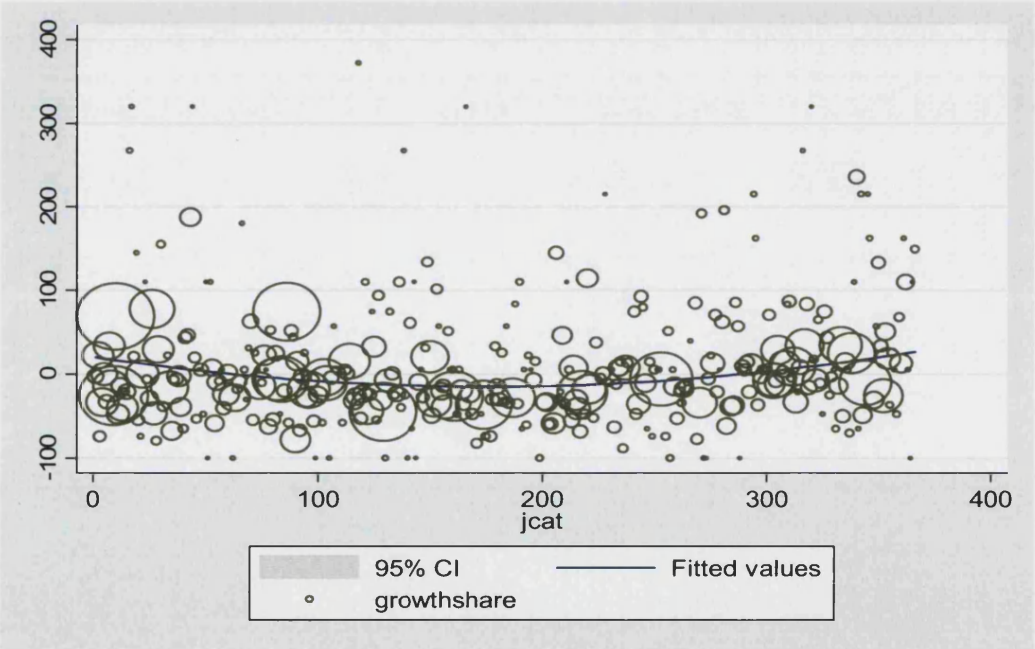
Note: London's curve is the one with the lower minimum.

Figure 3-3. Scatter plots of percentage employment growth (1991-2001) and job quality rank in 1991,

a) London



b) South West



Source: NES.

Size of circle corresponds to initial occupational cell size (3-digit SOC90). Fitted values of the regressions are shown with the continuous line. The ranking of the 366 occupation cells according to median hourly pay is obtained for 1991. In these graphs, the x-axes correspond to exactly the same occupations for London and the South West.

Figures 3-4i to 3-4v: Fitted regressions for various subgroups of the labour force, 1991–2001

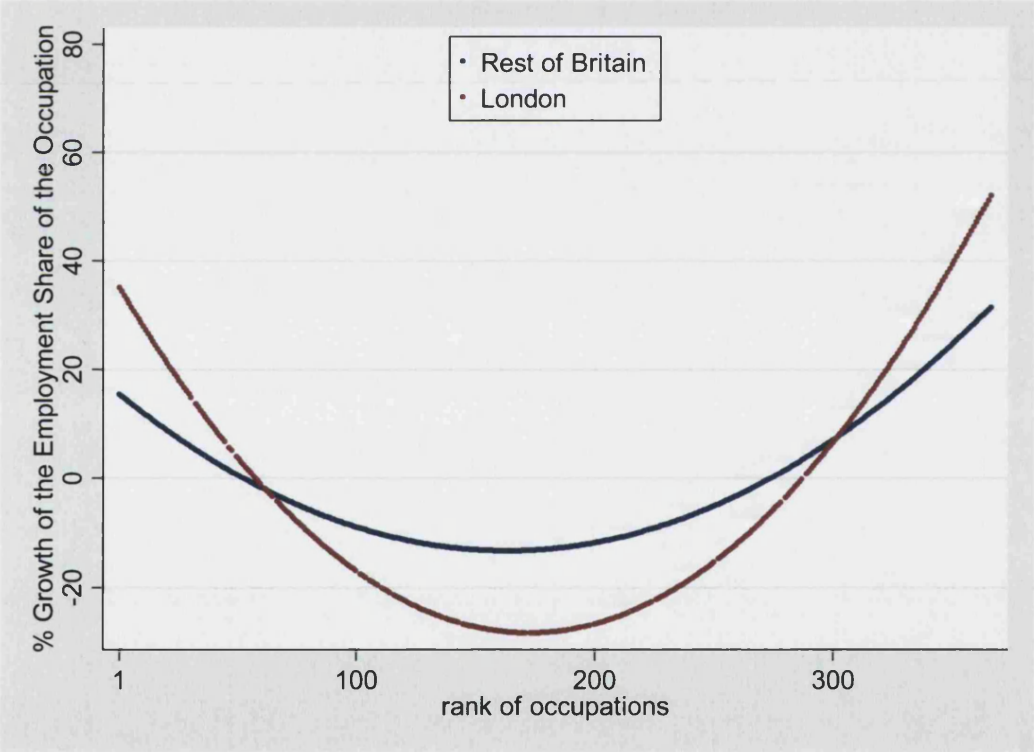
Growth of employment share 1991-2001 against job quality rank in 1991; NES data.

Notes:

1. London's curve is the one with the lower minimum in all 5 graphs that follow.

2. In the following five graphs, the x-axes correspond to exactly the same occupations for London and the Rest of Britain and the fitted values are shown only for occupations that exist in the sample. This is more noticeable for the female demographic group (and especially for London) that there are many missing occupations. These missing occupations spread all over the occupation pay rank and do not affect the analysis.

Figure 3-4i: All workers



Figures 3-4ii to 3-4v: Different Demographic Groups

Figure 3-4ii: Male workers

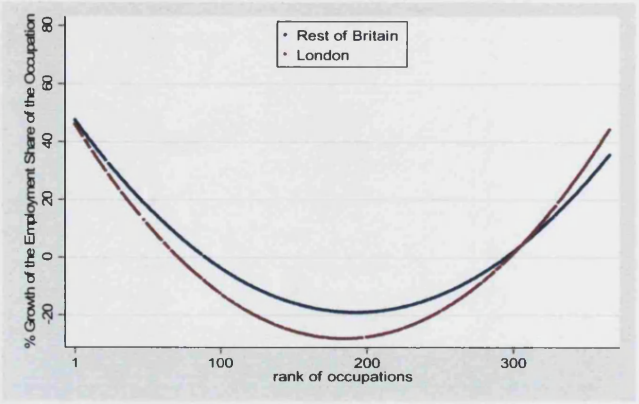


Figure 3-4iii: Female workers

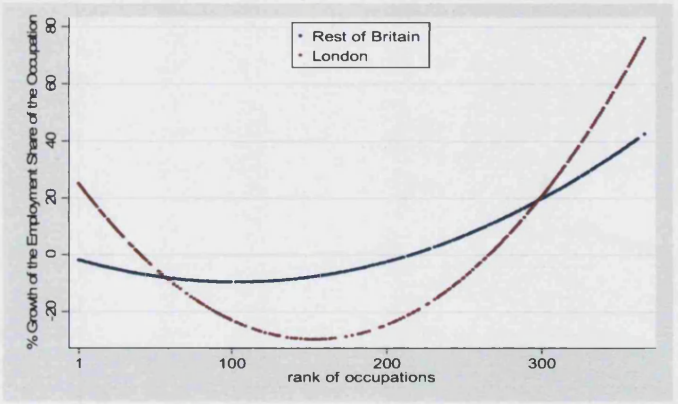


Figure 3-4iv: Full-time workers

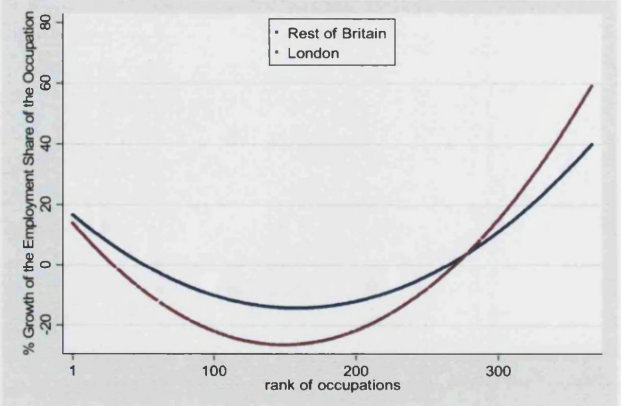


Figure 3-4v: Full-time male workers

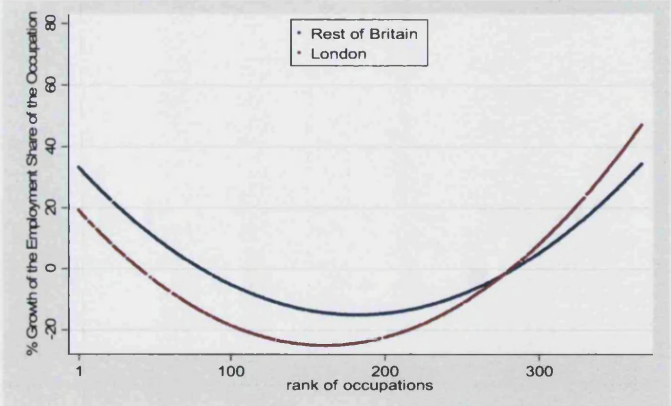
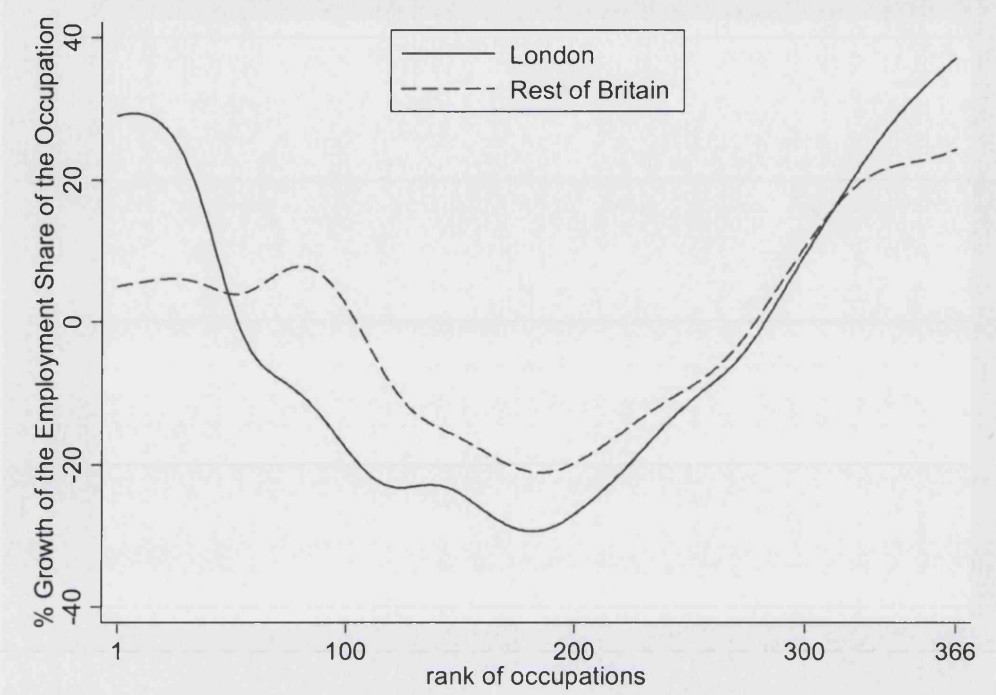


Figure 3-5: Smoothed changes of employment shares of the occupations (1991–2001) with rank of occupations in 1991



Source: NES

Nadaraya-Watson Kernel regressions, with a bandwidth of 20 and a Gaussian Kernel.
X-axes correspond to exactly the same occupations for London and the rest of Britain.

3.5. TABLES

(Shading in the Tables 3-3 to 3-12 is for visual aesthetic purposes. In Tables 3-1 and 3-2, highlighting indicates specific points of interest.)

Table 3-1. Lowest occupations in terms of median wage in the UK, 1991

Job pay rank 1991	Label of occupation cell	Job quality categ. 1991	Median wage 1991	Employment share (%) in 1991	Growth of share 1991–2001	Growth rank
1	Hairdressers, barbers	1	3.44	0.189	-5.79	218
2	Bar staff	1	3.70	0.636	31.89	300
3	Petrol pump forecourt attendants	1	3.82	0.091	-38.74	68
4	Kitchen porters, hands	1	3.92	0.704	-23.34	136
5	Waiters, waitresses	1	3.99	0.406	15.92	273
6	Launderers, dry cleaners, pressers	1	4.06	0.221	-33.27	88
7	Other childcare and related occupations	1	4.09	0.624	29.06	297
8	Counterhands, catering assistants	1	4.15	0.950	-0.12	234
9	Cleaners, domestics	1	4.17	3.348	-24.74	128
10	Sales assistants	1	4.21	4.055	47.11	323
11	Sewing machinists, menders, darners & embroiderers	2	4.24	0.696	-59.91	17
12	Dental nurses	2	4.29	0.111	23.46	289
13	Retail cash desk and check-out operators	2	4.30	0.693	-8.40	210
14	Hotel porters	2	4.43	0.043	-8.67	208
15	Shelf fillers	2	4.45	0.226	26.66	294
16	Other health associate professionals	2	4.47	0.030	83.77	347
17	Domestic housekeepers & related occupations	2	4.52	0.025	158.41	363
23	Beauticians and related occupations	2	4.69	0.033	38.90	310
26	Care assistants and attendants	2	4.82	1.103	83.84	348
29	Receptionists	2	4.89	0.635	38.79	309
43	Educational assistants	2	5.14	0.245	240.26	366

Source: NES

Notes:
The data are from the NES dataset referring to 3-digit occupational cells of the SOC90 classification.
Wages are median real hourly wages deflated for 2001 prices.
Highlighting indicates occupations of substantial size that experience high employment growth.

Table 3-2. Highest occupations in terms of median wage in the UK, 1991

Job pay rank 1991	Label of occupation cell	Job quality categ. 1991	Median wage 1991	Employ ment share (%) 1991	Growth of share 1991-2001	Growth rank
366	General managers; large companies and organisations	10	31.24	0.103	115.92	359
362	Treasurers and company financial managers	10	19.50	0.334	73.11	342
360	Medical practitioners	10	17.87	0.384	25.18	291
359	Management consultants, business analysts	10	17.53	0.107	98.55	351
354	Bank, building society and Post Office managers	10	16.40	0.337	32.15	301
353	Computer systems and data processing managers	10	16.19	0.327	75.44	344
352	Higher and further education teaching professionals	10	16.15	0.882	-27.15	111
351	Solicitors	10	15.97	0.178	57.17	330
350	University and polytechnic teaching professionals	10	15.90	0.265	103.10	353
348	Special education teaching professionals	10	15.58	0.186	0.25	236
344	Secondary education teaching professionals	10	15.20	1.744	-2.31	229
343	Electrical engineers	10	15.12	0.176	-13.70	188
340	Software engineers	10	14.71	0.221	154.95	362
338	Primary and nursery education teaching professionals	10	14.45	1.459	14.20	271
335	Underwriters, claims assessors, brokers, investment analysts	10	13.96	0.472	27.94	295
334	Electronic engineers	10	13.87	0.112	-40.66	62
333	Marketing and sales managers	10	13.76	1.534	54.29	327
332	Personnel, training and industrial relations managers	10	13.64	0.242	71.78	340
317	Other financial institution and office managers	9	12.48	0.927	73.03	341
312	Other managers and administrators	9	12.31	1.510	-1.21	231
308	Police officers (sergeant and below)	9	12.14	0.755	6.03	256
305	Computer analysts/programmers	9	11.95	0.766	39.64	311
303	Production, works and maintenance managers	9	11.82	1.166	6.77	259

Source: NES

Notes:
The data are from the NES dataset referring to 3-digit occupational cells of the SOC90 classification.
Wages are median real hourly wages deflated for 2001 prices.
Highlighting indicates occupations of substantial size that experience high employment growth.

Table 3-3. Percentage point difference in employment share by 'job quality category', 1991–2001

Job category	Great Britain	London	South East	East Anglia	South West	West Midlands	East Midlands	Yorkshire & Humb.	North West	North	Wales	Scotland
1	1.25	1.87	1.03	-0.13	2.00	1.19	1.89	1.31	1.04	1.13	0.33	0.44
2	0.60	2.07	0.52	0.42	0.91	0.70	-0.89	-0.15	0.37	0.04	0.07	0.65
3	1.68	0.19	1.06	-0.01	1.55	1.38	2.85	2.55	2.33	3.24	2.44	2.37
4	-1.23	-2.98	-1.59	-0.16	-1.04	-0.55	-1.00	-0.85	-0.30	0.20	-1.37	-1.49
5	-1.27	-1.58	-1.29	-1.38	-1.70	-1.12	-0.81	-1.06	-1.39	-1.86	-0.44	-0.98
6	-2.47	-3.59	-2.44	-2.29	-2.89	-3.55	-1.80	-1.66	-2.06	-1.32	-1.95	-1.88
7	-1.83	-1.99	-1.52	-1.53	-1.00	-2.12	-1.62	-2.42	-2.15	-1.52	-1.29	-2.55
8	-0.69	-0.74	-0.61	1.48	-0.42	-0.20	-1.78	-1.47	-0.47	-1.90	-0.39	-0.60
9	1.28	1.33	1.60	1.13	1.09	1.40	1.53	1.89	0.73	0.38	0.97	1.56
10	2.69	5.42	3.24	2.48	1.51	2.88	1.63	1.86	1.89	1.61	1.64	2.47

Source: NES

Notes:
Each of the 366 occupation cells (3-digit SOC90) is ranked from worst to best according to median hourly pay in 1991 and then grouped into 'job quality categories' so that each category contains the 10% of the employees nationally for 1991. On this basis, job quality category 1 contains workers from the lowest paid occupations and category 10 of the highest paid ones. While the employment share of each category is approximately 10% for GB in 1991, it can be less or more for the individual regions depending if that category is under- or over-represented in the region.

Table 3-4. Employment shares of least-paid and highest-paid jobs, 1991–2001

	Category	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	*Correlation*
London	1	9.14	9.30	9.52	10.08	10.11	10.05	10.41	10.73	10.36	10.98	11.02	***0.95***
	10	13.99	14.91	15.50	15.88	16.38	16.86	17.32	17.61	17.97	18.15	19.41	
South East	1	11.08	11.61	11.75	12.25	12.31	12.31	12.19	11.86	11.99	11.82	12.12	***0.35***
	10	11.05	11.45	11.33	11.14	11.89	12.25	12.84	12.64	13.17	13.51	14.28	
East Anglia	1	11.47	11.63	12.18	11.69	11.94	11.14	10.88	12.05	12.08	11.94	11.34	***-0.27***
	10	8.31	8.97	9.14	9.45	9.30	9.73	10.28	9.55	9.68	10.41	10.79	
South West	1	11.94	12.20	12.19	12.53	13.00	12.58	12.76	12.67	12.96	13.77	13.94	***0.87***
	10	9.68	9.94	10.13	10.40	10.52	10.55	10.40	10.24	10.18	10.66	11.18	
West Midlands	1	11.02	11.33	11.66	11.51	11.60	11.38	12.03	11.81	12.10	11.44	12.21	***0.58***
	10	8.61	9.17	9.65	9.50	9.56	9.37	9.30	9.64	10.04	10.91	11.49	
East Midlands	1	10.54	11.10	10.99	11.57	11.02	11.24	11.78	12.02	12.34	12.63	12.43	***0.64***
	10	8.25	8.62	8.09	8.56	8.58	8.39	8.10	8.34	8.56	9.38	9.87	
Yorkshire	1	12.06	12.30	12.58	12.93	12.49	12.74	14.02	14.05	12.90	12.72	13.37	***0.40***
& Humberside	10	8.43	9.12	8.86	8.78	9.16	9.13	9.16	9.43	9.84	9.85	10.29	
North West	1	11.29	11.68	12.00	11.75	11.47	11.58	12.02	11.93	11.81	11.75	12.34	***0.60***
	10	8.79	8.94	9.19	9.42	9.48	9.84	10.05	9.72	10.40	10.46	10.68	
North	1	13.13	12.81	13.14	13.98	13.64	13.81	14.17	14.50	14.73	14.01	14.26	***0.70***
	10	6.99	8.06	6.78	8.08	8.01	7.76	8.15	8.28	8.46	8.49	8.60	
Wales	1	12.75	13.42	13.29	13.74	13.76	12.76	12.94	13.35	13.28	12.81	13.13	***-0.13***
	10	8.00	8.36	7.71	8.14	8.09	7.33	8.32	8.50	9.02	9.83	9.71	
Scotland	1	12.31	12.25	12.78	13.48	13.40	13.23	13.36	13.21	12.94	12.81	12.72	***0.35***
	10	8.95	8.09	9.32	9.63	9.62	9.77	10.11	10.33	10.94	10.89	11.40	

Source: NES

Notes: The employment shares (%) of the job quality categories 1 (lowest pay) and 10 (highest pay) are tracked annually between 1991 and 2001. The correlation coefficient shows if there is co-movement of the two for each region.

Table 3-5. Regional regressions and regression for Britain with regional fixed effects, all workers, 1991–2001

Regression specification	Available occupations	Geographical scale	β_0 (const.)	β_1	β_2 (x100)	R^2
3-digit occupations (total: 366)	366	Great Britain	18.51 (1.50)	-0.4089 (-2.49)	0.124 (3.52)	0.12
	347	Greater London	35.82 (1.59)	-0.7841 (-3.11)	0.241 (3.91)	0.20
	354	Rest of South East	15.62 (1.35)	-0.4187 (-3.09)	0.137 (3.66)	0.11
	328	East Anglia	6.30 (0.74)	-0.2880 (-2.18)	0.115 (2.51)	0.04
	344	South West	20.93 (1.30)	-0.4294 (-2.22)	0.130 (2.53)	0.07
	352	West Midlands	20.58 (1.91)	-0.4673 (-3.57)	0.148 (3.93)	0.09
	352	East Midlands	15.22 (1.13)	-0.3202 (-1.94)	0.096 (2.16)	0.04
	355	Yorkshire & Humberside	15.79 (1.29)	-0.3469 (-2.43)	0.107 (2.77)	0.05
	356	North West	15.74 (1.31)	-0.3251 (-2.30)	0.097 (2.49)	0.04
	337	North	14.38 (1.30)	-0.2747 (-1.93)	0.080 (1.87)	0.02
	334	Wales	8.40 (0.77)	-0.2252 (-1.59)	0.077 (1.88)	0.02
	355	Scotland	14.22 (0.88)	-0.3538 (-1.94)	0.114 (2.39)	0.05
	3,814	GB with regional fixed effects	18.19 (3.79)	-0.4253 (-7.54)	0.135 (8.93)	0.07

Notes:
The data are from NES referring to 3-digit occupational cells from the SOC90 classification (total 366). Regressions are weighted by occupational cell size in 1991.
$\Delta n_i = \beta_0 + \beta_1 q_{i0} + \beta_2 q^2_{i0}$
(Δn_i : percentage growth in employment share of occupational cell i;
q_{i0}: rank according to pay in 1991 of occupational cell i)
T-statistics in parentheses. Coefficients of β_2 are multiplied with 100.

The bottom row refers to a pooled regression for 3,814 occupation-region cells for Britain (approximately 366 occupations times 11 regions, although not all occupations exist in all regions). Regional fixed effects are applied to the regression.

Table 3-6. Regressions metropolitan vs. non-metropolitan Britain, 1991–2001

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
All workers	366	Great Britain	18.51 (1.50)	-0.4089 (-2.49)	0.124 (3.52)	0.12
All workers	366	Non-metropolitan	14.86 (1.26)	-0.3457 (-2.60)	0.107 (3.03)	0.09
	363	Metropolitan	25.46 (1.77)	-0.533 (-3.40)	0.158 (4.09)	0.16
Male	360	Non-metropolitan	41.71 (3.64)	-0.6489 (-5.07)	0.176 (5.31)	0.18
	360	Metropolitan	57.96 (4.39)	-0.8533 (-6.07)	0.223 (6.50)	0.23
Female	314	Non-metropolitan	-1.48 (-0.12)	-0.1670 (-0.79)	0.095 (1.34)	0.07
	300	Metropolitan	7.07 (0.46)	-0.4446 (-1.88)	0.212 (2.63)	0.14
Full-time workers	366	Non-metropolitan	14.94 (1.64)	-0.3790 (-3.97)	0.123 (4.59)	0.14
	363	Metropolitan	21.20 (2.26)	-0.5060 (-5.25)	0.160 (6.23)	0.20
Full-time male	359	Non-metropolitan	28.38 (3.05)	-0.4984 (-4.72)	0.144 (5.03)	0.14
	360	Metropolitan	37.42 (4.16)	-0.6285 (-6.24)	0.176 (6.56)	0.16

Notes:
1. NES data refer to 3-digit occupational cells from the SOC90 classification (total 366). Regressions are weighted by occupational cell size in 1991.
$\Delta n_i = \beta_0 + \beta_1 q_{i0} + \beta_2 q^2_{i0}$ (Δn_i : percentage growth in employment share of occupational cell i; q_{i0}: rank according to pay in 1991 of occupational cell i); t-statistics in parentheses.
2. 'Metropolitan Britain' consists of Greater London (33 local authorities) and the six former metropolitan counties West Midlands, South Yorkshire, West Yorkshire, Greater Manchester, Merseyside, Tyne & Wear. The rest of the 58 NES areas consist the 'non-metropolitan Britain' part.

Table 3-7. Regressions London vs. rest of Britain, 1991–2001

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
LHS: % employment growth	366	Great Britain	18.51 (1.50)	-0.4089 (-2.49)	0.124 (3.52)	0.12
All workers	366	Rest of Britain	15.79 (1.36)	-0.3561 (-2.74)	0.109 (3.18)	0.09
	347	London	35.86 (1.59)	-0.7844 (-3.11)	0.241 (3.91)	0.20
Male	363	Rest of Britain	47.84 (4.42)	-0.7020 (-5.97)	0.184 (6.13)	0.20
	337	London	45.40 (2.12)	-0.8750 (-3.54)	0.261 (4.18)	0.19
Female	326	Rest of Britain	-2.11 (-0.17)	-0.1588 (-0.79)	0.090 (1.38)	0.07
	248	London	25.90 (1.04)	-1.0193 (-2.45)	0.508 (3.34)	0.17
Full-time workers	366	Rest of Britain	17.08 (1.89)	-0.3977 (-4.32)	0.126 (4.94)	0.14
	344	London	14.18 (1.15)	-0.5787 (-3.97)	0.208 (5.26)	0.25
Full-time male	362	Rest of Britain	33.57 (3.77)	-0.5402 (-5.54)	0.150 (5.75)	0.15
	334	London	18.95 (1.53)	-0.6037 (-3.77)	0.208 (4.58)	0.19

Notes:
The data are from NES referring to 3-digit occupational cells from the SOC90 classification (total 366). Regressions are weighted by occupational cell size in the initial period.
$\Delta n_i = \beta_0 + \beta_1 q_{i0} + \beta_2 q^2_{i0}$ (Δn_i : percentage growth in employment share of occupational cell i; q_{i0} : rank according to pay in 1991 of occupational cell i); t-statistics in parentheses.

These notes are similar for the following Tables 3-8 to 3-12.

Table 3-8. Regressions with dependent variable the employment share of the occupation in terms of labour-hours, London vs. rest of Britain, 1991–2001

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
LHS: % employment growth	366	GB	21.66 (1.98)	-0.5410 (-4.57)	0.176 (5.66)	0.21
All workers	366	Rest of Britain	20.35 (1.90)	-0.5114 (-4.39)	0.168 (5.41)	0.18
	345	London	29.18 (1.70)	-0.7765 (-3.95)	0.258 (5.13)	0.26

Source: NES

Table 3-9. Regressions London vs. rest of Britain, 1975–1990

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
LHS: % employment growth	428	GB	22.66 (2.78)	-0.4068 (-3.74)	0.099 (3.47)	0.06
All workers	427	Rest of Britain	26.47 (3.22)	-0.4401 (-4.07)	0.105 (3.71)	0.06
	391	London	1.02 (0.09)	-0.2414 (-1.49)	0.082 (1.77)	0.05

Source: NES

Table 3-10. Regressions with cubic term, London vs. rest of Britain, 1991–2001

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2 (x100)	β_3 (x100)	R^2
LHS: % employment growth	366	Great Britain	10.84 (0.71)	-0.0774 (-0.21)	-0.13 (-0.55)	0.000487 (1.17)	0.13
All workers	366	Rest of Britain	7.10 (0.50)	0.0228 (0.06)	-0.18 (-0.77)	0.000562 (1.32)	0.11
	347	London	36.56 (1.27)	-0.8140 (-1.43)	0.26 (0.80)	-0.000046 (-0.08)	0.20

Source: NES
Coefficients of β_2 and β_3 are multiplied with 100.

Table 3-11. Regressions using an alternative rank of occupations based on the incidence of low pay, London vs. rest of Britain, 1991–2001

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
LHS: % employment growth	366	Great Britain	12.79 (1.06)	-0.2814 (-1.97)	0.086 (2.32)	0.05
All workers	366	Rest of Britain	10.23 (0.91)	-0.2327 (-1.70)	0.072 (1.98)	0.04
	347	London	27.48 (1.19)	-0.6030 (-2.28)	0.189 (2.87)	0.11

Source: NES

Table 3-12. LFS dataset: Regressions London vs. rest of Britain, 1993–2000

Regression specification	Available jobs	Geographical scale	β_0 (const.)	β_1	β_2	R^2
LHS: % employment growth	351	GB	4.53 (0.65)	-0.1351 (-1.54)	0.047 (1.94)	0.03
All workers	351	Rest of Britain	3.65 (0.53)	-0.1156 (-1.32)	0.041 (1.68)	0.02
	308	London	12.66 (1.54)	-0.3506 (-2.70)	0.129 (3.15)	0.05

Source: Labour Force Survey (Spring quarters)

CHAPTER 4: Wage effects of high shares of top-paid occupation workers on the local labour markets of Britain

Abstract

This paper examines the wage effects arising from changing local human capital in the labour market areas of Britain. Employing wage regressions, it is found that individuals' wages are positively associated with changes in the employment shares of high-paid occupation workers in the British travel-to-work-areas for the late 1990s. I examine this positive association for different occupational groups (defined by pay) in order to disentangle between production function and consumer demand driven theoretical justifications. The former refer to production complementarities or wider productivity spillovers arising in areas with high shares of high-skill workers. According to the latter, the presence of a high income workforce in the economy boosts the demand for consumer services leading to an increase in low-pay, service related employment. As these services are non-traded, the increased demand for local low-paid services should be reflected in a wage premium for the relevant low-paid occupation employees in the areas with larger shares of high-paid workers. The wage impact is found to be stronger and significant for the bottom occupational quintile compared to the middle-occupational quintiles and using also sectoral controls the paper argues to provide some preliminary evidence for the existence of consumer demand effects. The empirical investigation addresses potential sources of biases controlling for time invariant unobserved area-specific characteristics and unobserved individual characteristics. Nevertheless, the paper points to a number of caveats of the analysis that warrant future research.

4.1. Introduction

As documented in the previous chapter, all British regions experienced some degree of employment polarisation in the 1990s. London appeared unique in terms of the magnitude of its employment polarisation. It was suggested that a spatially differentiated pattern for polarisation might arise through the expansion of consumer demand for non-traded locally produced consumer services. There have been contributions to this direction both from the urban geography/sociology and the economics literature (Sassen, 1991, 2001; Manning, 2004; Mazzolari and Ragusa, 2007). This paper attempts to shed some light on this hypothesis for Britain by looking at wage effects from changes in the occupational structure of local areas. As outlined in Chapter 2, the growth of a high income workforce in the economy boosts the demand for consumer services leading to an increase in low-pay, service related employment. As these services are non-traded, the increased demand for local low-paid services should be reflected in a wage premium for low-paid occupation employees in the localities with larger shares of high-paid workers. Therefore the empirical analysis will examine the wage effects arising from a larger share of professionalized and skilled employment in the local area and particularly their effect on the low-paid occupational groups.

Using ASHE data for the period 1997-2001, a scatter plot shows a strong positive association between the median real hourly wage of a travel-to-work-area and its employment share of high-skilled occupations like managers and senior officials (Figure 4-1). This is not surprising and the positive relationship can be attributed to various roots including worker characteristics (i.e. more productive workers) and area

specific characteristics like industrial mix, urban status and historical reasons. Controlling for observed personal characteristics of the area's population but also for some unobserved individual and area heterogeneity, this chapter will seek to examine if there still remains a positive relationship between wages and shares of high-skilled workers in an area. In that respect, the main aim is to shed light on the existence of positive pecuniary human capital externalities: otherwise similar workers earn a wage premium in areas with higher human capital (above the one that that their individual characteristics would dictate).

There exists an important literature on human capital externalities, as seen in Chapter 2, which is also associated with research on agglomeration economies and productivity gains through knowledge spillovers, local input sharing and labour market pooling (Marshall, 1890; Lucas, 1988; Glaeser, 1999; Moretti, 2004). Besides such production function accounts, I am interested to find if there are wage effects arising through a consumer demand mechanism and examine its contribution to the overall outcome. Therefore the consumption demand hypothesis is examined in comparison with two competing production related accounts: production complementarities and wider productivity spillovers. The former refer to productivity increases due to imperfect substitutability between low and high-skilled workers; the latter to human capital externalities through face-to-face interaction with high-skilled workers and knowledge spillovers.

The following section 4.2 explains the data, the spatial level of the analysis and the empirical strategy that is employed. Section 4.3 presents the samples used and the empirical results. The last section 4.4 sums up the findings and concludes.

4.2. Empirical Strategy and Data Used

The Data

The main empirical exercise conducted for this paper involves wage regressions and the data come from the historic series of Annual Survey of Hours and Earnings (ASHE) for Britain, that applies ASHE methodology to the earlier New Earnings Survey data (NES). ASHE is the survey that succeeded the New Earnings Survey (NES) in 2004 offering an improved version of it. As NES, it is an employer-based survey and covers all individuals whose national insurance number ends in a specific pair of digits- approximately 160,000 individuals a year. Statistical imputation for item non-response, weighting to be consistent with LFS population estimates and better coverage of low-earners and people who recently changed or started new jobs have been the main improvements compared to NES. The NES does not cover people who earn less than the threshold for paying national insurance contributions and therefore ASHE includes a supplement survey to improve their coverage. For the years before 2004, the NES data have been re-constructed using the ASHE methodology in order to give historic data for the period 1997-2003. Therefore for the period 1997-2003, historic data for ASHE exist that do not include though the supplementary sample of low-earners. These are essentially NES data with imputation and weighting that is applied to ASHE and henceforth referred as 'ASHE' for simplicity reasons (rather than 'historic ASHE'). As the occupational coding changes in 2002 and in order to have a consistent coding for a sufficient time span, this paper examines the five year period 1997-2001. Detailed geographical information on the workplace of each employee at the postcode level enables analysis

at different spatial levels (NES did not offer information at the postcode level). One of the limitations of the ASHE dataset is its lack of information on education. Therefore, an empirical strategy that does not use educational information but focuses on occupations has been developed and presented in the subsequent section.

The empirical strategy

The main task of the empirical strategy is to discern between the consumption demand hypothesis outlined earlier and alternative production function related approaches. The latter, as discussed, refer to the productivity spillovers and production complementarities mechanisms. Wage equations are applied to ASHE microdata to examine to what extent individuals accrue a wage premium in localities with larger shares of high-skilled individuals. Since ASHE does not have any information on education, I use a measure of skill based on pay and the explanatory variable of interest is defined as the share of individuals in the locality who are employed in the top-paid occupations.

Applying wage regressions to the whole sample of individuals is not particularly useful since all three accounts could generate a positive shift of the labour demand curve and contribute to the wage premium found. According to the consumer demand hypothesis, abundant high income high skilled individuals stimulate the local demand for low-paid low-skilled consumer services and inflate the wages for the relevant low paid occupations. Alternatively, the existence of human capital externalities would imply that abundant high-skilled labour force raises the productivity of the local

workers through physical interaction and knowledge spillovers. However, it is possible to expect positive productivity spillovers even without the presence of wider human capital externalities if low and high skilled workers are considered to be imperfect substitutes. Then the productivity of low-skilled workers increases with the presence of larger numbers of high-skilled workers due to production complementarities as in a standard neoclassical model.

It should be noted here that the exact impact on wages from the outward shift of the labour demand would also depend on the elasticity of the labour supply. Assuming a non-elastic labour supply curve at least in the short run, larger shares of high-skilled individuals would exert an upward force on the wages.

Since these three mechanisms discussed above do not have a similar impact across the skill distribution (as also discussed in Section 2.7 and Table 2-2), it is more informative to split the sample in different skill groups and apply separate regressions for each of them. The consumer demand and the production complementarities accounts would affect predominantly the wages of the low skilled groups while we expect productivity spillovers to have a similar effect across different skill groups. I compose these skill groups from occupation cells characterised by different median wages. These broader occupational groupings that denote different skill groups might serve better the purposes of capturing the consumer demand hypothesis than skill groups defined by qualifications would do. We will see in a following section that the low-paid occupational groups refer mainly to consumer and personal service occupations that are non-traded and according to the theoretical framework described earlier they are increasingly dependent on consumer demand arising from the

presence of high-income workforce on the locality. Moretti (2004) used qualification groups and in a similar vein applied separate wage regressions to them although his purpose was to inform on productivity spillovers while abstracting from production complementarities effects.

Before seeing in more detail how the differential impact of the share of high-skilled individuals on different occupational categories can inform on the three different accounts, let's first consider the main model that is used.

Model specification

Equation (i) presents the basic econometric specification employed in my empirical model.

$$log(w_{iat}) = X'_{it}\beta + \lambda * SHARE10_{at} + d_o + d_{rt} + u_{iat} \qquad \text{(i)}$$

It shows the log hourly wage of individual i who resides in area a in year t. Region-year fixed effects d_{rt} are included in the model to control for economic cycles at the broader regional level. I have also produced results using a less restricted specification with just yearly fixed effects that control for national cycles (see subsection 4.3). X_{it} is a vector of individual characteristics (a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and d_o is a set of occupational fixed effects (3-digit Standard Occupational Classification SOC90). u is the error term which ideally it would be independently and identically distributed across individuals, areas and

years. Finally, *SHARE10* is our variable of interest that stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Classifying individuals in occupation groups according to pay

The 3-digit SOC90 occupational coding is used in order to classify occupations according to pay with 1997 as the base year. Each of the 367 occupational cells is ranked from worst (1) to best (367) according to its median hourly pay in Britain in 1997 and then grouped into broader occupation categories so that each category contains the 10% of the employees nationally for 1997. This way ten 'occupational deciles' are created. The explanatory variable of interest *SHARE10* denotes the percentage of employees who are employed in occupations that form the highest paid occupational decile (i.e. the 10^{th}). Although *SHARE10* is 10% nationally for 1997 by construction, it varies across areas and years. The variable of interest was constructed using the highest decile since it aims to capture only the occupations that are very highly remunerated and serve as a proxy for the high-skilled.

As discussed in the 'Emprical Strategy' subsection, the main empirical exercise is to examine how *SHARE10* impacts on wages of different skill groups. I construct these different skill groups from occupational cells as did with the *SHARE10*, but now 'occupational quintiles' rather than 'deciles' are used since I am interested in a broader definition of skill. There are now five 'occupational quintiles' (Q1-Q5) created according to pay data for Britain in 1997 (in a similar way with the creation of

the 'occupational deciles'). Occupation quintile 1 (Q1) contains workers who are employed in the lowest paid occupations so that they form nationally the 20% of the employees in 1997, while Q5 is the highest-paid occupation quintile. The main regression (i) is repeated separately for these five occupational quintiles, in order to examine how the share of the high-skilled jobs in an area (*SHARE10*) affects the wages of different skill groups ('occupational quintiles Q1-Q5').

A detailed list of occupations that form the top occupational decile *SHARE10* and their employment share in 1997 is shown in the Appendix A (Table 4-15). As most of them are in business and finance as well as the new economy sectors, they match the notion of the high-income workforce that is put forward in the consumer demand driven approach. For example, occupation cells of substantial size are the marketing and sales managers, that take up 1.9% of the total employment share in 1997, and brokers (0.7%). In Appendix A (Table 4-16), the bottom paid occupations that form occupational quintile Q1 are also presented. The most sizable occupation cells are care assistants (1.9% of total employment), cleaners (3.3%) and sales assistants (5.2%), which is also the largest of all 367 cells.

The spatial level of the analysis

An important issue for consideration is the spatial units of the analysis, denoted as *a* in equation (i). For the years 1997-2001 ASHE has information only on the workplace and not on the residence of an individual. Since workplace information would be more informative for production related human capital externalities, while

residence information for the consumer demand hypothesis, this limits the potential for such dual analysis. Then although ASHE allows analysis to very fine geographies like postcode area or local authorities (LAs), I have to opt for larger geographical entities like travel-to-work-areas, where the majority of the employees live in the same area that they work and thus reasonably consume within it. The travel-to-work-areas (TTWAs) definition is the best we can get to self-contained labour markets. By definition they are constructed such that the bulk of their population lives and works within the same area and are discussed in further detail below. Another advantage of using TTWAs is that they are based in non-administrative boundaries unlike the local authority districts.

Travel-to-Work-Areas (TTWAs)

Office for National Statistics (ONS) constructed TTWAs for UK according to a logarithm that ensures that the majority of the workers of an area live in the same area and also the majority of residents of an area work in the same area (75%). The population can vary widely but the lowest threshold by construction is 3,500 individuals. The London TTWA is the largest one and includes both London Government Office Region and few adjacent localities. ONS defined 243 TTWAs for UK utilising the 2001 Census information on home and work addresses of the population. Excluding Northern Ireland, there are 232 TTWAs for Britain which is the focus of study.

ASHE does not have information on the 2001 TTWAs but rather on the outdated 1991 TTWAs that were 314. Therefore, I used the postcode information available in ASHE on the workplace of an employee to make the match to the corresponding 2001

TTWA. After the cleaning of the sample, TTWAs that were left with few observations (less than 50) were dropped so that each TTWA has large enough sample size for reliable analysis. The final working set consists of 195 TTWAs for Britain.

Regions

When controlling for cycles in the regional economy, region-year fixed effects are included. The working definition of 'region' refers to standard administrative spatial entities used for regional analysis in Britain. These are the 9 Government Office Regions of England (North East, North West, Yorkshire & Humber, East Midlands, West Midlands, South West, East, London, South East) together with the devolved administrations of Wales and Scotland (11 in total).

Local Authorities (LAs)

The main empirical analysis is conducted at the TTWAs level but it has been tried also at lower spatial entities like local authorities (LAs) for comparison purposes. There are 408 local authority/unitary authority districts in Britain that correspond to administrative entities. Dropping a district due to small sample size (Isles of Scilly), we are left with 407 LAs for the empirical analysis.

Dealing with Potential Sources of Bias

In estimating the basic regression (i), an issue of concern is potential sources of biases arising from omitted variables. Firstly, there may be area-specific unobserved

characteristics that are correlated both with the share of high-paid occupation workers *SHARE10* but also with wages. For example, areas with better urban amenities will attract a larger number of high-paid occupation workers (see Glaeser et al. 2001 for such an argument) and also pay higher wages to compensate for the higher urban rents. Similarly, dynamic areas that due to their industrial mix or historic reasons are booming generate more managerial and new economy sector jobs while at the same time pay higher wages. A way to control for variations in the wages that are caused from the time invariant part of area differences (industrial structure, historic reasons, physical and cultural amenities) is to use area fixed effects (d_a) (Equation (ii)). This can be seen like deflating with an area deflator the wages to adjust for area differences in the levels of the wages.

Another potential source of bias can arise from unobserved individual characteristics. Education and ability are both unobserved in our empirical model as data are not available in the ASHE dataset to control for them. Employees who are better educated and/or more able (e.g. a sale assistant with a bachelor degree) would possibly be more productive and a non-random sorting of them across areas will bias the results. If areas with more abundant high-paid workforce offer better returns to education/ability, then they would attract better educated/able employees. As these employees might be more productive compared to other areas' employees with similar observed characteristics doing similar jobs, a correlation of the share of high-paid occupation workers and high wages arises.

To control for time-invariant unobserved education/ability, I use individual fixed effects (d_i). Now, I essentially estimate how changes in the wage of a specific

individual are associated with changes in the percentage of the top-paid jobs in the area. I drop atemporal personal characteristics like gender and keep experience and its quadratic form, full/part time status, trainee/adult rate and occupational dummies as my controls. The point of keeping the occupational dummies is to control for variation in the wages of individuals who move to jobs that have a higher remuneration.

Therefore using both individual and area fixed effects (Equation (ii)), the identification for the coefficient *SHARE10* comes from two sources: people who stay in the same area and how changes in the shares of top-paid jobs in the area affect their wages, as well as from people who move to other areas. In the latter case, identification comes from a change in the wage of the mover by more (less) than is the level effect associated with that area and taken away with the area fixed effect.

$$log(w_{iat}) = d_i + d_a + X'_{it}\beta + \lambda * SHARE10_{at} + d_o + d_{rt} + u_{iat} \qquad \text{(ii)}$$

However, this econometric specification (individual; area fixed effects) might still generate a positive coefficient for the share of top-paid jobs for the wrong reasons. For example it might be the case that high-paid occupation workers move between areas for job purposes only if they are going to get a higher wage (above the area level effect) and at the same time they are attracted to areas that have higher percentages of top-paid jobs because these areas also offer better urban amenities. To control for that and estimate how changes in the percentage of top paid jobs affects the wage premium of people who stay in the same area over time, an econometric specification with individual interacted with area fixed effects ('individual-area', d_{ia})

is used (Equation (iii)). Therefore a person will get a different dummy if she moves to another area and the identification in the econometric specification comes from the effect of the share of top-paid jobs on her wage in the subsequent years.

$$log(w_{iat}) = d_{ia} + X'_{it}\beta + \lambda * SHARE10_{at} + d_o + d_{rt} + u_{iat} \qquad \text{(iii)}$$

This is my preferred econometric specification which is applied both for the full sample and for different subsamples representing different skill groups. An earlier subsection explained the construction of five 'occupation quintiles' (Q1-Q5) based on pay, that correspond to different skill groups. The next section examines how the differential performance of the preferred econometric specification for the different occupational quintiles might aid my identification strategy.

Distinguishing between the three different accounts

As said, the purpose of the empirical strategy is to shed light on the effect of the consumer demand mechanism and discern it from the two alternative production related mechanisms. The way to do so is to examine the differential impact of the share of top-paid occupation workers on the wages of the various occupational quintiles, that represent different skill groups. Regarding the productivity spillovers account, it is not expected to find a differential impact amongst the various occupational groups. Rather, human capital externalities arising from larger shares of high-killed workers would raise the productivity of the average worker in each of the occupational quintiles causing a shift of the corresponding labour demand. The

induced wage impact should be roughly similar for the different occupational quintiles.

In contrast, if having more managers, bankers and generally top-paid occupation workers in an area boosts the labour demand for local low paid occupations such as cleaners, care workers and bartenders through consumption, the wage impact would affect the bottom occupational quintile (Q1). Also, if managers and bankers demand more receptionists and security staff in their workplace, then a wage premium at the bottom occupation quintile could be generated from production complementarities rather than consumer demand. Therefore, it could be informative to compare the coefficient of the share of top-paid occupation workers found for the bottom (Q1) and that found for the other occupational quintiles (Q2-Q5). A higher positive coefficient for bottom occupational quintile compared to the other quintiles can be considered a product of the simultaneous effect of consumer demand and production complementarities. However, it can prove more difficult to separate between the consumer demand and production complementarities effects.

Looking at the industrial composition of the area could be informative. Firstly, using occupation-industry fixed effects in the analysis can abstract from the coefficient of the variable of interest capturing changes in the industrial composition rather than genuine consumer demand effects. For example, it is possible that production complementarities could generate a move of cleaners and security staff from the housework sector to corporate sectors where remuneration might be higher and this could be picked up at the corresponding wage premium found. Occupation-industry fixed effects control for this possibility.

Furthermore, I would expect that production complementarities take place predominantly within the same industrial sector rather than across sectors, since larger shares of top-paid occupation workers would tend to generate demand for low-paid occupation workers of the same sector. Therefore I add a variable that captures the share of top-paid occupation workers in the same sector and area with the individual. At the same time I amend the variable of interest so that it captures the share of top-paid occupation workers in local area excluding the sector that the individual observation belongs to. The relevant econometric specification is shown below.

$$log(w_{iats}) = d_{ia} + X'_{it}\beta + \lambda * SHARE10_{at,-s} + \mu * SHARE10_{sat} + d_o + d_{rt} + u_{iat} \qquad \text{(iv)}$$

where s stands for the sector of the individual i in year t and area a.

$SHARE10_{at,-s}$ is similar to (iii) but now excludes the own sector, while $SHARE10_{sat}$ is the share of top-paid occupation workers that changes across sectors s, areas a and years t.

In that respect I interpret the coefficient of $SHARE10_{sat}$ as capturing production complementarities and productivity spillover effects within sectors, while the coefficient $SHARE10_{at,-s}$ capturing mainly the consumer demand effect at the area level. The coefficient of $SHARE10_{at,-s}$ is possibly an underestimate of the true consumer demand effect if there are consumer demand effects within sectors and an overestimate if there are production complementarities and productivity spillovers between sectors. To the extent that these opposing biases are small or cancel out, a coefficient close to an unbiased one would be expected.

As discussed in Chapter 2, wage effects from production complementarities might arise for the low-skill workers due to imperfect substitutability of low and high-skill labour. Wider productivity spillovers (on top of production complementarities) refer to human capital externalities that arise from increased knowledge spillovers, provision of specialised local inputs and availability of skilled labour force in areas with higher human capital. For our case this is not straightforward but depends to the extent that the share of top-paid occupation workers in an area ($SHARE10_{at,-s}$) or an industry-area ($SHARE10_{sat}$) can be thought as a reasonable proxy to measure human capital in the respective unit. Then, if there are external returns from the overall level of human capital above the individual returns to human capital, productivity spillovers can be said to emerge.

Since in the case of $SHARE10_{sat}$ the economies are generated within the same sector, these productivity gains can be thought as 'localisation economies' that are internal to the industry but external to the firm according to the distinction presented in Chapter 2. These are localisation economies not in the standard usage of the term that refers to economies of industrial agglomeration but rather as simply human capital externalities within the same sector. In a similar vein, $SHARE10_{at,-s}$ can be thought as capturing 'urbanisation economies' that are external to the sector but internal to the area. Again it should be noted that these are urbanisation economies not in the standard usage of the term referring to urban agglomeration economies that arise from increased city size or density but human capital externalities between sectors for a specific travel-to-work-area.

This distinction between localisation and urbanisation economies might be useful to have in our mind when interpreting the coefficients, but its explanatory capacity might be limiting when the econometric specification is applied to just the bottom occupational quintile (Q1). As said earlier, wage effects for this quintile can come from all three accounts: productivity spillovers, production complementarities or consumer demand effects. In that respect, it might be more useful and accurate to restrain from this terminology for the rest of the paper and think of $SHARE10_{sat}$ and $SHARE10_{at,-s}$ as capturing 'within' or 'between sectors' effects respectively (coming from any of the three accounts).

In order to control for production complementarities or productivity spillovers that are firm-specific, I add a variable that controls for the share of top-paid occupation workers in the individual firm. As seen in (v):

$$log(w_{iats}) = d_{ia} + X'_{it}\beta + \lambda * SHARE10_{at} + \mu * SHARE10_{fat} + d_o + d_{rt} + u_{iat} \qquad (v)$$

where $SHARE10_{fat}$ stands for the share of top-paid occupation workers within the firm.

Since firms cannot be identified over years in the ASHE dataset, it is not possible to add firm fixed effects in the model and exploit the potential of this approach as well. A firm fixed effects specification would abstract from identification arising from workers moving between firms.

Finally, I select a subset of occupations out of the bottom occupational quintile that refer to consumer and personal service occupations but are not affected by production complementarities or spillovers in a straightforward way. Then I apply wage regressions to just this subset of occupations. To the extent that my selection criterion is satisfied, the variable of interest ($SHARE10_{at}$) may capture a wage impact that mainly feeds through the consumer demand mechanism rather than production related ones. The selected occupations combined make up 8.6% of the total national employment in 1997 and are presented in Appendix A (Table 4-17). The most sizeable of them are cleaners (3.3%), care assistants (1.9%), bar staff (0.8%), childcare workers (0.8%), cooks (0.7%) and waiters/waitresses (0.5%).

4.3. Empirical Results

Samples used and Descriptive Statistics

The sample is restricted to men and women of age 16-64. Only individuals who appear in the sample for more than one year in the period 1997-2001 are included so that variation comes from multiple observations of the same individual in the individual-area fixed effects specifications. I drop observations whose pay was affected by absence and also those with unrealistically low or high real hourly wages (below £1 or above £200 in 2001 prices). Finally, observations with missing information on the location of workplace are excluded. The final sample I get is 610,016 observations in total for 1997-2001, that correspond to 169,842 individuals.

The employees stay on the sample on average for 3.6 years. Summary statistics for this sample are shown in Table 4-1. This is the sample that is going to be used in most of the analysis that follows. It is slightly reduced for the analysis that includes sectoral controls since observations with missing information on industry were dropped.

Distribution of SHARE10

The share of top-paid occupation employees *SHARE10* varies across 195 TTWAs and 5 years. Considering its distribution over the 975 area-years, the median TTWA had 7.4% of employees working at the top occupational decile (Table 4-2). The average is 7.7% with standard deviation 2.7. It is interesting to see that the bottom 1% of the TTWAs have a share below 1.8% and the top 1% of TTWAs a share above 16.7%. Table 4-2 shows also the distribution of median real hourly wages for the TTWAs of the sample. The median sample size for the TTWAs is 299 with standard deviation 1488 (mean 626).

Regressions

Table 4-3 presents results on the basic wage regression (Equation (i)) for all workers. This pooled regression does not link individuals that appear in the sample more than once but considers them separately. Log hourly wages are regressed on the share of the top-paid occupational decile workers *SHARE10* in the TTWA along with other

controls. Other controls include occupational fixed effects and personal characteristics with information available in the ASHE dataset, such as gender, a proxy of experience based on age and its quadratic form, as well as dummies for part-time employment, trainee/junior rate employment. The specification in the first column uses year dummies that control for shocks in the national economy, while the second column uses region-year dummies to account for region specific shocks. In all econometric specifications that follow, the standard errors are corrected for the grouped nature of the data (area-year clusters).

The variable of interest, the share of the top-paid occupational decile workers *SHARE10* in the TTWA, has strongly significant positive coefficients in both specifications, 1.875 in the first column and 1.139 in the second column. Henceforth, I allow for regions to experience different shocks over time and present results for the region-year dummies specification[11]. Overall, using this specification it is found that a 1 percentage point increase in the share of top-paid occupational workers in the area is associated with a 1.15% rise in wages[12].

As suggested earlier, it would be more informative for my research purposes to repeat this exercise for different occupational groups. Firstly, I restrict the sample to only workers employed in the bottom paid occupational quintile. The observations are now 113,499, roughly a fifth of the full sample. The results for the basic model

[11] This way I miss any particular effect driven from London since the region of London is roughly the same with its TTWA. But this might not alter things much, since using the less restricted year dummies specification, the increase in my variation comes from just five extra values of the *SHARE10* over time (London TTWA over the five years).

[12] An interesting thing to note although not directly relevant to the analysis of this thesis is the high magnitude of the R^2 (0.66), which in line with results from Goos and Manning (2003) and supports their argument that a lot of the research on residual wage inequality might be based on a too broad definition of a group.

specification are presented in the first column of results of Table 4-4. The wage premium arising to the bottom occupational quintile workers (Q1) from a higher share of top-paid occupational decile workers in the local area is now 0.84%. The magnitude and the significance of the coefficient are still quite high, although they declined compared to those of the full sample. Similarly, the coefficients of the other controls used have been diminished as well as the R^2 which is now almost a third of that for the full sample.

In order to control for some unobserved area heterogeneity that is time invariant (e.g. industrial structure, historic reasons, physical amenities), area fixed effects are included in the regression. The results are shown in Col.2 of Table 4-4 for the pooled sample of bottom-paid occupational quintile workers. The coefficient of *SHARE10* now drops significantly to 0.238 but still remains marginally significant at the 1% significance level. The controls used have coefficients quite similar to the basic model specification.

In column 3 of the same table, the results of the specification with area and individual fixed effects are shown. In this specification (Equation (ii)), I am controlling for the time-invariant part of unobserved characteristics of individuals, like education and ability (of course, both education and ability could possibly change). I now get identification in the model from two sources: the effect on the wage of an individual from changes in the share of high paid occupation workers in her area; wage gains (losses) from people who move between areas. The coefficient of *SHARE10* now takes a value of 0.217 and is significant at the 1% level. Only individual control

variables that might change over time are included in the regression and their coefficients change substantially due to the inclusion of the individuals' fixed effects.

However, as discussed earlier this specification can still provide biased results. An example can be that individuals move to other areas only if they are to get wages higher than the premium associated with that area (i.e. the area fixed effect) and at the same time they self-select themselves to areas with better urban amenities, that are also the ones with abundant high-paid workforce.

In order to abstract from variation arising from individuals moving between areas, a specification with individual interacted with area fixed effects ('individual-area') is used (Col.4/Table 4-4). This is the preferred specification for this analysis and a full set of controls is used as in Equation (iii). The coefficient now of *SHARE10* stands to 0.225 and the t-statistic has risen to 3.00. This can be interpreted as a 0.23% rise in the hourly wage of an individual when the surrounding share of top-paid occupation workers in the TTWA increases by 1 percentage point. It corresponds to a wage rise of 0.62% for one standard deviation increase in *SHARE10* (2.7 percentage points). It should be noted that although the sample size is 610,016, identification of the variable of interest *SHARE10* comes from an effective sample of 975, since *SHARE10* varies over 195 TTWAs and 5 years.

Table 4-5 presents comparative results from separate regressions on the 5 different occupational quintiles of workers. The specification used is the preferred one with a full set of individual-area fixed effects (Equation (iii)). It is found that the share of high-paid occupation workers at the local area *SHARE10* has differential impact for

different occupational quintile workers. Its coefficient is higher and strongly significant for the bottom occupational quintile, positive but weakly significant for the top occupational quintile, while insignificant for all other quintiles (though positive).

According to the discussion in the Empirical Strategy subsection in 4.2, a comparison of the coefficient for the different occupational quintiles can possibly inform on the three different accounts, consumer demand, production complementarities and productivity spillovers. The strongest coefficient found for the bottom occupational quintile can be interpreted as the product of the simultaneous effect of the consumer demand and production complementarities on top of productivity spillovers that are expected to have a roughly similar effect across occupational quintiles. The second occupational quintile has also a relatively high coefficient although insignificant and this might also be due to the effect of production complementarities, to the extent that the relevant low-skill employees are imperfect substitutes with the high-skilled employees captured by the variable of interest. Examining the list of occupations that compose the second occupational quintile, effects from a consumer demand root are less likely. The third and fourth occupational quintiles have low positive coefficients which are also insignificant, failing to show any strong impact arising from productivity spillovers. The relatively high and weakly significant coefficient for the top occupational quintile (Q5) poses some caution in its analysis and possible interpretation. Since this quintile includes workers of the 9^{th} and the 10^{th} occupational decile, when trying to extract meaningful results on the relationship between the employment share of the 10^{th} occupational decile (*SHARE10*) and the wages of workers of the same decile, the direction of the causation is not clear. For example, it

may be the case that migrant high skilled workers are attracted to the local area due to the higher growth of wages (or the rising productivity) of the high-skilled workers that reside in the area. In that respect, there is an important relevant literature examining human capital flows through domestic migration for the UK regions (Fielding, 1992, 1993; Faggian et al., 2007; Faggian and McCann, 2006; 2009a; Champion and Coombes, 2007).

Table 4-6 has similar regressions with Table 4-5 but now the share of the individual's own quintile is added as an additional control. The share of employment of the own quintile might account for supply changes in the same skill group as the individual belongs to. The coefficient of *SHARE10* is not affected much by the inclusion of this control variable for the quintiles one to four (Columns 1-4). For the top quintile (Q5), the results are not meaningful as there is overlap of variable *SHARE10* that refers to the share of the highest decile (D10) and the own quintile's share which consists of deciles 9 and 10 (D9-D10). The coefficients for the personal controls are similar to the regressions without the supply control.

Taking a more agnostic approach, Table 4-7 presents similar regressions with Table 4-5 where now shares from all other occupational deciles are included as explanatory variables as well (where the reference base is decile 5). The purpose is to investigate if *SHARE10* was picking up earlier the effect on wages from high shares of other 'occupational deciles'[13]. As shown in column 1 which refers to the bottom quintile sample, the coefficient of *SHARE10* remains strong and highly significant while all

[13] As seen in 4.2, these 'occupational deciles' were constructed so that each makes up 10% of the workforce in Britain in 1997. They vary over areas and years and their share is higher (lower) than 10% in an area-year if the respective occupations are over-represented (under-represented) in that area-year relative to the share for Britain in 1997.

other coefficients are insignificant with the exception of the coefficient of the share of the third decile *SHARE3* which is weakly significant. Therefore, it can be seen that the top-paid occupational decile is the variable that drives the effect on the wages of the bottom-paid occupational quintile workers. For the middle occupational quintiles (Q2-Q4), all coefficients are insignificant. For the top occupational quintile (Q5), it appears that the shares of deciles 9 and 10 have the strongest positive association with wages, although their interpretation is suspect to issues of causation as briefly discussed earlier.

IV attempts

Although similar criticism for reverse causation can also apply to the regressions of the other occupational quintiles, for the top occupational quintile is clearly more relevant since it refers to the same sample from both sides of the equation. However, it is less clear why this reverse causation should matter for the bottom occupational quintile but not for the middle-occupational quintile ones. This can give some reassurance over my estimates for the bottom occupational quintile and the interpretation put forward in this chapter. Of course, a formal treatment of concerns about reverse causality would require an empirical specification using instrumental variables. It has been difficult to find adequate variables to instrument for the share of top-paid occupation workers in the travel-to-work-area over time[14].

[14] Experimenting with possible atemporal candidates like using a dummy for areas that have a pre-1992 university or the number of registered university students in the area in an earlier year (e.g. 1995) has not been successful. The main reason is that my observed pattern arises from changes in the share of top-paid occupation workers over time rather than the levels of this share.

I have tried to use the number of first degrees qualifications awarded in the previous year (*t-1*) in the TTWA as an instrument for the share of workers of top-paid occupations ($SHARE10_{at}$) in year *t* in the TTWA. The correlation might arise since university students that graduated with a first degree in year (*t-1*) might stay in the same TTWA in the following year (*t*) and enter employment in high-skilled jobs. Given a three year study period for the vast majority of undergraduates, most of the graduates of year (*t-1*) applied for university admission three years before their graduation. Since the undergraduate admissions policy and application procedure for each university took place four years before the year of consideration (i.e. in *t-4*), it could be argued that it is largely unrelated with contemporaneous unobserved economic conditions that feed through as residuals in our wage regressions and thus considered exogenous. The assumption here is that the number of undergraduate admissions is determined by the admissions policy of the relevant institution and the number of undergraduate applicants, which are both argued to be unaffected by economic conditions in the university area in year *t*. Regarding the latter, there is some relevant empirical evidence from UK that choice of university has largely to do with university specific characteristics rather than the local employment opportunities of the university area available on graduation (Faggian and McCann, 2006). Furthermore, it may be expected that the number of undergraduates graduating in academic year (*t-1*) would be correlated with the share of high-skilled employees in the relevant travel-to-work-area in the following year (*t*) and therefore be a relevant instrument for my variable of interest $SHARE10_{at}$. Using data for broader spatial entities like the UK regions, Faggian and McCann (2006) found that universities serve as 'conduits' that attract undergraduate human capital into a region, while many of the students stay to work in the local economy upon graduation.

Experimenting with this proposed instrument for finer spatial entities like TTWAs, I found a positive correlation for the 65 areas that have universities (out of the total 195). However, the first stage regression showed a weak instrument and therefore the results are briefly presented here with a great degree of caution. I restricted the sample of observations to the 65 TTWAs that had at least one university in my period of study. Using data from the Higher Education Statistics Authority (HESA), I constructed a variable that measures the total number of first degrees qualifications awarded in year (*t-1*) from all universities based in travel-to-work-area *a* in order to instrument for *SHARE10* in year *t* and area *a* (e.g. awards in academic year 1995-1996 as an instrument for *SHARE10* in 1997). The IV regression gives a coefficient for *SHARE10* of 2.616 which is insignificant and has a high standard error of 1.72. The F statistic for the excluded instrument is very strong (279.21), but its Shea's partial R^2 is very low at 0.006 and undermines the relevance of this instrument.

Further examination of the bottom occupational quintile

With these caveats in mind, let's try now to shed more light in the strong positive significant coefficient found for the bottom occupational quintile in Table 4-5 (Column 1). Since there was not much evidence in favour of productivity spillovers from the analysis at the middle-paid occupational quintiles, this coefficient can be considered to be the outcome both of consumer demand mechanism and production complementarities. Before trying to discern between these two accounts, I present some more robustness checks for that quintile.

In Table 4-8, I add the log average hourly wage of the top-decile (*D10*) as an additional control to my econometric specification (Equation (iii)). Its coefficient shows a small elasticity of 0.014%, which is weakly significant at the 10% level, while the coefficient of *SHARE10* does not change much. In that respect, this result suggests that the main wage effect comes largely from greater shares of workers in top-paid occupations in the area and to a much less extent by higher levels of their wages.

Furthermore, I control for effects arising from unaccounted changes in the industrial composition by using occupation-industry dummies. The 367 occupations are now interacted with 13 industries (1-digit SIC03) to compose the occupation-industry dummies[15]. In that respect, a cleaner in the 'Hotels and Restaurant' sector is distinguished from a cleaner in the 'Financial Intermediation' Sector. The regression results are shown in Column 2 of Table 4-9 and are very similar to the specification with just occupational dummies (Column 1; reproduced from Col.1/Table 4-5). Therefore this gives me some reassurance on the results presented so far and for computational simplicity reasons I am going to continue with the occupational dummies specification (Equation (iii)).

In order to capture production complementarities within sectors, I include a variable $SHARE10_{sat}$ that denotes the employment share of top-paid occupation workers in the same industrial sector and area with the individual observation. The variable of interest $SHARE10_{at,-s}$ is amended to refer to the share of top-paid occupation workers

[15] Information on very detailed industries referring to the Standard Industrial Classification (SIC03) is available for each observation in ASHE. Using the one digit classification there are 17 sectors and aggregating further I end up with 13 industrial sectors.

employed in the area when excluding the sector the individual observation belongs to. The results are shown in Column 3 of Table 4-9. The coefficient of interest now captures consumer demand effects as well as production complementarities (and productivity spillovers) between sectors. As discussed in 4.2, if the latter are minimal or cancel out with an opposing downward bias from within-sector consumer demand effects, $SHARE10_{at,-s}$ can be argued to capture the consumer demand impact generated from rising shares of high-paid occupation workers in the area. Both coefficients in the regression result are positive and significant. The wage effect arising from higher-shares of top-paid occupation workers within the sector is 0.119% and very strongly significant (as the share now changes across sectors, areas and years). Its inclusion reduces the coefficient of the variable of interest which now takes a lower value of 0.139 (down from 0.225 in Column 1) while it is still significant at the 5% level.

Column 4 of the same Table (4-9) shows results from the econometric specification that controls for the employment share of top-paid occupation workers in the same firm (Equation v). This control accounts for production complementarities or productivity spillovers that are firm-specific. Its coefficient is found to be positive and strongly significant, while the coefficient of interest is slightly reduced to 0.219 and remains significant at the 1% level. Since this control has the potential to account for production complementarities at the very micro level, the workplace, it would be very powerful for the analysis if only the samples were larger. Unfortunately, since the ASHE sample covers only about 1% of the total workforce, the majority of firms in the sample have only one observation although their actual employment may be

higher as seen from linked data from IDBR (Inter-Departmental Business Register)[16]. As IDBR does not have data on occupations or education but only on the number of employees, it is not possible to get the relevant information from there. Additional time-varying area variables, constructed from IDBR, have been included as controls in column 5. I use the log of the employment in the area to capture any size effects, and also the log of the number of the establishments. The use of these variables is quite common in the agglomeration literature (e.g. Combes et al., 2008) in order to capture any urbanisation type effects[17]. Both coefficients for these variables are found positive but insignificant and do not alter my results.

The regression results for the selected subset of consumer and personal service occupations are presented in Columns 1 and 2 of Table 4-10. As seen in section 4.2, these occupations were selected out of the list of bottom quintile occupations so that they largely match the notion of consumer demand hypothesis rather than production related accounts. Applying the preferred econometric specification, the coefficient of interest now increases to 0.319 compared to 0.225 for the full set off occupations, possibly reflecting stronger wage effects through a consumer demand root for this selected set of occupations. Due to the nature of these occupations, it is expected that a larger part of the wage premium from higher shares of top-paid occupation workers can be attributed to consumer demand explanations rather than production side ones.

The result from the regression that controls for within-sectors wage effects is consistent with such an argument (Column 2/ Table 4-10). The coefficient of interest

[16] Inter-Departmental Business Register is a census of the UK businesses and can be linked to ASHE data (more info on IDBR and its usage for research on productivity in Criscuolo et al. 2003).
[17] Although the use of the log of the density of employment in the area might have been preferable to capture these urbanisation type effects.

rises to 0.230 compared to a value of 0.139 obtained for the full set of occupations (Col.3/ Table 4-9). As discussed, this value will get a downward bias if within-sector consumer demand effects exist and an upward bias if there are production complementarities or productivity spillovers between sectors. To the extent that these opposing biases are minimal or cancel out, an unbiased estimate of the relevant wage impact might be given by this regression. The assertion that $SHARE10_{at,-s}$ might capture largely consumer demand effects is reinforced when looking at its performance in the regressions for the remaining bottom quintile occupations (i.e. the ones that do not belong to my 'selected subset' of occupations) (Columns 3 and 4; Table 4-10). There $SHARE10_{at,-s}$ has its coefficient close to zero, while the coefficient of $SHARE10_{sat}$ that captures the share of top-paid occupations workers in the sector-area remains significant. It appears that for the 'selected subset' of occupations there are both between and within-sector wage effects from higher human capital; while for the remaining occupations of the same bottom quintile, there are only within-sector wage effects. Whether this is the product of between-sector effects coming from the consumption side, while within-sector effects coming from the production side, is still debatable, but plausible. Having in mind the caveats of this analysis, a tentative concluding result is the following: cleaners, carers and personal service workers accrue a wage rise of 0.23% when the share of top-paid occupation jobs in their travel-to-work area rises by 1 percentage point.

Results for specific demographic groups

Table 4-11 presents results informing on the wage premium acquired by bottom occupational quintile workers when the sample is split for different demographic groups. The analysis is conducted at TTWA spatial level using the preferred econometric specification (iii). There are not big differences in the coefficient of interest for men, women and the full-time subsamples. However, the coefficient for men although having a value close to the full sample, it has now become insignificant. The regression ran only for part-timers gives a coefficient for the share of the top-paid occupation workers that is positive although small and far from being statistically significant. Since the part-timers make up more than half of the jobs for the bottom occupational quintile, this is an important concern for the story put forward here. Of course, while there might be issues with measurement error regarding the hourly wages of part-timers, further investigation would be needed for conclusive answers.

Examining urban effects

It is of interest to examine if there is any urban specific story that might affect my variables. Therefore I add as an additional control *U_SHARE10*, the interaction of my *SHARE10* variable and an urban dummy for the 79 TTWAs that are classified as

'primary urban'[18]. I construct similar urban interacted variables for my between and within-sectors share variables (noted by the prefix *U*). The results of the wage regressions are presented in Table 4-12. Column 1 shows the baseline regression for the bottom quintile. The coefficient for *U_SHARE10* is 0.145 which should be added to the reference coefficient of 0.160 for *SHARE10* in order to get the full effect for the urban areas. However, this difference is not statistically significant. When controlling for within-sector effects, it is found that the coefficient for the urban interacted variable $U\_SHARE10_{at,-s}$ (that captures the between sector effects) is even stronger, as can be seen in column 2. Again, the difference with the baseline coefficient $SHARE10_{at,-s}$ is not statistically significant. The stronger effect for the urban areas is not present when looking at the coefficient of the urban interacted variable that captures mainly within-sector effects ($U\_SHARE10_{sat}$). Therefore, an urban specific case appears to have some validity when looking for between sector effects and not when looking for within sector effects. Considering the former, it might be consistent with the consumer demand story as I would expect that consumer demand effects that are captured at the area level (between sectors) to be more prominent in urban areas. It is also consistent with stronger wage effects of an 'urbanisation economies' type in urban areas than rural areas, which is what we would expect. On the other hand, 'localisation economies' type wage effects (as captured by the within-sector share variable) do not show any urban specific differentiation.

Finally, when Scotland is excluded, a similar analysis provides interesting results that are presented in Table 4-13. The regressions that refer now just to England and Wales

[18] These are the TTWAs that contain a Primary Urban Area (PUAs). Primary Urban Areas are defined using their physical extent and have a minimum population of 125,000 (more information on PUAs is available from 'State of the English Cities' project and the relevant CLG website). Similar notions were used in order to come up with meaningful definitions of PUAs for Wales and Scotland.

give coefficients substantially higher than those for Britain. The coefficient for the males subsample is now significant at the 10% level. The coefficient for the part-timers has increased and although its p-value has risen as well, it still fails to be statistically significant.

Results for Local Authorities

I repeat the comparative analysis of the different occupational quintiles using local authorities (LAs) rather than travel-to-work-areas. Now subscript *a* in the econometric specification (iii) stands for the local authority that corresponds to the workplace of each worker. The results are presented in Table 4-14 and should be compared with those of Table 4-5. Since the local authorities are finer geographies and referring to the workplace of each job, they are much more likely to capture production related accounts rather than the consumer demand one. Although workers might still consume at the local shops nearby their workplace, they probably do so to a less extent than consuming nearby their homes. This interpretation is partly confirmed by the regression results. The coefficient of interest for the bottom occupation quintile is less now at 0.134, possibly reflecting weaker consumer demand effects. It is now significant at 5%, compared to 1% for the TTWAs analysis. The coefficients of the 3rd and 4th quintile have roughly doubled although they still remain insignificant. This change in the coefficients for the middle-occupational quintile regressions might reflect the ability of the variable *SHARE10* to capture production complementarities/spillovers, something that was not possible before at the more aggregate geographical level.

Although not presented here, I have experimented adding time varying area controls at the local authority level in my wage regressions for England and Wales. Local unemployment rate and log median house prices in the local authority area had coefficients close to zero and my results were largely unaffected. However, there is a caveat here since both variables were residence based while the empirical analysis was workplace based. In future research, additional area controls can be applied both at the local authorities level but also and more importantly at the travel-to-work-area one.

Some additional considerations

An issue left to consider is whether the introduction of the minimum wage might have created a spurious positive significant coefficient of *SHARE10* for the bottom quintile, which is the one with the least paid occupations. Since the National Minimum Wage (NMW) legislation came in full effect in 1st April 1999 which is in the middle of the examined period, splitting the sample does not leave a long enough panel to examine this empirically in a satisfactory way (getting inference from variation of *SHARE10* over time). For what it is worth, I repeated my preferred wage regression of the bottom quintile (Col.1, Table 4-5) for pairs of years (1997-98; 1998-99; 1999-00; 2000-01) to examine if there is a peculiar result for the years around the change of legislation. These essentially differences-in-differences regressions do not produce statistically significant coefficients for the share of workers in top-paid occupations (*SHARE10*). The coefficients are positive insignificant for the 1997-98, 1999-00 and 2000-1 regressions with the highest coefficient for the 2000-01 pair of

years. Since there is evidence that the strongest impact of the NMW was within the first two months of its introduction (Dickens and Manning, 2004), this should not be worrying for the story that is put forward in this chapter. The regression for the years 1998-99 gives a negative insignificant coefficient for *SHARE10* that coincides with the introduction of the minimum wage[19]. This suggests that if the minimum wage had any effect on the coefficient of *SHARE10* for the full panel of 1997-2001 this was probably to mitigate it. Intuitively, this might have been expected. In principle it can be argued that the minimum wage would be binding and affecting the wages of the low-paid individuals more in areas with slack demand, i.e. creating an upward bias of wages in areas where the percentage of the high-paid occupation workers is lower. In that respect, it seems unlikely that the main conclusions of this paper are spuriously driven by the introduction of the minimum wage, although it is an issue worth considering.

4.4. Concluding Remarks

This chapter examined how high local human capital in a local area affects the wages of the individuals in the area. A positive association between the two is well documented in the literature and mainly attributed to production related accounts like production complementarities and wider productivity spillovers. This chapter examines also an account through consumer demand that has not been discussed extensively so far. According to this account, a larger share of a high-skilled

[19] Since the NES questionnaires (where the historic ASHE is based) were sent in April each year, it is quite likely that the 1999 wage figures have incorporated the increase in wages due to the introduction of the minimum wages. There is also evidence that some employers adjusted their pay structures in anticipation of the introduction in the months before April 1999 (Low Pay Commission, 2001).

workforce in the local area boosts the demand for consumer services that are not necessities like personal and leisure services. These services are labour intensive and to a large extent involve low-pay sector occupations. Furthermore, as they are non-traded, they need to be produced and consumed locally and this requires physical proximity of the high-skilled high-income workforce and the low-paid service workers. The chapter presents an empirical strategy that attempts to discern the effect of the consumer demand account from that of the production related accounts. Wage regressions are applied to ASHE microdata for the period 1997-2001 adding an additional variable that captures local human capital, the share of top-paid occupation workers in the travel-to-work-area. In order to shed light on the three different accounts, I examine the differential wage impact of the share of top-paid occupation workers on employees of different occupation quintiles defined by pay. The wage impact is stronger and significant for the bottom occupational quintile compared to the middle-occupational quintiles. This is argued to be the simultaneous product of production complementarities and consumer demand effects on top of productivity spillovers. Specifically, it is found that 1 percentage point rise in the share of high-paid occupation workers in the travel-to-work-area, increases the hourly wages of least-paid quintile occupation workers by roughly 0.23%. Accounting for within-sectors effects, the wage impact remains positive that is argued to come from consumer demand or production complementarities between sectors. If the latter are minimal, then my specification can be argued to capture a positive wage impact that comes mainly through the consumer demand mechanism.

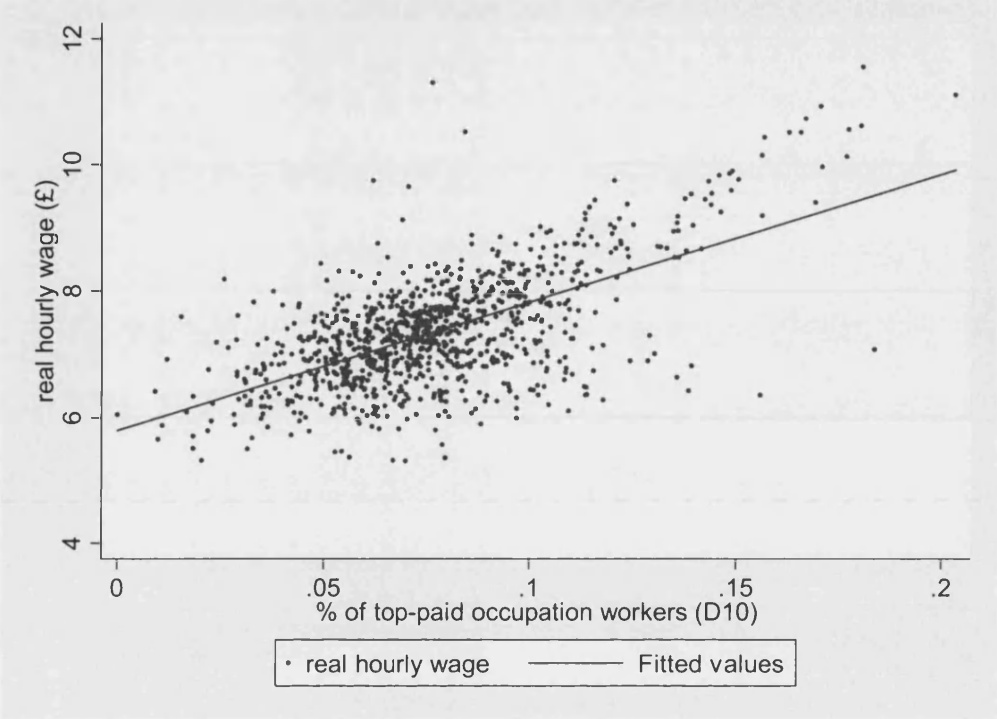
Applying the analysis to a subset of the bottom occupational quintile that consists of personal and consumer service occupations (like cleaners, carers and

waiters/waitresses) gives even stronger results in consistence with a consumer demand explanation. A final result of the paper is the following: cleaners, carers and personal service workers accrue a wage premium of 0.62% when the share of top-paid occupation jobs in their travel-to-work area rises by one standard deviation[20]. When using urban interacted effects, it appears that between-sector wage effects are stronger in the urban areas compared to the rural ones, while within-sector wage effects are similar in urban and rural areas. However, the results of this chapter are tentative subject to the limitations of the analysis and the chapter has pointed to a number of caveats regarding the successful separation of the three different accounts and possible concerns with endogeneity of the variable of interest. Future research would be needed in order to deal with these issues.

[20] which corresponds to £66 pay rise a year for an hourly wage of £5 and a 40 hour week.

4.5. FIGURES

Figure 4-1. Median real hourly wage against the share of top-paid occupation workers *SHARE10* of a travel-to-work-area; 1997-2001 (in £; 2001 prices)



Source: ASHE

Notes:

Median real hourly wages are shown, deflated using the Retail Price Index (RPI) for 2001 prices.

High-paid occupations are defined in Section 4.2 and shown in Appendix A (Table 4-15).

Travel-to-work-areas are defined such as the bulk of the population lives and works in the same area. There are 243 TTWAs for UK and 232 for Britain when excluding the Northern Ireland (defined according to 2001 Census data). Dropping TTWAs with small sample size (less than 50), my final set consists of 195 TTWAs.

4.6. TABLES

Table 4-1. Summary Statistics for 1997-2001

Observations (pooled sample)	N	Age	Real hourly wage (£) (2001prices)	Male	Full-time	Trainee/ Junior
All that stay in sample (>1 year)	610,016	39.4 (11.5)	£10.16 (7.46)	52.1%	77.9%	1.7%

Source: ASHE

1. Standard deviations in brackets.

2. Trainee/junior rate employment status rather than normal adult rate employment affects the earnings of the employee.

3. Considering only individuals who appear in the sample at least for two years, I end up with a panel of 610,016 observations, that correspond to 169,842 individuals. The employees stay on the sample on average for 3.6 years.

4. Average hourly real wages are shown that are deflated with RPI for 2001 prices.

Table 4-2. Distributions of time-varying area characteristics for 1997-2001

Variable/ Spatial level	**Mean**	**Standard deviation**	**1%**	**50%**	**99%**
TTWAs 195 TTWAs x 5 years=975					
SHARE10 (%) (share of top-paid occ.workers)	7.66	2.74	1.83	7.37	16.70
Real hourly wage (£ in 2001)	7.35	0.89	5.57	7.25	10.51

Source: APS

1. '*SHARE10*' in a travel-to-work-area stands for the share of employment that belongs to the highest paid occupational decile.
2. Travel-to-work-areas are constructed by ONS so that the bulk of their population lives and works in the same area (75%) using 2001 Census information.
3. Real hourly wages have been deflated for 2001 prices using the Retail Price Index (RPI).

Table 4-3. Wage effect of share of top-paid occupation workers on all workers

Explanatory Variables	Basic Model	Basic Model (Equation (i))
SHARE10	1.875	1.139
	(31.64)	(24.64)
Experience	0.024	0.024
	(73.97)	(74.42)
Experience sq.	-0.043	-0.042
(coeff.x100)	(-66.74)	(-68.40)
Trainee rate	-0.366	-0.365
	(-58.97)	(-58.62)
Part-time	-0.081	-0.080
	(-43.80)	(-45.69)
Female	-0.153	-0.153
	(-77.09)	(-75.82)
Occupation dummies	Yes	Yes
Year dummies	Yes	
Region-Year dummies		Yes
R^2	0.66	0.66
N	610,016	610,016

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-4. Wage effect of share of top-paid occupation workers on bottom-paid occupational quintile (Q1)

Explanatory Variables	**Basic Model** (Equation (i))	**area effects**	**area, individual effects** (Equation (ii))	**areaXindiv. effects** (Equation (iii))
	1	2	3	4
SHARE10	0.835	0.238	0.217	0.225
	(17.03)	(2.58)	(2.90)	(3.00)
Experience	0.012	0.012	0.031	0.033
	(47.31)	(47.15)	(5.79)	(6.09)
Experience sq.	-0.022	-0.022	-0.045	-0.046
(coeff.x100)	(-43.81)	(-43.69)	(-25.29)	(-25.33)
Trainee rate	-0.217	-0.216	-0.147	-0.147
	(-24.57)	(-24.49)	(-19.36)	(-19.42)
Part-time	-0.059	-0.059	0.046	0.047
	(-16.11)	(-16.05)	(11.78)	(12.11)
Female	-0.101	-0.101		
	(-31.45)	(-31.37)		
Occup.dummies	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes
Area dummies		Yes	Yes	
Individ. dumm.			Yes	
areaXindiv. dummies				Yes
R^2	0.25	0.26	0.78	0.78
N	113,499	113,499	113,499	113,499

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-5. Wage effect of share of top-paid occupation workers on the various occupational quintiles (Q1-Q5) (Equation (iii))

Explanatory Variables	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile
SHARE10	0.225	0.091	0.035	0.019	0.170
	(3.00)	(1.55)	(0.52)	(0.26)	(1.93)
Experience	0.033	0.027	0.040	0.031	0.056
	(6.09)	(6.21)	(8.56)	(6.19)	(9.63)
Experience sq. (coeff.x100)	-0.046	-0.059	-0.067	-0.077	-0.114
	(-25.33)	(-35.36)	(-36.14)	(-39.52)	(-20.64)
Trainee rate	-0.147	-0.210	-0.241	-0.235	-0.242
	(-19.42)	(-22.19)	(-23.03)	(-19.14)	(-17.26)
Part-time	0.047	0.050	0.094	0.106	0.179
	(12.11)	(11.30)	(15.62)	(14.40)	(19.09)
Occ.dumm.	Yes	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes	Yes
areaXindiv dum.	Yes	Yes	Yes	Yes	Yes
R2	0.78	0.85	0.88	0.89	0.89
N	113,499	119,830	108,034	119,296	117,575

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-6. Wage effects including a supply control ('own quintile share')

Explanatory Variables	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile
SHARE10	0.242	0.088	0.033	0.017	-0.089
	(3.10)	(1.50)	(0.49)	(0.23)	(-0.69)
Own quintile share	0.030	-0.023	-0.040	-0.009	0.251
	(0.77)	(-0.58)	(-0.83)	(-0.19)	(3.05)
Other Controls	Yes	Yes	Yes	Yes	Yes
areaXindiv. dummies	Yes	Yes	Yes	Yes	Yes
R^2	0.78	0.85	0.88	0.89	0.89
N	113,499	119,830	108,034	119,296	117,575

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

The share of the quintile that each observation belongs to is added as a regressor in order to control for supply effects ('*Own quintile share*').

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-7. Wage effect of various occupational deciles (SHARE1-SHARE10) on the five occupational quintiles (Q1-Q5)

Explanatory Variables	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile
SHARE10	0.308***	0.110	0.061	0.026	0.331**
	(2.86)	(1.28)	(0.62)	(0.22)	(2.38)
SHARE9	0.044	0.022	0.054	0.003	0.377***
	(0.44)	(0.25)	(0.52)	(0.03)	(2.86)
SHARE8	0.120	0.098	0.047	-0.175	0.185
	(1.15)	(1.10)	(0.48)	(-1.56)	(1.38)
SHARE7	0.012	0.030	0.010	0.094	0.225*
	(0.13)	(0.39)	(0.11)	(0.86)	(1.91)
SHARE6	0.053	-0.061	0.004	-0.024	0.104
	(0.54)	(-0.72)	(0.04)	(-0.21)	(0.80)
SHARE5	-	-	-	-	-
SHARE4	0.002	-0.012	0.094	0.079	-0.003
	(0.02)	(-0.15)	(1.03)	(0.75)	(-0.03)
SHARE3	0.179*	-0.006	0.091	-0.042	0.016
	(1.78)	(-0.07)	(1.02)	(-0.38)	(0.13)
SHARE2	0.050	0.000	0.028	-0.013	0.202*
	(0.54)	(-0.01)	(0.34)	(-0.13)	(1.66)
SHARE1	0.125	0.026	0.021	0.006	0.165
	(1.45)	(0.37)	(0.27)	(0.06)	(1.53)
Other Controls	Yes	Yes	Yes	Yes	Yes
areaXindiv. dummies	Yes	Yes	Yes	Yes	Yes
R^2	0.78	0.85	0.88	0.89	0.89
N	113,499	119,830	108,034	119,296	117,575

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters (* 10%, ** 5%, *** 1%).

D5 is dropped to avoid multicollinearity.

Table 4-8. Include average wage of top-paid occupation workers as an additional control *('wage control')*

Explanatory Variables	**Bottom quintile**
	Eq.(iii)
	1
$SHARE10_{at}$	0.235
	(3.11)
Wage control	0.014
	(1.91)
Other controls	Yes
areaXindiv dummies	Yes
R^2	0.78
N	113,473

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

'*Wage control*' stands for the log of the average hourly wage of the workers who make up the highest decile (D10).

Table 4-9. Regression results using sectoral and firm controls (Bottom Quintile)

Explanatory Variables	**Eq.(iii)**	**Occupation-Industry dummies**	**Area-sector control Eq.(iv)**	**Firm control Eq.(v)**	**Additional area controls**
	1	2	3	4	5
$SHARE10_{at}$	0.225	0.221		0.219	
	(3.00)	(2.95)		(2.93)	
$SHARE10_{at,-s}$			0.139		0.138
			(2.07)		(2.04)
$SHARE10_{sat}$			0.119		0.118
			(5.19)		(5.17)
$SHARE10_{fat}$				0.048	
				(4.09)	
Log(employment)					0.020
					(1.26)
Log(establishments)					0.045
					(0.80)
Occ.dumm.	Yes		Yes	Yes	Yes
Occ.-insustry dummies		Yes			
Region-Year dummies	Yes	Yes	Yes	Yes	Yes
areaXindiv dummies	Yes	Yes	Yes	Yes	Yes
R2	0.78	0.82	0.82	0.82	0.78
N	113,499	113,000	113,000	113,499	113,000

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

$SHARE10_{at}$ stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

$SHARE10_{at,-s}$ is similar to $SHARE10_{at}$ but now excludes the own sector *s*

$SHARE10_{sat}$ is the share of top-paid occupation workers in sector *s*, area *a* and year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-10. Regression results for 'Selected occupations' out of the Bottom Quintile and the 'Rest'

Explanatory Variables	Selected occupations	Selected Occupations	Rest occupations	Rest occupations
	Eq.(iii)	Eq.(iv)	Eq.(iii)	Eq.(iv)
	1	2	3	4
$SHARE10_{at}$	0.319		0.090	
	(2.29)		(1.01)	
$SHARE10_{at,-s}$		0.230		-0.008
		(1.91)		(-0.10)
$SHARE10_{sat}$		0.137		0.087
		(3.71)		(2.89)
Occ.dumm.	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes
areaXindiv dummies	Yes	Yes	Yes	Yes
R2	0.78	0.78	0.81	0.81
N	42,233	41,800	71,266	71,200

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

$SHARE10_{at}$ stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

$SHARE10_{at,-s}$ is similar to $SHARE10_{at}$ but now excludes the own sector *s*

$SHARE10_{sat}$ is the share of top-paid occupation workers in sector *s*, area *a* and year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

'Selected occupations' were selected out of the bottom quintile occupations so that they match the notion of consumer demand hypothesis (e.g. cleaners, care assistants, bar staff).

'Rest' refers to the remaining occupations of the bottom occupational quintile.

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-11. Wage effect on the bottom occupational quintile by demographic group (Equation (iii))

Explanatory Variables	All	Male	Female	Full-time	Part-time
SHARE10	0.225	0.217	0.240	0.232	0.096
	(3.00)	(1.59)	(2.70)	(2.57)	(0.85)
Experience	0.033	0.046	0.027	0.041	0.026
	(6.09)	(4.97)	(4.12)	(6.93)	(3.06)
Experience sq. (coeff.x100)	-0.046	-0.058	-0.041	-0.061	-0.032
	(-25.33)	(-14.17)	(-18.62)	(-29.04)	(-10.26)
Trainee rate	-0.147	-0.150	-0.144	-0.191	-0.135
	(-19.42)	(-12.54)	(-16.15)	(-15.66)	(-11.63)
Part-time	0.047	0.026	0.053	-	-
	(12.11)	(3.32)	(13.53)		
Occ.dumm.	Yes	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes	Yes
areaXindiv dum.	Yes	Yes	Yes	Yes	Yes
R^2	0.78	0.83	0.74	0.89	0.73
N	113,499	30,581	82,918	50,292	63,207

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-12. Urban effects on the wage premium

Explanatory Variables	Bottom quintile	Bottom quintile
	Eq.(iii) 1	Eq.(iv) 2
$SHARE10_{at}$	0.160	
	(1.69)	
$U\_SHARE10_{at}$	0.145	
	(1.00)	
$SHARE10_{at,-s}$		0.060
		(0.68)
$U\_SHARE10_{at,-s}$		0.173
		(1.35)
$SHARE10_{sat}$		0.119
		(3.19)
$U\_SHARE10_{sat}$		0.005
		(0.10)
Occ.dumm.	Yes	Yes
Region-Year dummies	Yes	Yes
areaXindiv dummies	Yes	Yes
R^2	0.78	0.78
N	113,499	113,000

Source: ASHE

Notes: The dependent variable is log hourly wage of the individual.

$SHARE10_{at}$ stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

$SHARE10_{at,-s}$ is similar to $SHARE10_{at}$ but now excludes the own sector *s*

$SHARE10_{sat}$ is the share of top-paid occupation workers that changes across sectors *s*, areas *a* and years *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

The prefix *U* stands for an interaction of the regressor with an urban dummy that gets the value 1 for the TTWAs that are classified as "urban".

Table 4-13. England & Wales: Analysis by demographic group

Explanatory Variables	All	All	Male	Female	Full-time	Part-time
	Eq.(iii)	Eq.(iv)	Eq.(iii)	Eq.(iii)	Eq.(iii)	Eq.(iii)
$SHARE10_{at}$	0.271		0.280	0.281	0.267	0.129
	(3.27)		(1.86)	(2.84)	(2.63)	(1.03)
$SHARE10_{at,-s}$		0.199				
		(2.67)				
$SHARE10_{sat}$		0.121				
		(4.86)				
Occ.dumm.	Yes	Yes	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes	Yes	Yes
areaXindiv dum.	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.78	0.78	0.84	0.75	0.89	0.73
N	102,653	102,188	27,748	74,905	45,244	57,409

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

$SHARE10_{at}$ stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

$SHARE10_{at,-s}$ is similar to $SHARE10_{at}$ but now excludes the own sector *s*

$SHARE10_{sat}$ is the share of top-paid occupation workers in sector *s*, area *a* and year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

Table 4-14. Local Authorities analysis- Wage effect of share of top-paid occupation workers on the various occupational quintiles (Q1-Q5) (Equation (iii))

Explanatory Variables	Bottom Quintile	2nd Quintile	3rd Quintile	4th Quintile	Top Quintile
SHARE10	0.134	0.076	0.063	0.052	0.108
	(2.56)	(2.04)	(1.43)	(1.16)	(2.06)
Personal controls	Yes	Yes	Yes	Yes	Yes
Region-Year dummies	Yes	Yes	Yes	Yes	Yes
areaXindiv dum.	Yes	Yes	Yes	Yes	Yes
R2	0.79	0.86	0.89	0.90	0.90
N	116,951	124,696	112,093	122,160	117,452

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 stands for the employment share of individuals who do the highest-paid occupations in the area *a* at a given year *t*.

Additional controls include a proxy of experience based on age and its quadratic form, dummies for gender, part-time employment, trainee/junior rate employment) and occupational dummies (SOC90).

T-statistics shown in parenthesis are corrected for area-year clusters.

4.7. APPENDIX A

Table 4-15. Top occupational decile (*SHARE10*); Britain, 1997

Pay rank	SOC	Label of Occupation Cell	Empl.Share %	Median wage £
367	101	General managers; large companies and organisations	0.07	49.99
366	100	General administrators; national government	0.02	31.41
365	331	Aircraft flight deck officers	0.04	28.32
364	703	Air, commodity and ship brokers	0.02	23.09
363	120	Treasurers and company financial managers	0.49	22.15
362	113	Managers in mining and energy industries	0.03	21.36
361	152	Police officers (inspector and above)	0.06	20.36
360	241	Barristers and advocates	0.01	20.17
359	232	Education officers, school inspectors	0.04	19.75
358	220	Medical practitioners	0.42	19.00
357	126	Computer systems and data processing managers	0.38	17.88
356	125	Organisation and methods and work study managers	0.08	17.84
355	222	Ophthalmic opticians	0.02	17.69
354	223	Dental practitioners	0.03	17.34
353	215	Chemical engineers	0.03	17.27
352	253	Management consultants, business analysts	0.16	17.20
351	242	Solicitors	0.23	16.81
350	131	Bank, Building Society and Post Office managers	0.46	16.77
349	330	Air traffic planners and controllers	0.02	16.65
348	361	Underwriters, claims assessors, brokers, investment analysts	0.67	16.41
347	290	Psychologists	0.05	16.27
346	230	University and polytechnic teaching professionals	0.43	16.27
345	235	Special education teaching professionals	0.17	16.10
344	212	Electrical engineers	0.11	16.07
343	240	Judges and officers of the Court	0.01	16.02
342	384	Actors, entertainers, stage managers, producers & directors	0.11	15.84
341	252	Actuaries, economists and statisticians	0.06	15.82
340	233	Secondary education teaching professionals	1.70	15.81
339	123	Advertising and public relations managers	0.20	15.69
338	121	Marketing and sales managers	1.87	15.69
337	214	Software engineers	0.30	15.29
336	124	Personnel, training and industrial relations managers	0.30	15.10

Source: ASHE

Notes:
Shading indicates the largest five occupations in terms of employment share.
Wages are median real hourly wages deflated for 2001 prices using the RPI.

Table 4-16. Bottom occupational quintile (Q1) (Britain 1997)

Pay rank	SOC	Label of Occupation Cell	Occup. Decile	Empl.Share %	Median wage £
1	732	Market and street traders and assistants	1	0.01	2.34
2	621	Waiters, waitresses	1	0.52	3.67
3	622	Bar staff	1	0.81	3.67
4	660	Hairdressers, barbers	1	0.17	3.74
5	952	Kitchen porters, hands	1	0.67	3.89
6	556	Tailors and dressmakers	1	0.01	3.94
7	722	Petrol pump forecourt attendants	1	0.08	4.04
8	953	Counterhands, catering assistants	1	0.96	4.14
9	956	Window cleaners	1	0.01	4.15
10	958	Cleaners, domestics	1	3.30	4.20
11	673	Launderers, dry cleaners, pressers	1	0.18	4.24
12	659	Other childcare and related occupations	1	0.76	4.33
13	670	Domestic housekeepers and related occupations	1	0.02	4.36
14	791	Window dressers, floral arrangers	1	0.04	4.40
15	720	Sales assistants	1	5.16	4.41
16	951	Hotel porters	2	0.05	4.43
17	553	Sewing machinists, menders, darners, embroiderers	2	0.51	4.45
18	959	Other occupations in sales and services	2	0.04	4.48
19	955	Lift and car park attendants	2	0.05	4.48
20	721	Retail cash desk and check-out operators	2	0.84	4.54
21	593	Musical instrument makers, piano tuners	2	-	
22	619	Other security and protective service occupations	2	0.11	4.68
23	644	Care assistants and attendants	2	1.91	4.73
24	902	All other occupations in farming and related	2	0.10	4.75
25	934	Driver's mates	2	0.02	4.79
26	699	Other personal and protective service occupations	2	0.45	4.80
27	651	Playgroup leaders	2	0.03	4.81
28	999	All others in miscellaneous occupations	2	0.03	4.85
29	620	Chefs, cooks	2	0.70	4.90
30	954	Shelf fillers	2	0.25	4.97
31	813	Winders, reelers	2	0.02	5.02
32	661	Beauticians and related occupations	2	0.04	5.07
33	812	Spinners, doublers, twisters	2	0.03	5.11
34	643	Dental nurses	2	0.15	5.11
35	595	Horticultural trades	2	0.08	5.12
36	863	Weighers, graders, sorters	2	0.07	5.15
37	920	Mates to woodworking trades workers	2	0.02	5.15
38	862	Packers, bottlers, canners, fillers	2	1.07	5.17
39	800	Bakery and confectionery process operatives	2	0.17	5.18
40	671	Housekeepers (non-domestic)	2	0.03	5.21
41	581	Butchers, meat cutters	2	0.15	5.24
42	950	Hospital porters	2	0.08	5.24
43	591	Glass product & ceramics finishers & decorators	2	0.07	5.25
44	641	Hospital ward assistants	2	0.11	5.28
45	652	Educational assistants	2	0.52	5.28
46	615	Security guards and related occupations	2	0.62	5.30
47	460	Receptionists	2	0.85	5.32
48	874	Taxi, cab drivers and chauffeurs	2	0.12	5.36
49	544	Tyre and exhaust fitters	2	0.05	5.39
50	990	All other labourers and related workers	2	0.46	5.40

Notes on table 4-16 (previous page):
Shading indicates the largest five occupations in terms of employment share.
Wages are median real hourly wages deflated for 2001 prices using the RPI.

Table 4-17. Selected occupations out of the bottom occupational quintile (1997)

Pay rank	SOC	Label of Occupation Cell	Occup. Decile	Empl.Share %	Median wage £
1	732	Market and street traders and assistants	1	0.01	2.34
2	621	Waiters, waitresses	1	0.52	3.67
3	622	Bar staff	1	0.81	3.67
4	660	Hairdressers, barbers	1	0.17	3.74
6	556	Tailors and dressmakers	1	0.01	3.94
10	958	Cleaners, domestics	1	3.30	4.20
11	673	Launderers, dry cleaners, pressers	1	0.18	4.24
12	659	Other childcare and related occupations	1	0.76	4.33
23	644	Care assistants and attendants	2	1.91	4.73
27	651	Playgroup leaders	2	0.03	4.81
29	620	Chefs, cooks	2	0.70	4.90
32	661	Beauticians and related occupations	2	0.04	5.07
48	874	Taxi, cab drivers and chauffeurs	2	0.12	5.36

Source: ASHE

Notes:
Wages are median real hourly wages deflated for 2001 prices using the RPI.
These occupation cells make up together 8.57% of the total employment in 1997.

Table 4-18. Wage effects on all workers (2-digit occupational classification used)

Explanatory Variables	**Basic Model** (Equation (i))	**Basic Model** (Equation (i))	**area effects**	**areaXindiv. effects** (Equation (iii))
	1	2	3	4
SHARE10	1.139	1.195	0.188	0.165
	(24.64)	(23.84)	(3.44)	(4.23)
Experience	0.024	0.026	0.026	0.037
	(74.42)	(69.40)	(69.72)	(13.81)
Experience sq.	-0.042	-0.047	-0.047	-0.076
(coeff.x100)	-68.40	-63.85	-63.87	-39.78
Trainee rate	-0.365	-0.363	-0.363	-0.199
	(-58.62)	(-57.61)	(-57.86)	(-45.77)
Part-time	-0.080	-0.094	-0.093	0.051
	(-45.69)	(-50.28)	(-50.05)	(16.65)
Female	-0.153	-0.162	-0.162	
	(-75.82)	(-80.45)	(-80.40)	
Occup.dummies	Yes (3-digit)	Yes (2-digit)	Yes (2-digit)	Yes (2-digit)
Region-Year dummies	Yes	Yes	Yes	Yes
Area dummies			Yes	
Individ. dumm.				
areaXindiv. dummies				Yes
R^2	0.63	0.63	0.63	0.94
N	663,022	663,022	663,022	663,022

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 refers to the employment share of high-paid occupational decile workers in the area.

T-statistics shown in parenthesis are corrected for area year clusters.

Specification in Column 1 uses 3-digit occupational classification dummies (SOC90), while Columns 2-4 use 2-digit occupational classification dummies.

Table 4-19. Wage effects on the bottom-paid occupational quintile (Q1)- *Year dummies* specification

Explanatory Variables	**Basic Model** (Equation (i))	**area effects**	**area, individual effects** (Equation (ii))	**areaXindiv. effects** (Equation (iii))
	1	2	3	4
SHARE10	1.368	0.185	0.228	0.237
	(16.51)	(1.82)	(3.08)	(3.20)
Experience	0.012	0.012	0.031	0.032
	(47.75)	(47.32)	(5.75)	(6.03)
Experience sq.	-0.022	-0.022	-0.045	-0.046
(coeff.x100)	-44.52	-43.60	-25.52	-25.56
Trainee rate	-0.216	-0.216	-0.148	-0.147
	(-24.58)	(-24.59)	(-19.52)	(-19.54)
Part-time	-0.059	-0.059	0.046	0.047
	(-15.72)	(-15.79)	(11.76)	(12.06)
Female	-0.102	-0.101		
	(-32.25)	(-31.96)		
Occup.dummies	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes
Area dummies		Yes	Yes	
Individ. dumm.			Yes	
areaXindiv. dummies				Yes
R^2	0.25	0.26	0.78	0.78
N	113,499	113,499	113,499	113,499

Source: ASHE

Notes:

The dependent variable is log hourly wage of the individual.

SHARE10 refers to the employment share of high-paid occupational decile workers in the area.

T-statistics shown in parenthesis are corrected for area year clusters.

CHAPTER 5: Local human capital and its impact on local employment chances in Britain

Abstract

This paper examines how high human capital in a locality is associated with the employment outcomes of individuals. A probit model is used to examine how the employment probability of otherwise similar working age males is associated with changes in the share of degree holders in the local area. Different econometric specifications are employed in order to shed light on the positive effect found and its possible causes. The paper discusses three main accounts, referring to the consumption demand, productivity spillovers and production complementarities. For Britain, it is found that the share of high skill *residents* in a locality has a strong positive impact on the local employment chances of men with no qualifications. The effect on the local employment chances of the other educational groups is either insignificant or significant negative. These results are consistent with the consumer demand hypothesis that the presence of high educated, high income individuals in a locality boosts the demand for local low skill services. On the other hand, when the share of skilled *workers* is used, the results hint on possible simultaneous effect of production complementarities and productivity spillovers. However, the analysis points to the existing limitations of successfully isolating the consumption demand and the production function mechanisms and calls for further research.

5.1. Introduction

Needless to say, employment is vital for the well being of an individual but also for the society as a whole. Although economic conditions are quite different from the post-war reconstruction era, one of the main economic policy goals is to deliver an economy that offers employment opportunities and at the same time has a highly qualified, skilled labour to access them. In that respect, education and skills acquisition is crucial for fostering growth and delivering employment. There exists an important literature on human capital and how it affects growth at the national or regional level. This paper looks at the effects of high human capital at the very localised level for Britain. Specifically, it examines whether the increasing presence of university graduates in a locality affects positively the employment chances of its residents.

Using data for the British travel-to-work-areas (TTWAs) in 2006, a simple scatter plot shows a clear positive association between the share of degree holders in the area and the employment rate of its working age resident population (Figure 5-1). More educated areas have higher employment rates. This association appears to hold but is weaker when looking at the Local Authority level, mainly due to the London Boroughs having high shares of degree holders together with low employment rates (Figure 5-2). In any case, this positive relationship suggests that educated areas are associated with higher employment rates. Of course, the causality can go either way. It is quite possible that educated individuals migrate to the areas with higher employment rates. This paper will try to examine whether a greater number of educated individuals in an area might affect the employment chances of the residents

of the area. In view of the discussion in Chapter 2, such employment effect might come from an increase in the labour demand due to the higher human capital in the local area. Bearing in mind that the issue of endogeneity is an important caveat for this study, the empirical strategy utilises the available information in Annual Population Survey microdata and looks at the relationship of the degree holders in an area and the employment chances of different skill groups.

As suggested in Chapter 2, a positive shift in labour demand from higher human capital in an area might arise for reasons that can be broadly divided to production driven and consumption driven ones. The former refers to the vast literature on agglomeration economies and human capital externalities (Marshall, 1890; Rauch, 1993, Glaeser and Mare, 2001; Moretti, 2004). While the latter focuses on the increased demand for local consumer services by an expanding high-income, high-educated urban workforce. Although economic research has turned less attention to consumption driven explanations compared to production driven ones, the relevant literature has been expanding recently (Glaeser et al. 2001; Manning, 2004; Shapiro, 2006; Kaplanis, 2007; Mazzolari and Ragusa, 2007). These different mechanisms are not mutually exclusive and can take place at a local labour market simultaneously. In that respect, relevant research can inform policy albeit with a different focus for each account; the workplace for the production related and the neighbourhood for the consumption related. Agglomeration economies and productivity spillovers can be said to provide the economic rationale for governments' efforts to affect business location decisions. Notable example is the creation of technological parks. On the other hand, the consumption driven account can be said to lie behind area regeneration projects. These projects encourage mixed uses of land and aim to attract

young professionals in the deprived neighbourhoods of the metropolitan areas in order to revitalise their local economic base.

Using microdata from the Annual Population Survey, this paper examines how greater presence of degree holders in a local area in Britain might increase the employment chances of otherwise similar individuals. Potential ways to disentangle between production driven and consumption driven explanations are discussed although attempts for empirical verification are inconclusive.

The next Section 5.2 presents the empirical strategy employed and describes the data. Section 5.3 discusses the empirical results and various robustness tests. The final Section 5.4 concludes.

5.2. Empirical strategy and data used

Data

The data used for this paper comes from the Annual Population Survey (APS) of the UK Office for National Statistics (ONS). At the time accessed, data with information on fine geographies were available through a special license only for the years 2004-2006 and thus this is the time period of the analysis. The APS uses data from the Labour Force Survey together with an additional sample boost for urban areas of England. As the APS boost ceased in 2005 due to financial constraints, the analysis in

this chapter is restricted to the APS without the boost. Essentially this leaves the dataset with information from the LFS and its annual boosts, which was known as ALALFS for the years before 2004 (Annual Local Area Labour Force Survey). LFS is the largest continuous household survey with information on labour statistics in UK. It covers approximately 57,000 private households that are contacted each quarter. Each household is contacted for five quarters and then drops from the sample. In order to construct an annual representative survey with each household included only once, information from four consecutive quarters is aggregated keeping only households who are interviewed for the first and the fifth time. This design delivers an annual database for UK known as the LADB (Local Area Database). Adding to this database annual local LFS boost samples for England (LLFS), Wales (WLFS) and Scotland (SLFS), gives us a very large survey with about 365,000 individuals every year. This is the survey used for the analysis below.

Model specification

The main empirical task of this paper is to investigate the relationship between high human capital in a local area and the corresponding employment rate. For that reason, a probit model is used to examine how the employment chances of otherwise similar individuals are affected by the presence of degree holders in the locality. The probability of employment of an individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. The probit model used is shown below:

$$y_{iat}^* = X'_{it}\beta + r * HC_{at} + d_t + u_{iat} \qquad \text{(i)}$$

$$Prob(y_{iat} = 1) = Prob(y_{iat}^* > 0) = F(X'_{it}\beta + r * HC_{at} + d_t)$$

$y = 1$ if $y^* > 0$

$= 0$ otherwise

The dependent latent variable y^* is associated with employment and not observed in the data; rather what we observe in the data is a dummy variable y that takes value 0 if the individual is unemployed or inactive and 1 if employed. The subscript t refers to the relevant year and a to the local area that the individual is based. X_{it} is a vector that controls for personal characteristics- age, educational level, marital status, number of children and foreign born status. The specification includes year dummies d_t to control for economic cycles in the national economy. The error term u is assumed to be independently and identically distributed following a normal distribution. Finally, HC is the variable of interest that stands for the share of university degree holders in the local area and varies yearly. This local area could refer to either the workplace or the residence area and this is an important issue that will be investigated later in more detail.

Dealing with potential sources of bias

A potential source of bias for the model in equation (i) arises from unobserved area characteristics that are correlated with the share of high educated individuals in the

area but also affect local employment chances in the area. For example, dynamic areas that experience a boom due to industrial mix or historic reasons might offer increased employment opportunities while at the same time attract increasingly educated workers due to the urban amenities they offer. In order to account for time-invariant unobserved area characteristics, I add area dummies d_a to the model.

$$y_{iat}^{*} = X_{it}\beta + r * HC_{at} + d_t + d_a + u_{iat} \qquad \text{(ii)}$$

Since there is no longitudinal information in the APS (unlike LFS), it is not possible to control for unobserved individual characteristics, like individual ability. In that respect, a potential source of bias arises for my model if there is a non-random sorting of high ability individuals across areas.

Theoretical discussion

As discussed in the previous section, all in all there are three main accounts that come from the relevant literature, referring to consumer demand, productivity spillovers and production complementarities. The first refers to the consumption side, while the other two to the production function. These accounts are not mutually exclusive and what we observe in the local labour market could be their combined outcome. Ideally, we would like to discern the effect of each of the three accounts.

As the consumption driven account refers more to the residential area and the production driven ones to the workplace, this gives a starting point for the empirical

strategy to follow. In that respect, the variable of interest *HC* in the econometric specification above would be residence based or workplace based respectively. Investigating the impact to the local labour market from higher shares of educated residents would shed light mainly to the consumer demand story. Similarly, investigating the impact from educated workers would inform on productivity spillovers and/or production complementarities.

The other crucial factor that would aid identification is looking at the effect of the share of degree holders to the employment chances of different educational groups. As discussed in Section 2.7, while the productivity spillovers mechanism should affect equally all educational groups, the same does not apply for the consumption demand and the production complementarities accounts.

Let's look at each of the accounts one by one. The consumer demand account suggests that higher shares of educated residents would raise labour demand for local low skilled consumer services. Therefore increased employment chances for low qualification residents but not for the other educational groups would be consistent with this account. Regarding the productivity spillovers mechanism, it is expected that the effect would be similar for the different educational groups. Rather, high human capital is suggested to raise the productivity of the average worker of each skill group above the level that educational and other personal characteristics would dictate. The increased productivity of workers shifts the labour demand curve up and rightward and depending on the elasticity of the labour supply, wages and/or employment would increase. Assuming an upward labour supply curve that is not

perfectly inelastic, employment opportunities in the locality should increase via this productivity spillovers mechanism.

Finally, even in the absence of human capital externalities, productivity increases could arise due to production complementarities. In a standard neoclassical model, where skilled and unskilled labour are assumed to be imperfect substitutes, a rise in the numbers of skilled workers would raise the productivity of unskilled workers and the relevant demand for them. Therefore in our case, an increase in the share of educated workers would mean increased employment opportunities in low skill jobs. Looking at the differential effect of our variable of interest to the different educational groups could inform on the combined effect of production complementarities and/or productivity spillovers (in a similar way with the Chapter 4 approach). Table 5-1 summarises this discussion.

However, there are a number of important caveats that we have to acknowledge. Firstly, an increase in local low-skill job opportunities does not necessarily mean that local residents would benefit from them. It might as well be the case that commuters from elsewhere are attracted to the locality in order to work. If this is the case, the dependent variable in specification (i) would miss the increased employment opportunities and the probit results would give an underestimate of the effect of the share of degree holders (*HC*). In a parallel fashion, some residents of the locality might get a job in another locality. In that case, the dependent variable erroneously captures employment opportunities in neighbouring areas and the results give an overestimate of the effect of *HC*. There are two ways this study employs in order to deal with these problems. The first one is to amend the sample in order to capture in a

meaningful way the 'local employment chances'. Therefore, I exclude from the sample individuals who live in one area and commute for work to another one. This way the dependent variable y_{iat} in (i) takes the value 0 for a workless resident of locality a and the value 1 for a resident who works and lives in locality a [21]. The second way is to apply the analysis for 'travel-to-work-areas' (TTWAs). TTWAs are constructed by definition so that the bulk of their resident population also work within the same area. Therefore, they correspond to the best definition we can get of local labour markets and are preferable to administrative spatial entities with arbitrary boundaries (like the local authorities (LAs)).

The second problem refers to the way the variable of interest, the share of educated individuals in the local area, is constructed. Earlier we suggested a residence vis-à-vis workplace distinction in order to shed some light in this investigation. Nevertheless, it would not be possible to isolate a consumption related rather than a production related effect, unless the educated residents do not work in the same area. Therefore, in order to isolate the consumption demand effect we want the variable of interest to refer to the share of degree holders in the locality who are residents that commute to other localities for work[22]. Similarly, when considering the production driven mechanisms, we would want educated workers who live in another area and commute for work to the locality we are examining. The problem with pursuing such analysis is

[21] When we restrict the sample as described and the analysis is done at the LA level, we should note that we capture not only 'local employment chances' but also the capability of residents to find employment in the locality that they live. Therefore, this specification is more restricted than probably needed.

[22] An alternative way would be to restrict the sample to those who are over working age so as to capture the retired (as Manning, 2004). However, this is not possible as information on educational attainment for the over working age population exists in APS only for those who are employed, roughly 10% in 2006. Also, considering workless residents would be problematic since they might not have income to spend on services, unless the educated workless people are particularly wealthy; which is unlikely to be true for the vast majority of them.

twofold. In the theoretical level, the likelihood of commuting depends on urban rents, urban amenities, employment opportunities and wages. In that respect, examining how the share of the educated amongst all inward commuters impacts on the local labour market would not be so straightforward. In the practical level, the sample sizes fall substantially and introduce noise in our variable of interest.

Finally, there is a third problem that is more conceptual than the other two and blurs the distinction between the three accounts. The best way to illustrate this problem is to consider an example. Think of a banker who buys food for his lunch-break. If he goes out of the office and has lunch at the local sandwich shop, then this transaction should probably best fit the consumer demand account. Therefore, although the induced rise in the local labour demand for sandwich makers would show in a workplace-based consideration of my econometric specification, the account points to the consumption story rather than the production one. On the other hand, if he prefers to go to the café of his workplace for lunch, then the induced increase in labour demand might be considered part of a production complementarities explanation. In this case, demand for sandwich-makers, which is a relatively less-skilled job, would come from the employment of more bankers in that workplace. In that respect, there is not a clear cut distinction to judge whether the source of the effect is consumer demand driven or driven by production complementarities, even if one successfully separated residents and workers in the variable of interest as discussed earlier.

5.3. Empirical results

Samples used and descriptive statistics

The sample is restricted to males so that we do not complicate the discussion of the labour supply with issues like the child-bearing role of women or partner's income. However, the variable of interest *HC*, the share of educated individuals in the area, includes both men and women. In any of the three accounts, female residents or workers are expected to have similar effect in the local labour market as male ones. Therefore, the empirical investigation examines how the share of educated men and women in an area affects the local employment chances of men. The sample of the probit model includes men of working age, so age group 16-64. The sample includes the self-employed as self-employment status is common for specific low-skill services. The sample excludes the retired, the unpaid family workers and students who did not seek and did not want employment. The variable of interest *HC* considers both men and women over the age of 16. Variations of the latter in terms of age groups and the resident/worker status have been tried but data limitations restricted the potential of these approaches. This is discussed in more detail in a later section.

Summary statistics for the educational/skill groups used in the analysis are presented in Table 5-2. The APS variable used classifies the qualifications of the individuals to 7 broad categories, corresponding to the National Vocational Qualification levels structure (NVQ). NVQs are work-related, competence based qualifications that reflect the skills and knowledge of the individuals. There is a correspondence of the

various academic and vocational qualifications that exist in UK to NVQ level equivalent (see Appendix A). This way individuals are classified in five broad educational groups, ranked here in descending order: 'level 4 and above', 'level 3', 'level 2', 'below level 2' and 'no qualifications'. Then there is a sixth group that contains individuals who have acquired 'trade apprenticeships'. It is conveniently placed between NVQ level 2 and 3, although its specific nature will caution on easy conclusions when comparisons are discussed in the next section. Finally, the seventh group consists of those with 'other qualifications'. This group includes qualifications that cannot be classified in any other group, many of which are non-accredited foreign qualifications (roughly 44% of those with 'other qualifications' are foreign born).

The employment rate for the whole sample of 291,547 men is 84.0%. As expected, there is a rising pattern for the employment rate as we move up the educational ladder. The 'no qualifications group' has the lowest employment rate at 60.9%, while the 'level 4+' group has the highest at 92.8%.

Spatial level examined

The analysis is conducted for two different spatial levels, local authorities (LAs) and travel-to-work-areas (TTWAs). The finest geographical detail available at the dataset is for Local Authorities, which are administrative units. Dropping the City of London due to small sample sizes (17 observations), there are 406 local authorities in Britain. The average sample size of an LA is 235 males and the standard deviation 189

(median 124 males). For all individuals in our sample, there is information on the local authority of their residence and also the local authority of their workplace if they are employed.

As it was discussed earlier in the empirical strategy, we would like to control for commuting when examining the 'local employment chances'. Since there are many individuals who happen to live in one area and work in another, I repeat the analysis for an alternative geographical disaggregation, the 'travel-to-work-areas'. TTWAs are defined in such a way by the Office for National Statistics so that most workers living in an area also work in the same area (75%) and most people who work in an area also live there (75%). The algorithm that constructs the TTWAs applies also a minimum threshold of working age population of 3,500. Nevertheless, many especially those that refer to the city metropolitan areas are quite larger than that, with London and the surrounding area forming one TTWA which represents 15.5% of the total population in 2006. TTWAs correspond to the best definition of self-contained local labour markets we can get of.

ONS has defined 243 TTWAs for UK using information from the 2001 Census. Since our analysis excludes Northern Ireland, we are left with 232 TTWAs that cover Britain. Information on TTWAs is not available in the APS dataset and therefore we have to construct a mapping of the LAs to TTWAs. Since some LAs correspond to more than one TTWA, the approach followed was to simply allocate an LA to the TTWA that makes up the largest share of it. This way some TTWAs are lost and we end up with 186 'customised TTWAs'. Although we lose some detail, the definition is still valid to a large extent and the bulk of their resident population also work

within the same area. For simplicity, we refer to our customised set of areas as 'TTWAs'.

Distribution of HC

The category 'NVQ level 4 or above' is quite broad and includes both higher education and further education. The subcategory that refers only to the higher education is considered for the variable of interest *HC* so that we capture only the top educated. Then *HC* is the share of degree holders in the local area and changes across areas and years.

Considering its distribution for the 406 LAs in 2006, the median area had 16.9% of men and women over 16 years old with a degree. The standard deviation of *HC* across areas is 7.5%. The top 1% of areas have a share of degree holders above 42.9% and the bottom 1% of the areas a share below 6.1%. Table 5-3 presents broadly similar figures for the full set of 1,118 LAs over the three year period. Regarding the 186 customised TTWAs in 2006, the share of degree holders for the median area was 16.1%. The standard deviation of *HC* across areas was 5.2%. The lowest percentile is below that for the LAs and stands at 2.5%. Similarly, the top percentile for *HC* is 32.8%, which is about ten percentage points below the one for LAs.

Probit model results- educated residents of the area

The empirical strategy that was presented earlier aims to inform on the impact of the presence of educated individuals on the local employment chances. In a nutshell, I try to get meaningful results by considering two different versions of the variable of interest, one with the share of educated residents and one with educated workers. Secondly, the impact of the local human capital on the different educational groups of the locality is considered. Thirdly, we attempt to capture the 'local employment chances' by refining the sample and/or using TTWAs.

Table 5-4 presents probit estimates for males residing in 406 local authorities of Britain between 2004-6. The probability of employment status of a working age male is examined by a probit model that includes the share of degree holders in the local area (*HC*) and a number of personal controls. The controls used are a full set of dummies for 5-year age bands, for the number of children, for the educational level, marital status and whether foreign born. Year dummies are included to account for the cycles of the national economy. In all econometric specifications of the analysis, the standard errors are corrected for the grouped nature of the data (area-year clusters).

Column 1 shows the probit model results for all individuals in the simple model specification (i). It is shown that higher shares of degree holders in a locality are associated with higher employment probability for the local residents. I report the elasticity of the employment probability with respect to the share of degree holders at the sample mean to facilitate interpretation. For the simple model (i) the elasticity is

positive and significant at the 5% significant level albeit of a small magnitude. Column 2 adds regional dummies to the specification as in the model specification (ii). Both the magnitude of the elasticity and its significance rise substantially. The regional dummies capture time invariant regional characteristics that affect local employment chances. The variable of interest *HC* varies across local authorities and thus captures within regions variation of the levels of *HC*.

Nevertheless, when a specification with area dummies rather than regional ones is examined the coefficient of the share of degree holders becomes insignificant. The area dummies capture all the variation and render *HC* insignificant. This is not the case when the sample is restricted to the no qualifications groups. The simple and the regional dummies specifications give positive significant results for the coefficient of *HC*, with small elasticities around 0.054 and 0.075 respectively (Columns 4, 5). These elasticities are almost four times higher than the respective one for the whole sample. Furthermore, the specification that controls for model area effects now gives strongly positive significant results (Col.6). This specification controls for time-invariant unobserved area characteristics. Essentially the identification arises from changes in the shares of the degree holders in the area over time and how it affects the employment probability of the residents of the area. Since there are 406 LAs over 3 years, the identification for *HC* comes from 1218 effective values (in this specific case 1215 since a local authority is dropped from the sample as it predicts success perfectly). The elasticity rises now to 0.131 and is significant at the 1% level. Finally, we exclude from the sample residents who commute to other local areas for work. Then in the model (ii), the dependent variable gets the value 0 if the resident is inactive/unemployed and 1 if he works in the same area. The elasticity remains at the

same level and its significance is reduced but still significant at the 5% level (Col.7). This is our preferred specification for this study.

Table 5-5 presents results of the preferred probit specification for samples of the different educational groups. The no qualifications group has the elasticity with the highest magnitude than all other groups. 'Level 2' and 'Level 3' have also significicant coefficients for the coefficient *HC*, although the elasticity is negative and of smaller magnitude. It is not straightforward to interpret these negative elasticities. The most intuitive account could be that middle-skilled individuals compete for the same jobs with the degree holders and therefore face adverse employment prospects from a rise in the supply of the latter group. The remaining educational groups give insignificant results. The strong positive elasticity for the no qualifications group is consistent with the consumer demand story. A rise in educated residents in a locality boosts the demand for local low skill services and thus positively affects the local employment chances of males with no qualifications.

Tables 5-6 and 5-7 present results for the same analysis on my customised travel-to-work-areas. TTWAs are the closest we can get to local labour markets and therefore more suitable for this analysis. The results in Table 5-6 are qualitatively the same with the results for LAs (Table 5-4), albeit the elasticities and the significance levels are much stronger. This is the case for both sets of estimates, of the whole sample and of the no qualifications group. Our preferred specification that excludes the commuters (Col.7) gives a 0.212 elasticity of employment probability of the low-skilled men with respect to the share of degree holders, which is significant at the 1% level. In Table 5-7 the signs of the elasticities for the various educational groups are

the same with Table 5-5 (except for 'Trade Apprenticeships'). However, this time the coefficients of *HC* are insignificant for all other groups except for the 'no qualifications' one.

Probit model results- educated workers of the area

The analysis above examines how the share of educated *residents* in a local area impacts on the employment chances of men in the same locality. We have tried a similar analysis replacing the variable of interest *HC* with the share of high skill *workers* in the local area. Now *HC* stands for the share of 'managers and senior officials' out of the employed workforce that work in the local area. This is the top occupational group in terms of skill out of the 9 major groups of the ONS standard occupational classification (SOC2000) and includes 'corporate managers' and 'managers and proprietors in agriculture and services' (see Table 5-3 for its distribution over areas and years).

Table 5-8 presents the results of the analysis for different educational groups with *HC* varying in the local authority level. The elasticity for the no qualifications group is significant positive as with the educated residents' specification (see Table 5-5 for comparison). However, there are now three other educational groups with significant positive elasticities. The 'below level 2' and 'level 2' qualification group exhibit elasticities of 0.100 and 0.069 respectively. The highest skill group ('level 4+') has a low elasticity of 0.036, which is still significant positive. According to our empirical strategy, the impact of skilled workers on the local employment chances would

inform predominantly on the production complementarities and/or productivity spillovers accounts. What is striking is that the elasticities for 'level 2' and 'level 3' that were both significant negative have now changed to significant positive and to zero respectively. The 'below level 2' and 'level 4+' groups have also changed from close to zero to significant positive. These results could be attributed to productivity spillovers raising the productivity and demand for these groups. Production complementarities reinforce this effect for the low skill groups and this might explain that the elasticities are stronger as we move down the educational ladder. However as discussed earlier, managers might still consume at the local area of their workplace (e.g. at lunch breaks) and therefore the results might capture a consumer demand effect as well. More research is needed to shed light in this area.

When similar workplace analysis is conducted at the TTWA level (Table 5-9), the coefficients do not change much compared to the local authority level. The mid-low and lower skill groups increase slightly their elasticities; though the no qualifications group elasticity is now weakly significant. Remarkably, the elasticity of the 'NVQ level 4+' now drops to zero, which is puzzling. An initial suggestion could be that supply side effects might apply to this broader labour market level and where not applicable to the local authority level before. Of course, further investigation would be useful to inform on this issue.

Let's try now to summarise our empirical findings through the prism of the empirical strategy proposed earlier. When the share of educated residents is considered, then we get a strong positive impact on local employment chances of the low skilled. The effect on the local employment chances of the other groups is either insignificant or

significant negative. These results are consistent with the consumer demand hypothesis that the presence of high educated, high income individuals in a locality boosts the demand for local low skill services. On the other hand, when the share of skilled workers is used, the results suggest the simultaneous effect of production complementarities and productivity spillovers. Nevertheless, a caveat arises due to the difficulty of successfully isolating the consumption demand and the production function mechanisms as discussed in the empirical strategy.

Robustness checks

Finally, time varying area characteristics are added to the econometric specification (ii) for the no qualification group as additional controls. The specifications include either the unemployment rate or the inactivity rate in the locality (see Table 5-3 for their distribution over areas-years). The unemployment rate is measured as the claimant count rate of unemployment benefits in the local area. The data is provided by Job Centre Plus unemployment offices and since it is administrative it is exclusive. The inactivity rate is calculated as the percentage of the individuals who do not work or actively seek job in the local area (so that to meet the criteria of ILO definition 'unemployed') out of the working age population. The results are shown in Tables 5-10 and 5-11. These results should be viewed in juxtaposition with the respective results without the time varying area characteristics; columns 5 to 7 of Table 5-4 for LAs and columns 5 to 7 of Table 5-6 for TTWAs. Both the unemployment and the inactivity rate have negative coefficients as expected and reduce the employment chances of males in the locality. In the specification that has regional dummies, the

unemployment rate has positive significant elasticity while it renders the *HC* effect insignificant (Column 1/Table 5-10). Since regional dummies are included, the unemployment rate captures the within regions variation and reflects the general demand conditions in the LA. However, when area dummies are included, the unemployment rate is insignificant and the share of degree holders *HC* retains its significance (Columns 3 & 5). This is consistent with the well documented fact of unemployment persistence over time. The results are similar for TTWAs as with LAs, although for TTWAs the share of degree holders remains significant at the regional effects specification (Table 5-11). We now turn our attention to the specifications with inactivity rate as an additional control. The elasticities of the employment probability with respect to inactivity rate are much stronger than earlier with the unemployment rate and remain significant in both regional and area fixed effects specifications. They also have a greater impact in reducing the *HC* elasticities. The reduction in the *HC* elasticities is less profound in the TTWAs specifications compared to the LAs.

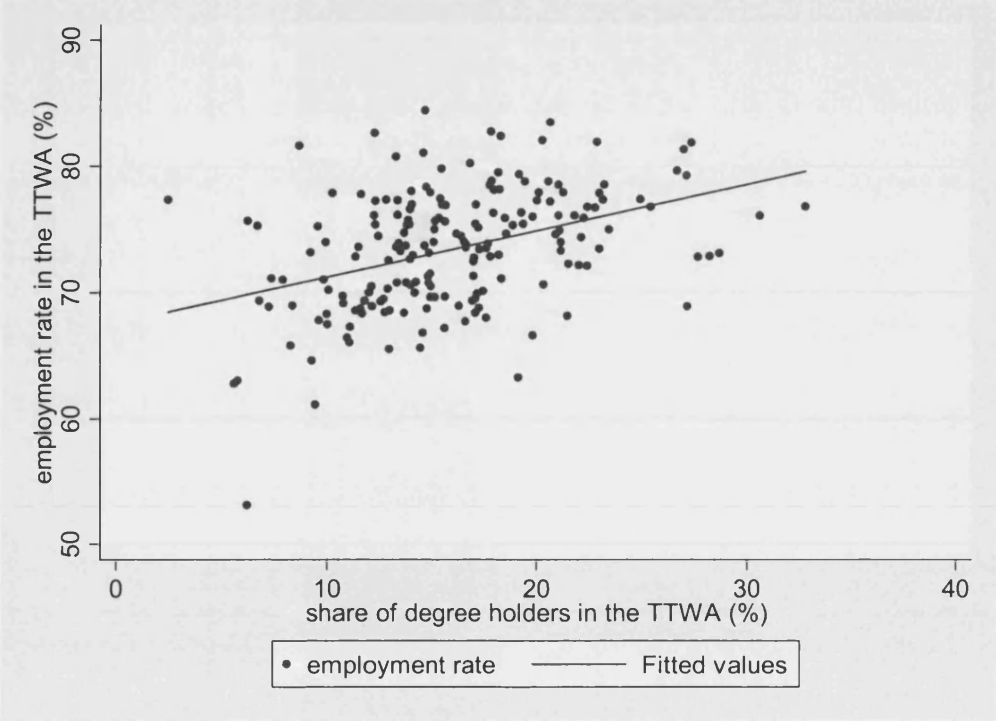
5.4. Concluding remarks

This paper examines how high human capital in a locality affects the local employment chances of individuals. A probit model is used to examine how the employment probability of otherwise similar working age males is affected by the share of degree holders in the local area. Different econometric specifications are employed in order to shed light on the positive association found and its possible causes. The paper discusses three main accounts, referring to the consumption

demand, the productivity spillovers and production complementarities. Furthermore, it presents an empirical strategy to capture their effect. The analysis is repeated for different educational groups and for two different spatial scales, Local Authorities and customised travel-to-work-areas. Additionally, the share of the high skilled is investigated at both residence-based and workplace-based level. When the share of high skill residents is considered, then I get a strong positive impact on local employment chances of men with no qualifications. The effect on the local employment chances of the other groups is either insignificant or significant negative. These results are consistent with the consumer demand hypothesis that the presence of high educated, high income individuals in a locality boosts the demand for local low skill services. On the other hand, when the share of high skilled workers is used, the results hint on possible simultaneous effect of production complementarities and productivity spillovers. However, a caveat arises due to the difficulty of successfully isolating the consumption demand and the production function mechanisms as discussed in the empirical strategy. The result that appears more robust across all the econometric specifications employed is that the elasticity of the employment probability with respect to the share of the high skilled in the local area is stronger for the no qualifications group. The elasticity is 0.212 in the econometric specification that examines the share of degree holder residents in the travel-to-work area. In that respect, further research would be needed to disentangle between the consumption demand account and the production complementarities that both appear to feed into this effect.

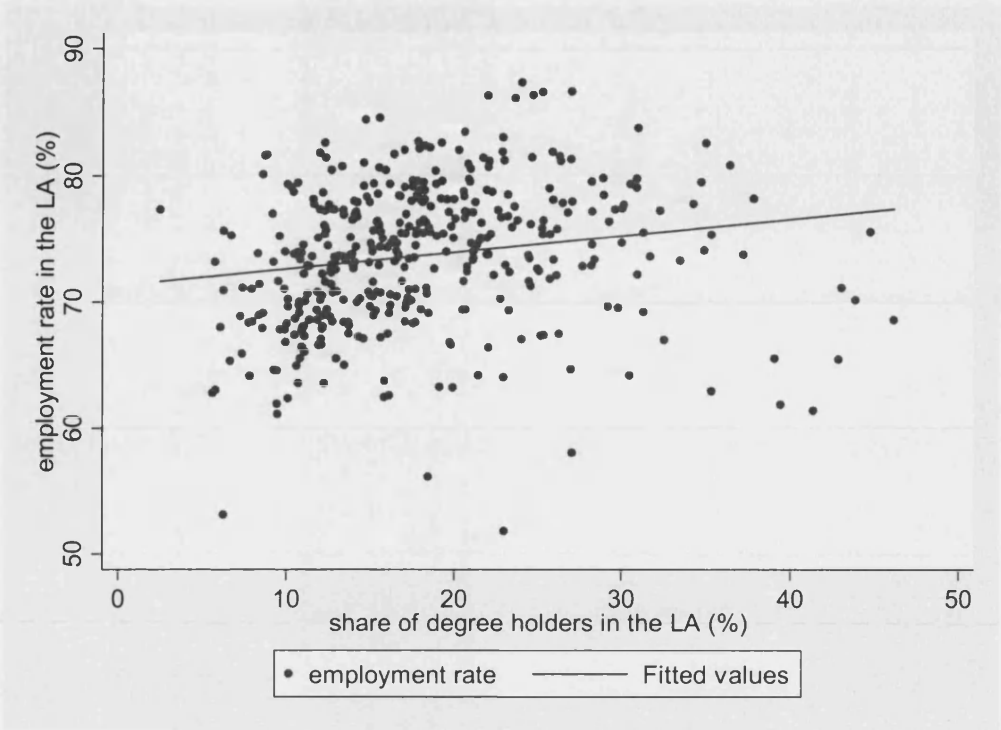
5.5. FIGURES

Figure 5-1. Association between employment rate of working age population and share of degree holders in the travel-to-work-area



Source: APS, 2006

Figure 5-2. Association between employment rate of working age population and share of degree holders in Local Authority



Source: APS, 2006

5.6. TABLES

Table 5-1. Synopsis of the three accounts that are examined in the study

	Mechanism	Local manifestation	Impacts on
Consumption story	Consumption	Residence area	Low skilled
Production complementarities	Production	Workplace area	Low skilled
Productivity spillovers	Production	Workplace area	All

Note: This table is similar to Table 2-2 but reflects also the discussion in Section 5.2 on the area of manifestation of each of the accounts.

Table 5-2. Employment rates for the different educational groups (2004-6)

Educational Group	Sample size	Employment rate %
All working age males	291,547	84.0
No qualifications	41,544	60.9
Below level2	35,399	82.1
Level 2	36,195	85.1
Trade apprenticeships	31,306	85.9
Level 3	46,287	88.6
Level 4+	76,119	92.8
Other qualifications	24,697	82.4

Source: APS
See Appendix A for detailed description of educational groups.

Table 5-3. Distributions of time-varying area characteristics for 2004-6

Variable/ Spatial level	Mean	Standard deviation	1%	50%	99%
LAs (406x3=1,118 effective obs.)					
Different HC definitions:					
% Share of:					
degree holders	17.4	7.3	5.7	15.9	41.4
managers & senior officials	14.3	3.6	7.0	13.8	24.3
Controls used:					
Claimant count rate %	2.1	1.1	0.6	1.8	5.2
Inactivity rate %	37.0	4.8	25.9	37.1	48.5
TTWAs (186x3=558 effective obs.)					
Different HC definitions:					
% Share of:					
degree holders	15.5	5.1	5.5	14.8	28.7
managers & senior officials	13.7	3.0	7.0	13.4	22.1
Controls used:					
Claimant count rate %	2.1	0.9	0.7	2	4.7
Inactivity rate %	38.0	4.4	27.9	38.2	50.1

Source: APS

1. 'Share of degree holders' in the local area refers to the share of individuals who have a qualification equivalent to first degree or NVQ Level 5 (see Appendix A relevantly).

2. 'Managers and senior officials' is the top occupational group in terms of skill out of the 9 major groups of the ONS standard occupational classification (SOC2000) and includes 'corporate managers' and 'managers and proprietors in agriculture and services' (APS data extracted from NOMIS).

3. The unemployment rate is measured as the claimant count rate of unemployment benefits in the local area (Job Centre Plus data provided by NOMIS).

4. The inactivity rate is calculated as the percentage of the individuals who do not work and are not 'unemployed' according to the ILO definition ("currently not working but willing and able to work for pay, currently available to work, and have actively searched for work") out of the total working age population of the local area.

Table 5-4. Probit model for Local Authorities (Residence Analysis)

Probit specification	ALL MALES Simple	Region dummies	Area dumm.	NO QUALIFICATIONS Simple	Region dumm.	Area dumm.	Area dumm. Live+ Work
	1	2	3	4	5	6	7
HC (elasticity)	**0.010**	**0.017**	**-0.004**	**0.054**	**0.075**	**0.131**	**0.131**
t-stat	2.34	3.98	-0.51	3.04	4.22	2.90	2.02
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Region dummies		*YES*			*YES*		
Area dummies			*YES*			*YES*	*YES*
N	291,530	291,530	291,530	41,544	41,544	41,523	33,573
Pseudo R^2	0.14	0.15	0.16	0.07	0.09	0.11	0.12

Source: APS
Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies and qualification dummies (for all males sample).
HC presents the elasticity of employment probability with respect to *HC*.
T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-5. Educational groups- Local Authorities (Residence Analysis)

Probit specification	No qual.	Below level 2	Level 2	Trade Apprent.	Level 3	Level 4+	Other qual.
HC (elasticity)	**0.131**	**0.011**	**-0.095**	**0.041**	**-0.088**	**0.009**	**-0.091**
t-stat	2.02	0.23	-2.33	0.92	-2.52	0.43	-1.57
Area dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
N	33,573	24,225	23,892	21,322	28,938	38,733	16,407
Pseudo R^2	0.12	0.14	0.11	0.15	0.13	0.11	0.12

Source: APS
Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies.
HC presents the elasticity of employment probability with respect to *HC*.
T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-6. Probit model for TTWAs (Residence Analysis)

Probit specification	ALL Simple	ALL Region dummies	ALL Area dumm.	NO QUALIFICATIONS Simple	NO QUALIFICATIONS Region dumm.	NO QUALIFICATIONS Area dumm.	NO QUALIFICATIONS Area dumm. Live+ Work
	1	2	3	4	5	6	7
HC (elasticity)	**0.022**	**0.024**	**-0.007**	**0.087**	**0.086**	**0.216**	**0.212**
t-stat	2.32	4.57	-0.52	2.77	3.75	3.30	2.76
Year Dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
Region dummies		*YES*			*YES*		
Area dummies			*YES*			*YES*	*YES*
N	291,547	291,547	291,547	41,544	41,544	41,544	37,020
Pseudo R^2	0.14	0.15	0.15	0.07	0.08	0.09	0.09

Source: APS
Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies and qualification dummies (for all males sample).
HC presents the elasticity of employment probability with respect to *HC*.
T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-7. Educational Groups- TTWAs (Residence Analysis)

Probit specification	No qual.	Below level 2	Level 2	Trade Apprent.	Level 3	Level 4+	Other qual.
HC (elasticity)	**0.212**	**0.023**	**-0.046**	**-0.046**	**-0.047**	**0.003**	**-0.091**
t-stat	2.76	0.5	-1.01	-1.03	-1.37	0.18	-1.54
Area dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
N	37,020	28,835	28,946	25,164	35,653	53,646	20,326
Pseudo R^2	0.09	0.11	0.08	0.13	0.10	0.09	0.08

Source: APS
Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies.
HC presents the elasticity of employment probability with respect to *HC*.
T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-8. Educational groups- Local Authorities (Workplace Analysis) (Elasticities for the Share of 'managers and senior officials')

Probit specification	No qual.	Below level 2	Level 2	Trade Apprent.	Level 3	Level 4+	Other qual.
HC (elasticity)	**0.123**	**0.100**	**0.069**	**-0.003**	**-0.007**	**0.036**	**0.066**
t-stat	2.37	2.91	2.12	-0.10	-0.29	2.02	1.39
Area dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
N	33,573	24,225	23,892	21,322	28,938	38,733	16,407
Pseudo R^2	0.12	0.14	0.11	0.15	0.13	0.11	0.12

Source: APS

Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies. T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-9. Educational Groups- TTWAs (Workplace Analysis)

Probit specification	No qual.	Below level 2	Level 2	Trade Apprent.	Level 3	Level 4+	Other qual.
HC (elasticity)	**0.131**	**0.130**	**0.096**	**0.031**	**-0.021**	**-0.006**	**0.055**
	1.91	3.33	2.78	0.94	-0.69	-0.32	1.06
Area dummies	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*	*YES*
N	37,020	28,835	28,946	25,164	35,653	53,646	20,326
Pseudo R^2	0.09	0.11	0.08	0.13	0.10	0.09	0.08

Source: APS

Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies.

HC presents the elasticity of employment probability with respect to *HC*.

T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-10. Robustness Checks for the 'no qualifications group'- LAs (Residence analysis)

Probit specification	Region dummies	Region dummies	Area dummies	Area dummies	Area dummies **Live+ Work**	Area dummies **Live+ Work**
	1	2	3	4	5	6
HC (elasticity)	**0.009**	**0.020**	**0.131**	**0.117**	**0.132**	**0.117**
t-stat	0.58	1.08	2.89	2.59	2.03	1.80
Unemployment rate (elasticity)	**-0.168**		**-0.007**		**0.032**	
t-stat	-12.38		-0.12		0.39	
Inactivity rate (elasticity)		**-0.517**		**-0.319**		**-0.323**
t-stat		-9.44		-3.13		-2.24
Region dummies	*YES*	*YES*				
Area dummies			*YES*	*YES*	*YES*	*YES*
N	41,523	41,523	41,523	41,523	33,573	33,573
Pseudo R^2	0.09	0.09	0.11	0.11	0.12	0.12

Source: APS

Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies. T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

Table 5-11. Robustness Checks for the 'no qualifications group'- TTWAs analysis

Probit specification	Region dummies	Region dummies	Area dummies	Area dummies	Area dummies **Live+ Work**	Area dummies **Live+ Work**
HC (elasticity)	**0.052**	**0.014**	**0.212**	**0.207**	**0.209**	**0.200**
t-stat	2.06	0.58	3.23	3.20	2.71	2.62
Unemployment rate (elasticity)	**-0.157**		**-0.040**		**-0.024**	
t-stat	-6.30		-0.53		-0.27	
Inactivity rate (elasticity)		**-0.564**		**-0.382**		**-0.488**
t-stat		-7.22		-2.58		-2.74
Region dummies	*YES*	*YES*				
Area dummies			*YES*	*YES*	*YES*	*YES*
N	41,544	41,544	41,544	41,544	37,020	37,020
Pseudo R^2	0.09	0.09	0.09	0.09	0.09	0.09

Source: APS

Each column is a separate probit specification. The employment probability of the individual is examined by a probit model that includes the share of degree holders in the local area and a number of personal controls. Personal controls: 5 year age band dummies, number of children dummies, year dummies. T-statistics reported. St.Errors adjusted for the grouped nature of the data (area-year level).

5.7. APPENDIX A

This study uses the APS variable "levqua2", derived from variable "hiqual5" that reports the individual's highest qualification attained. Below the different qualifications that individuals self-report are shown. Table 5-13 follows that shows the correspondence of the different qualifications to 7 broader educational groups that are equivalent to National Vocational Qualification Level. NVQs are work-related, competence based qualifications that reflect the skills and knowledge of the individuals. This correspondence is taken from the derived variable "levqua2" of the APS. The category 'level 4 or above' is quite broad and includes both higher education and further education. The subcategory that refers only to the 'higher education' is considered for the variable of interest *HC* so that I capture only the top educated.

Table 5-12. Variable HIQUAL5 - Highest qualification/trade apprenticeship

(1) Higher degree
(2) NVQ level 5
(3) First degree/foundation degree
(4) Other degree
(5) NVQ level 4
(6) Diploma in higher education
(7) HNC/HND/BTEC higher etc
(8) Teaching – further education
(9) Teaching – secondary education
(10) Teaching – primary education
(11) Teaching – foundation stage
(12) Teaching – level not stated
(13) Nursing etc
(14) RSA higher diploma
(15) Other higher education below degree
(16) NVQ level 3
(17) Advanced Welsh Baccalaureate
(18) International Baccalaureate
(19) GNVQ/GSVQ advanced
(20) A-level or equivalent
(21) RSA advanced diploma
(22) OND/ONC/BTEC/SCOTVEC National etc
(23) City & Guilds Advanced Craft/Part 1
(24) Scottish 6 year certificate/CSYS
(25) SCE higher or equivalent
(26) Access qualifications
(27) AS-level or equivalent
(28) Trade apprenticeship
(29) NVQ level 2 or equivalent
(30) Intermediate Welsh Baccalaureate
(31) GNVQ/GSVQ intermediate
(32) RSA diploma
(33) City & Guilds Craft/Part 2
(34) BTEC/SCOTVEC First or General diploma etc
(35) O-level, GCSE grade A*-C or equivalent
(36) NVQ level 1 or equivalent
(37) GNVQ/GSVQ foundation level
(38) CSE below grade 1, GCSE below grade C
(39) BTEC/SCOTVEC First or General certificate
(40) SCOTVEC modules
(41) RSA other
(42) City & Guilds foundation/Part 1
(43) YT/YTP certificate
(44) Key skills qualification
(45) Basic skills qualification
(46) Entry level qualification
(47) Other qualification
(48) No qualifications
(49) Don't know

Table 5-13. Mapping of different qualifications to NVQ Level equivalent
(i.e. mapping of 'hiqual5' to 'levqua2')

Level 4 or above		Level 3	Trade Apprent.	Level 2	Below level 2	No qual.	Other qual.
Higher Education *(HC)*	Further Education						
1-4	5-15	16-23 25-27	28	20, 24, 25, 27 29-35	35-46	48	24 47

CHAPTER 6: Conclusion

As seen in Chapter 2, the rise in earnings inequality in the recent decades has sparked an interesting research literature that tries to document the inequality trends and offer potential explanations. In the relevant debate, most economists have looked to the skill biased technological explanation as the most likely explanation. Although the predictions of SBTC match the observed employment and wage growth at the upper-tail of the wage distribution, they fail to account for the employment and/or wage growth at the lower-tail of the distribution that has been documented. In that respect, economists have turned to employment polarisation explanations as more adequate to explain what is happening at the lower-tail of the wage distribution. An important question that has not received as much attention in the literature is the spatial dimension of this employment polarisation. This thesis attempted to shed some light in this area and offered an empirical examination for Britain. Empirical analysis at the regional level in Chapter 3 of this thesis finds that polarisation does not arise nationally in Britain because some regions get all the 'nice' jobs and some regions all the 'bad'. Rather, a polarising pattern in job creation exists even for the prosperous South and particularly for London.

The thesis offers a discussion of why a spatially differentiated pattern might arise and looks at the relevant evidence. In particular, I argue that the spatially differentiated polarisation might come through a consumer demand mechanism, along with other explanations. In Chapters 4 and 5, I find that low-skill individuals' wages and

employment chances in an area are positively associated with changes in the human capital of the area (measured by occupational structure or qualifications). Besides the consumer demand story, this association might also arise from local human capital spillover effects that come from the production side, like production complementarities and productivity spillovers. Since the association is found to be stronger for the low-skill group compared to the other skill groups, I argue that there is some preliminary evidence that consumer demand effects might have contributed to it. Supply side explanations like migration might have been able to explain the rise in employment of low-paid occupations but it would be harder to reconcile with the positive wage effects found for these occupations.

Let's see now in a bit more detail the results found from the three empirical papers of the thesis. Chapter 3 examined the spatial patterns of employment polarisation and found that a polarising pattern arises in all regions of Britain to some extent in the 1990s although it is much stronger in London. London appears unique in terms of the magnitude of its polarisation. The booming London economy generates not only more jobs for bankers, accountants, IT consultants and managers but also for cleaners, waiters/waitresses, sales assistants and care workers. Quadratic regressions are employed in order to assess the strength of polarisation and whether any sub-national patterns that emerge are statistically significant. Looking into various subgroups of the labour force has revealed interesting results. The distinct London polarising pattern is not driven from a rise of low-paid part-time jobs in London as job polarisation is found to emerge even for full-time workers. While polarisation in women's employment emerges in London, this is not the case for the rest of Britain where a J-shape rather than a U-shape is observed. Of note, unlike the rest of Britain,

London is not found to experience employment polarisation in the period mid70s to late 1980s. In that respect, there is some evidence here in favour of Hamnet's (2003) account that London, unlike the other global cities, might have experienced professionalisation rather than polarisation. Buck et al. (2003) point to international migration as a possible factor that might explain the differential path of London compared to the other global cities like New York in the 1980s vis-à-vis the 1990s. Recently Wills et al. (2008) have theorised the rise of a new migrant division of labour in London, where migrant workers are increasingly employed in low-skilled low-paid jobs in the London capital. The role of migration is an interesting research question and warrants further investigation. Chapter 3 also investigated areas that are predominantly metropolitan and did not find an urban specific account for employment polarisation. Therefore in an empirical analysis that is mainly descriptive and was applied to the regional level, the main result found was that London was distinct in terms of the magnitude of its employment polarisation.

As said, a consumer demand hypothesis was put forward as a potential explanation for spatially differentiated patterns of polarisation. Let's briefly recall its formulation as discussed in Chapter 2. Cities attract growing numbers of high-skilled individuals due to the higher returns to human capital and/or the local urban amenities they offer. High-skilled individuals spend more on local non-traded low-skilled services that are income and education elastic. As these service jobs are labour intensive and automation has not managed to replace human labour in their performance, labour demand for the relevant low-skill service occupations will increase. Therefore, the growth of low-skilled jobs will differ across urban areas depending on the growth of

high-skilled individuals. It may be expected that urban areas or regions with faster growing human capital will experience greater polarisation.

Since London indeed experienced the fastest growth in the high-skilled sector in the 1990s, the results in Chapter 3 might be in line with the consumer demand hypothesis. However, stronger polarisation was not found for the former metropolitan counties and this casts some doubt in the approach. The analysis in that chapter examined aggregate occupational trends in the 1990s at regional level and did not account for any individual or area heterogeneity. Looking at smaller spatial units like travel-to-work-areas or local authorities and controlling for some individual and area heterogeneity, Chapters 4 and 5 attempted to find if there is any remaining association between growing human capital in an area and individuals' labour market outcomes in terms of wages and employment chances. The positive association found was suggested to arise theoretically from the consumer demand hypothesis and/or production side explanations. The empirical findings of the chapters might indicate some preliminary evidence for the existence of consumer demand linkages. A possible reason why this was not evident in the aggregate regional level apart from London might have to do with the complexity of processes and the different factors that operate. In other words, these processes might operate at the more localised level but they might not give rise to aggregate employment and wage trends in the regional level. For example, labour force composition changes might play an effect. Regarding London, its global cities specific characteristics and the boom of financial and business services along the lines of the Sassen (1991) account might mean that consumer demand linkages are nurtured and amplified in such a complex urban setting, giving rise to a distinct strong polarisation pattern.

There is a recent literature in economics that is US focused and considers the spatial dimension of polarisation- Manning, 2004; Mazzolari and Ragusa, 2007; Autor and Dorn, 2008. The first two contributions are based in the increased outsourcing of non-traded housework activities by the high-skilled that generates increased demand for local low-skilled workers, while the latter lies on the rapid productivity growth in the goods sector due to technological shocks along the lines of the ALM routinisation hypothesis. All three approaches use panel data information at the aggregate level for US states/commuting zones and years. The empirical part of this thesis contributes to this strand of research offering an analysis for Britain using microdata as well. In terms of theory, although the consumer demand hypothesis as outlined in Chapter 2 mainly focused on demand for consumer and personal services being income and/or education elastic (as in Clark, 1957; Baumol, 1967), it can be seen as complementary to the outsourcing of housework activities account (as in Manning, 2004; Mazzolari and Ragusa, 2007). The empirical analysis of the thesis does not differentiate between the two and this could be an area for future research.

But let's see now in brief the main empirical results of Chapters 4 and 5. Chapter 4 applies wage regressions to ASHE individual microdata for the period 1997-2001 to examine how individuals' wages change in response to changes in the area's occupational structure. In order to discern consumer demand from the production related accounts, I examine the differential wage impact of the share of top-paid occupation workers on workers of different occupational quintiles defined by pay. My preferred econometric specification includes individual-area fixed effects so that identification arises only from stayers of an area and not movers. I find that one

percentage point rise in the share of high-paid occupation workers in the travel-to-work-area, increases the hourly wages of low-paid occupational quintile workers by roughly 0.23%. The association is not significant for the middle-skill occupational quintiles, while it is weakly significant for the high-skilled one. According to the empirical strategy employed in the chapter, this positive association for the low-skilled might be argued to be the simultaneous product of production complementarities and consumer demand effects. Controlling for within-sectors effects, the wage impact remains positive that is argued to come from consumer demand or production complementarities between sectors. Restricting the analysis to a subset of low-paid occupational category that refer to personal and consumer service occupations (like cleaners, carers and waiters/waitresses) and appear less prone to production complementarities effects, gives even stronger results in line with the consumer demand explanation. When using urban interacted effects, it appears that between-sector wage effects from higher human capital are stronger in the urban areas compared to the rural ones, while within-sector wage effects are similar in urban and rural areas.

Chapter 5 examines individual labour market outcomes in terms of employment using APS microdata for the period 2004-2006. A probit model is used to examine how the employment probability of otherwise similar working age males is associated with the population share of high-skilled in the local area. The variable of interest now refers to the educational composition of the area and stands for the share of degree holders. Area dummies are used to control for atemporal unobserved area characteristics that might be correlated with both the variable of interest and the error term. Information is available both for the residence and the workplace of an individual (if employed)

and this facilitates the analysis by investigating the share of high-skilled at both levels. The empirical strategy argues that the residence based analysis is more informative for the consumer demand effects while the workplace-based analysis for the production complementarities and productivity spillovers. It is found that the share of degree holders residents has a strong positive impact on the employment chances of men with no qualifications The impact on the local employment chances of the other educational groups was either nil or negative. These results are in line with the consumer demand hypothesis. When the share of high-skilled workers ('managers and senior officials') who work in the local area is used, the impact is positive not only for the low-skilled but also for other middle-skill groups and this might be the result of possible simultaneous effect of production complementarities and productivity spillovers. Although there is this finding that hints on the existence of production related spillover effects, it should still be treated with caution and deserves further investigation. Nevertheless, the most robust result across all the econometric specifications applied is that the elasticity of the employment probability with respect to the share of the high skilled in the local area is stronger for the no qualifications group (0.13 for the local authority analysis and 0.21 for the travel-to-work-area level one).

There are some caveats in the empirical strategy that has been followed. Firstly, the variable of interest, the share of high-skilled individuals in the local area (whether defined in terms of qualifications or occupational structure) might be endogenously determined. In that respect, reverse causality might arise since high-skilled individuals might move to the areas with growing wages or employment prospects. When applying my analysis for different skill groups, this issue is particularly

relevant for the high skilled. The positive association in the labour market outcomes of the high-skilled individuals and the share of high-skilled in the local area might come from an agglomeration side account or from a reverse direction mechanism that suggests that high-skilled workers move to areas where they would receive faster growing wages. In any of these two cases, the positive association of labour market outcomes of the low-skilled and growing human capital in the local area might be thought as a human capital concentration benefit for the low-skilled. It is less clear from theory why a reverse direction would apply in the case of the low-skilled, i.e. high-skilled individuals migrating to areas where the wages of the low-skilled grow faster, but cannot be excluded and therefore a formal treatment with an instrumental variable approach would be informative.

Another possibility is that there might also be some missing variable that simultaneously affects local wages and/or employment chances and at the same time attracts high-skilled workers. This missing variable would have to be a time-varying area characteristic since the econometric specification controlled for atemporal area characteristics. Adding time-varying area controls like the local unemployment rate have not altered my main results. In future research, additional area controls could be included both at the local authorities and at the travel-to-work-area levels. Time varying area controls that address migration and the supply side of the labour market would enhance the analysis. The literature on human capital migration in UK (Molho, 1986; Gordon, 1995; Faggian et al., 2007; Faggian and McCann, 2008) and international migration (Dustmann et al. 2005; Gordon et al., 2007) might be useful in that respect.

Acknowledging the above endogeneity concerns, I tended to focus more on the comparison of the coefficient of the low-skill group compared to the other skill groups and did not discuss much the results for the other skill-groups, particularly the high-skilled one. In order to deal with the endogeneity issue, I tried to find suitable instrumental variables, as discussed in Chapter 4. It has been difficult to find time varying area instruments that are associated with the share of the high-skilled in the local area but are not affecting directly the individuals' labour market outcomes. Experimenting with the number of first degree qualifications awarded in the travel-to-work-area in the previous year appeared to be a weak instrument and was not of much use. Future research would look for suitable time-variant instrumental variables.

Let's try to look briefly the policy relevance of this research. The thesis has found evidence that employment polarisation emerged in the regions of Britain in the 1990s and that it was particularly strong for London. This might have contributed to the rise in inequality in the regions and London's high inequality that has been documented elsewhere (GLA, 2002). There is also research on the extent of 'working poverty' in UK, which shows that the share of poor households with a member in work has increased by ten percentage points in the last decade (Cooke and Lawton, 2008). Polarisation and the growth of low-paid jobs that this thesis has found might be one of the contributing factors to this rise in the numbers of the working poor. If the policy makers are interested in tackling working poverty, policies are needed that ensure that the pay of people who do the least remunerated jobs is sufficient to provide them a decent living standard and lift them out of poverty. In that sense, the UK national minimum wage (NMW) that was introduced in 1999 and presented a lower limit for workers earnings was a crucial step in the right direction. Subsequent

research on the NMW has shown partial success in supporting working poor households and making work pay, while not having any significant impact on employment (Dickens and Manning, 2003, 2004).

Furthermore, the more polarised pattern for London's employment growth may suggest special action for it. Then public policy needs to address the possible adverse outcomes of polarising cities and regions, such as poverty, child poverty and crime. An important step in addressing London's low-pay sector has been the introduction of 'London's living wage' that currently stands at £7.45 per hour (30% above the current NMW of £5.73). Given the high-cost of living in London, the increased offer of low-pay jobs and the lack of affordable childcare, the former Mayor of London launched the living wage scheme in 2005 that presents the lower threshold in hourly wage that would ensure a decent living standard in the British capital. It does not have any mandatory status for employers, but successful campaigning by trade unions, citizens movements like the 'London's citizens' and media exposure led many large employers including Universities, public sector organisations and large City banks to adopt it in their attempt to build a more ethical image. There has been a long history of campaigning and struggle initiated by the London Citizens as early as 2001 that compelled the Mayor of London to finally form a London Living Wage Unit in 2005 that sets and updates the London Living Wage (Wills, 2004). However, the extent of the London living wage has been limited so far and there have been calls for the introduction of a higher minimum wage for London compared to the other regions that will be mandatory (e.g. Cooke and Lawton, 2008; see also Martin and Sunley's (2003) discussion on regionally differentiated minimum wage). Depending also on

the interests of the policy makers and the society's stance towards relative inequality, redistributive polices could be used that mitigate the rise in inequality.

Given the large number of jobs offered in the low-pay sector in British regions and particularly London, a premature conclusion could be drawn that employment prospects are promising for low-skilled people. There are two reasons why this might not be true. Firstly, it ignores the supply side and that there might also be increased competition for theses jobs. Indeed, looking the ratio of residents with low qualifications to the number of low-skilled jobs as a crude measure of the relative competition, it is found over 3 in London (GOR) compared to an average of 2.3 for the other regions (GLA Economics, 2007; HM Treasury, 2007). Increased commuting from the other regions and growing international migration although it increases the effective labour supply, it might mean that low-skill residents would have to go to training and education courses in order to effectively compete for these jobs. And this is the second reason why employment prospects do not necessarily have to be promising. The middle-qualified workers who cannot find a job in the shrinking middle-paid occupations might increasingly look for jobs who require lower skills, climbing down on the educational ladder- a process Gordon (1999) calls 'bumping down'. Then it might be no surprise that people with no qualifications suffer particularly by low employment rates since for this group the employment rate in Britain is around 20 percentage points less than each of the other educational groups[23]. Education and training even at the basic level is particularly important to equip people with the necessary skills to effectively compete in the labour market. In that respect the government efforts in improving educational attainment at schools

[23] In Table 5-2 that looks into working age males' employment rate, it was shown to be 61% for the no qualifications group while for all other educational groups rates were above 82%.

and the targeting of basic skills and offer of courses for people whose English is not the first language by regional skills boards like the London Skills and Employment Board are in the right direction forward.

The findings of this thesis regarding a possible human capital agglomeration benefit for the low-skilled might be of policy relevance as well. If consumer demand or local human capital spillovers take place, then low-skilled people wages and employment prospects benefit from being in areas with growing numbers of high-skilled people. In that respect, there might be some justification for policies that encourage cohabitation of people of different skill backgrounds and try to attract high-income, high-educated people in impoverished areas. Of course, the situation is much more complex and this thesis does not claim to have covered this issue. Longitudinal research on life chances of people in communities with different socio-economic mix and cost-benefit evaluation of creating and sustaining socially mixed communities are important tools to this end. Therefore, it is the literature in neighbourhood effects and mixed communities that needs to be taken into account to construct an informed opinion and policy on the issue (amongst others for UK: Gibbons, 2002; Buck and Gordon, 2004; Cheshire, Gibbons and Gordon, 2008).

To conclude, this thesis has tried to shed some light on the spatial dimension of polarisation and offered an empirical investigation for Britain. Although there has been some research for US looking into spatially differentiated patterns of polarisation, the author is not aware of similar analysis for UK. Occupational polarisation is found to emerge in all regions to some extent and is most evident in London. Labour market outcomes of low-skilled individuals are found to be

positively associated with growing human capital in the local area. It is suggested that this might arise from consumer demand linkages or local human capital spillover effects. Further research would be useful in informing on the impact of these accounts. Regarding consumer demand linkages, analysis on the expenditure patterns of households of different income or skill level in different regions or local areas might be an informative way forward and will be left for future research.

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