Labour markets and agglomeration: The urban rat race in South Africa

By

D von Fintel[1], W.F Krugell[2] & A Wolhuter[3]

Abstract

This paper examines the possible existence of an urban rat race in South Africa by investigating the relationship between agglomeration and hours worked. We follow the work of Rosenthal and Strange (2002), who find evidence that industrious professionals are drawn to agglomerated areas and that agglomeration increases the number of hours worked, thus supporting Akerlof's (1976) theory of an urban rat race. Using cross-sectional data from the September 2007 Quarterly Labour Force Survey, OLS regressions were run using the log of hours worked as dependent variable and different worker attributes, dummy variables and agglomeration variables as predictors in order to determine the relationship between agglomeration and hours worked in the urban areas of South Africa. Findings from the empirical analysis yield atypical results concerning the relationship between worker characteristics, agglomeration and hours worked in South Africa. Overall, results indicate that a work-spreading effect occurs amongst professional workers, whilst non-professional workers appear to work the longest hours in South Africa.

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[1] Department of Economics, Stellenbosch University
[2] School of Economics, North-West University, Potchefstroom Campus. E-mail: waldo.krugell@nwu.ac.za
[3] South African Reserve Bank

LABOUR MARKETS AND AGGLOMERATION: THE URBAN RAT RACE IN SOUTH AFRICA

1.   Introduction

Increasing urbanisation throughout the 20th century has resulted in approximately 49 per cent of the global population living in urban areas (World Bank, 2009). Rapid expansions of metropolitan areas continue to occur internationally, including South Africa. Estimates are that 90 per cent of all future population growth will manifest in cities (SACN, 2006). No country has achieved significant increases in economic growth or productivity without the growth of its cities, therefore the economic importance of cities cannot be overlooked (World Bank, 2009; Quigley, 2009). The 2009 World Development Report further states that location is fundamental when considering a nation's welfare (World Bank, 2009). Developed countries have prospered economically by successfully modernising their economic geography, which involves developing greater density, urbanisation and agglomeration.

The importance of examining the influence of agglomeration in labour markets is stated in Rosenthal and Strange (2003), where it is claimed that agglomeration provides an incentive for workers to be more productive, therefore increasing labour supply. This increase in agglomerated labour supply could instigate a certain amount of rivalry between workers in cities, producing an urban rat race amongst workers. A number of studies have addressed an array of different aspects involving labour markets in South Africa, however, little has been said regarding agglomeration and its influence on economic productivity amongst industries and labour markets. Kingdon and Knight (2004, 2007) review potential causes for persistent unemployment and long run trends within the South African labour market. Inability on the part of the labour market to absorb current labour supply or to increase employment opportunities inhibits reductions in unemployment. Furthermore, the continuous mismatch between labour supply and labour demand diminishes real wages in both the formal and the informal sectors. Accelerated divergence between growth in the labour force and growth in formal sector employment, combined with an unprofitable informal sector worsens the outcomes of the South African labour market.

This paper contributes to the existing South African literature on urban labour economics by examining agglomeration in South African cities and labour markets whilst investigating whether an urban rat race exists. This is accomplished by evaluating the relationship between spatial agglomeration and working conditions in the South African labour market, measured as the total amount of hours worked by professional workers. The paper is structured as follows: Section 2 presents a literature review on labour markets and agglomeration. Section 3 examines literature on the South African labour market in particular. Section 4 provides an empirical analysis of the urban rat race model in South Africa. Section 5 presents the conclusions drawn and recommendations are made.

2.   Agglomeration Economies

2.1   Sources of Agglomeration Economies

When examining economic activity in terms of the location and distribution thereof, one must differentiate between specialisation, concentration and agglomeration. Firstly, geographic specialisation analyses a country or region's economic structure, asking if the location's share of an industry is larger compared to the share of other locations in that particular industry. Specialisation may lead to cost reductions within the production process and further enhance opportunities for input sharing amongst

firms. Concentration and agglomeration both consider location as the concentration of economic activity and are concerned with location across space in a particular industry, whilst agglomeration involves location across space in a specific sector as a whole (Brakman, Garretsen & van Marrewijk, 2009:187).

The purpose of this section is to elaborate on these three factors leading to clustering in urban areas, explaining why industries agglomerate and attract industrious workers. Focusing on agglomeration economies, this chapter will analyse the extent and sources of urban increasing returns, evaluate Marshallian externalities[4] and discuss competition within industries by urban employees. In particular, competitive or rivalrous behaviour between professional workers in terms of the increased amount of hours worked in urban areas is examined. In order to adequately comprehend the concept of urban development - why cities exist and why industries and workers continue to concentrate in cities - it is essential to understand the different sources of urban increasing returns. Agglomeration has a snowball effect caused by industries benefiting from higher density, greater diversity of activities and increased specialisation. Geographic concentration of industries may be due to profit-maximising location decisions made by each entity. Industries located in areas of dense economic activity are able to enjoy the benefits of localisation and urbanisation economies.

Various benefits may accrue to firms and workers due to reduced spatial proximity. These include rent-seeking and home market effects as well as urban consumption opportunities. This paper focuses on the sources of agglomerative spillovers suggested by Alfred Marshall (1920), which include knowledge spillovers, labour market pooling and input sharing. Dense urban areas produce large pools of skilled labour, which can benefit from sharing a variety of inputs. These concepts will be elaborated upon in the subsections that follow.

2.1.1 Input Sharing

Cities reflect the demand for density through the creation of a concentrated environment where industries and workers continually agglomerate. The choice to live in these dense urban areas is offset by an overall reduction in distance (World Bank, 2009:134). Metropolitan areas create a natural market for firms to situate themselves in areas with an influential amount of workers and infrastructure, hoping to serve a large local market from a large plant with low transport costs. Industries in dense metropolitan areas tend to be larger and agglomerate to areas with large concentrations of other firms in similar industries.

Therefore, competing firms geographically concentrated in metropolitan areas locate close to one another in order to share access to firms which specialise in providing intermediate inputs, making production more efficient (Fujita, Krugman & Venables, 1999). Intermediate inputs are produced by one firm and utilised by another in its production process. By accumulating pools of skilled labour and suppliers of specialised intermediate inputs, better employer-employee and buyer-seller matching is constructed. Due to the large variety and quantity of inputs, the probability of finding a suitable match increases, thereby improving the quality of matches made, making it easier to find suitable inputs in urban areas.

For example, a clothing manufacturer may be able to purchase large amounts of buttons required in its production process from a nearby company specialising in manufacturing of buttons. Average costs are

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[4] According to Marshall (1920), externalities arise from agglomeration and the formation of clusters in a particular area. These include 1) the availability and sharing of specialised input services, 2) accumulating human capital which culminate into a highly specialised labour force and 3) spillovers of knowledge between individuals and firms.

reduced in concentrated areas due to increasing returns to scale and reduced transport costs (Rosenthal & Strange, 2004:15). Similar firms that agglomerate in urban areas are able to share communal technology, product markets and services as well as the particular type of skilled labour required.

2.1.2 Labour Market Pooling

Labour market pooling occurs as a result of agglomeration, allowing a better match between employer requirement and worker skills. Larger numbers of specialised labour inputs are readily available as a result of locating near other firms in the same industry. Industry clusters therefore have the ability to transform from unsuccessful to successful firms by interchanging workers in the large supply pool of employees working in the urban labour market. Labour market pooling can be defined in terms of localisation and urbanisation economies. Firstly, an urbanisation effect of labour market pooling states that workers are supposed to be better matched in cities. Secondly, the localisation effect of labour market pooling emphasises better matching of workers in concentrations of industries (Rosenthal & Strange, 2004:32). For example, a movie producer in need of an actor can swiftly hire the most appropriate candidate due to the large amount of talented actors situated within a city, thus improving the flow of workers between firms. Likewise, an actor living in the city could find a new position within the city without having to relocate. This benefits both employer and employee by reducing search costs and, improves the quality of labour matching in large cities.

Helsley and Strange (1990) introduce a formal model of labour matching, making several assumptions regarding workers and firms:

- There is variation in each worker's unique skills;

- Firms enter the market by choosing a product to produce and requiring certain skills from employees;

- Workers carry the cost of reducing the gap between workers' skills and the skills required by firms;

- There exists competition between workers as each firm offers a wage premium to workers who meet the skill requirements. Workers accept the position offering the highest net income, equal to wage minus the training costs required to reduce the skills gap.

The general conclusion of this model is that the presence of a large workforce attracts firms to metropolitan areas that compete for workers. This increases skill matches and reduces training costs, thereby increasing workers' net wage. A higher wage acts as an incentive for workers to live in cities, equalising the attraction between workers' skills and firms' requirements (O'Sullivan, 2007:56).

2.1.3 Knowledge Spillovers

Marshall (1920) observes that industry agglomeration continues to accelerate partly because reduced proximity between firms allows workers to learn from each other. As a result, the spatial concentration of workers reduces the costs of producing knowledge through efficiency of innovation, learning, competition and transmission of ideas and education. Knowledgeable people may not be evenly distributed geographically. Therefore, cities facilitate the generation, diffusion and accumulation of knowledge by bringing together a large amount of workers and increasing the speed of interaction and productivity, particularly in technologically advanced industries (Annez & Buckley, 2009:14). These productivity-enhancing benefits within urban labour markets are termed as knowledge spillover effects.

The production of knowledge may be difficult to measure empirically. Therefore, the term 'knowledge spillovers' may be more suited to defining the concept.

Earlier work by Glaeser (1999) focuses on the increased accumulation of human capital in cities, explaining that urban areas present the ideal backdrop for workers to specialise within their range of acquired skills, using and sharing knowledge to become more productive. The model further predicts that the size of urban agglomerations may expand as the knowledge of workers, in particular young people, becomes shared and accumulated within cities.

The facilitation of knowledge between individuals therefore becomes a noteworthy determinant when considering city formation. Dumais *et al.* (2002) explain that knowledge spillovers cause significant increases in new firm start-ups, particularly in industries which employ graduates. Results further suggest that knowledge spillovers indeed determine the locations of firms in innovative industries or new forms of organisation (Duranton, 2008:115). Rosenthal and Strange (2002) conclude that knowledge-oriented industries tend to form clusters of innovative activity, and that spillovers are localised, attenuating over a few miles. Knowledge spillovers are also associated with labour mobility. Duranton (2008:5), states that knowledge flows are caused by the flow of people between industries, and that the technological innovation of industries is associated with the movements of skilled workers between firms.

Fu (2006) studies the quality and localisation of human capital stock within the Boston metropolitan area, claiming that individual workers learn from others in the same industry via the depth of human capital stock, specialisation and peer competition effects (Marshallian labour market externalities), diversity of labour markets in terms of occupations (Jacobs labour market externalities) and thickness of the local labour market. These four mechanisms capture the dimensions of knowledge which contribute to human capital formation and increased productivity. Findings indicate that these four attributes contribute significantly to sharing and learning from occupational and industrial workers, and that knowledge spillovers are relatively localised within an urban region.

2.2   The Urban Rat Race

2.2.1   Introduction

Literature on the relationship between agglomeration and work hours has been limited. Akerlof (1976) originated the principles of working conditions in the rat race model. The rat race model makes use of occupational and working conditions as indicators for selecting workers. In this particular analogy of the rat race, workers who are willing to work at faster speeds and in difficult conditions, are identified as being more creative or superior. In predicting the behaviour of individuals certain indicators are identified, for example race, gender, education and occupation. Akerlof (1976:603) states that obtaining an education or being able to work in more harsh conditions is positively correlated with increased productivity. A characteristic of the rat-race equilibrium is that individuals will be willing to work longer hours than the utility maximising level given the wage. Working hours and future career advancement have also been linked to wages and promotions received by employees working in competitive conditions. Gicheva (2009:31) concurs with Akerlof and explains that workers who are fast learners, willing and able to endure long working hours will be the first to be promoted or receive increased wage offers.

Continuing on Akerlof's theory that hostile working conditions lead to overwork, Landers *et al.* (1996) examine the organisational setting of law firms and the willingness and ability of employees to work undesirable hours in order to become eligible for promotion. Law firms introduce certain mechanisms

which aim to screen out those workers who tend to work shorter hours. This mechanism requires willing employees to work long hours, indicating a measure of the productivity of workers.

A model of adverse selection of work hours for large law firms is developed along with the income sharing and promotion characteristics of law firms inspiring associates to work long hours. Using survey data from two large law firms in large urban areas, evidence was found that at a number of law firm associates were working too many hours. Similarly, Bell and Freeman (2001) analyse the relation between hours worked and earnings inequality in the United States and Germany respectively. Using cross-sectional and longitudinal data on hours worked and earnings by occupation from 1985 to 1995 within the United States and Germany, Bell and Freeman attempt to prove that a country with greater earnings inequality will generate more hours worked amongst employees. In conclusion, Bell and Freeman (2001:200) find evidence that inequality in earnings causes employees to increase the amount of hours worked particularly within the United States where there is a greater inequality in salaries than in Germany. Studies further indicate that a reward for increased effort and extended working hours improve the probability of being promoted.

Rosenthal and Strange (2004) observe that cities indeed attract professional workers who apply more effort at all ages. When the rewards for hard work become great and a certain amount of rivalry exists, young professionals may exert more effort in terms of hours worked than experienced professionals. The following section will explain three different theoretical arguments which illustrate that agglomeration leads to harder work: signalling, thick markets, and productivity and selection.

2.2.2   Signalling

In terms of the effect of competition on labour supply in cities, Spence (1973) was instrumental in developing a model which illustrates the concept of job market signalling in game theory stating that investment in education by employees is assumed to be a signal for prospective employers. Employers are initially uncertain of the productive capabilities workers may or may not possess when hiring. Personal attributes of employees, such as gender or race, are not generally alterable and are therefore termed indices. However, aspects such as education have the ability to be improved upon or revised in order to alter employers' beliefs regarding workers' productive capabilities. Characteristics which can be manipulated are defined as signals. Wagner (2010) explains the model of job market signalling between worker and employer. The worker is familiar with his/her own ability level, however the employer is not. Together with his/her ability, the worker invests in education, which implies that certain costs are involved.

The employer hires and pays a worker an allocated wage, according to ability and level of education. Rosenthal and Strange (2004) explain that worker utility is a function of the difference between wages, hours worked and individual ability. In the absence of rivalrous behaviour, no signalling would be required causing workers to only work the amount of hours relative to individual ability. In the spirit of Akerlof (1976) and Spence (1973), workers and firms participate in the following game. Firstly, workers demand a certain level of wage for a predetermined amount of work hours. Secondly, firms accept or reject these offers. Rivalry amongst employees now starts to present itself as firms will be required to pay individual workers accordingly. In this model, there are two types of workers, namely high-type and low-type workers. Because each type of worker sends different signals, separate equilibriums are a feature of this game. Within the separated equilibriums, the single-crossing condition plays an important role. This requires that the high-type worker has to consistently send the 'high' signal, so that when the low-type worker is indifferent between the high and the low signal, he/she can be correctly

identified as low-type. Therefore the signal-crossing condition links signals to types, guaranteeing that high-types send higher signals in equilibrium.

In order to establish whether or not the high-type worker only prefers working a high number of hours, one needs to find the amount of hours worked where he/she may be indifferent between being perceived as low-type or working harder to be identified as high-type (Rosenthal and Strange, 2003:12). Firstly differencing the amount of hours worked in order to find the marginal cost of additional hours is referred to as the Spence-Mirrlees condition.

Additional features of this theory of separate equilibriums are that rivalry is the key element which enables the high-type worker to work longer hours, and working longer hours is the manner in which the workers' type is signalled. It is, however, also possible to find certain productivity levels whereby high-type workers would increase effort, but from which low-type workers would shirk. To conclude, the signalling model established the effect of competition on labour supply in cities. Findings by Rosenthal and Strange (2002, 2003) concur with Akerlof's (1976) rat race framework which states that workers are heterogeneous in type and that high-type workers will increase their productivity and willingness to work long hours in order to signal their ability.

2.2.3   Thick Markets

Following Rosenthal and Strange's (2002) discussion of the urban rat race model, another concept linked to agglomeration and leading to concentrations of more productive workers is termed 'thick market externalities'. According to Gan and Li (2004), matching probability and rivalry amongst workers is increased in denser areas with thicker labour markets. Instead of there only being two workers in the signalling model, the number of workers becomes unlimited, implying that as the number of firms increase the amount of available candidates increases, thereby lowering unemployment in these areas. In a particular market, each institution has a minimum quality requirement with better institutions in need of a higher requirement in terms of its minimum standard of quality. The candidate with the highest quality adhering to the minimum standards of the firm will be chosen. Therefore, in specialised labour markets, market thickness plays a significant role.

Rosenthal and Strange (2002:12) introduce two results of thick market externalities which characterise the urban rat race. Firstly, the probability of workers' signalling through working longer hours will increase as the number of competitive workers increases. Because there are more workers in agglomerated areas with similar levels of productivity, the chance of signalling their types will increase significantly. Secondly, the amount of working hours employees are willing to work increases as the number of competitive workers increase, implying that overwork becomes more apparent as worker populations concentrate in urban areas.

This signalling of skills may be more rigorous for certain occupations within geographical concentrations. The location choice of workers can signal their productivity to employers, with high-skill workers using locational agglomeration to separate themselves from low-types. Furthermore, Rosenthal and Strange (2002) ask whether employees are competing only with those in similar occupations or rather with all workers within the labour market. This introduces a localisation effect within a given occupation where workers may increase hours worked, thus distinguishing them from their fellow employees.

2.2.4   Productivity and Selection

Rosenthal and Strange (2002) suggest two additional factors explaining the relationship between labour market size and worker effort, namely productivity between workers and selection effects. In terms of productivity differences between firms, those with a higher productivity level tend to agglomerate substantially and disperse less compared to lower productivity firms (Baldwin & Okubo, 2005:2). This self-selection of firms, choosing to locate in urban areas, occurs due to the greater benefits gained from high productivity. Melitz and Ottaviano (2008) describe competition and average productivity between firms in heterogeneous markets. They conclude that increased aggregate productivity forces less productive firms to exit as a result of severe competition between firms. Feyrer (2007) examines the association between workforce demographics and productivity in OECD and low-income countries from 1960 to 1990. Findings indicate that productivity differences between rich and poor nations are associated with the age structures of the working population.

Moreover, results suggest that a significant proportion of 40-year-old workers work an increased amount of hours. Timmer *et al.* (2007) explain that productivity levels differ between high and low type workers. A labour composition effect is discussed where a shift in the share of hours worked between low- and high-skilled workers may lead to greater growth in labour services which exceeds growth in total hours worked.

The spatial selection of firms and workers is derived from the productivity effect, stating that workers relocate to areas where firms are most productive. Saito and Gopinath (2009) assess the contribution industries make toward productivity through self-selection and agglomeration. Using data on plants in the Chilean food manufacturing industry, the contribution of agglomeration economies to productivity is estimated whilst controlling for self-selection. Results indicate that high-productivity plants indeed locate in industrially agglomerated regions that boast a diversified and large market structure. In comparing the relative contribution of agglomeration economies and self-selection with regional productivity, findings indicate that industry self-selection offsets agglomeration economies when enhanced productivity levels are present.

Rosenthal and Strange (2004) observe that cities indeed attract professional workers who exert more effort at all ages. When the rewards for hard work become great and a certain amount of rivalry exists, young professionals may exert more effort in terms of hours worked than experienced professionals. Theoretical arguments which illustrate that agglomeration leads to harder work and increased competitiveness were introduced namely 1) signalling, stating that investment in education by employees is assumed to be a signal to prospective employers, 2) thick markets, implying that as the number of firms increases, a specialised urban labour market causes the number of suitable candidates to increase and, 3) productivity and selection, where between firms, those with a higher productivity level tend to agglomerate substantially and disperse less compared to lower productivity firms (Baldwin & Okubo, 2005:2). Spatial selection of firms and workers is derived from the productivity effect, stating that workers relocate to areas where firms are most productive. Rosenthal and Strange (2004) find a significant relationship between agglomeration in urban areas and the intensity of work provided by professional workers. As stated in Chapter 1, the South African literature investigating the agglomeration of economic geography and movements within the labour market is limited. This paper attempts to examine the competitive scope of agglomeration economies in the urban areas of South Africa. The question is: do agglomerated urban areas increase competition, and thus productivity, by attracting skilled workers?

3. Overview of the South African Labour Market

Characterised by sharp segmentation, high levels of unemployment and an insignificant non-agricultural informal sector, the South African labour market persistently creates controversy (Kingdon and Knight, 2007). Before evaluating employment and unemployment issues, an overview of key labour market indicators within the South African labour market is required. Using data from the September 2009 Labour Force Survey, Table 3.1 illustrates that the working population aged between 15 and 64 years has increased by 92 000 or 0.3 per cent from Q2:2009 to Q3:2009 and by 371 000 or 1.2 per cent from Q3:2008 to Q3:2009. According to Barker (2007:2), the total labour force or total supply of labour is defined as "people over age 15, presenting their labour for the production of goods and services, despite being employed or not". This constitutes workers in the formal and informal sectors, self-employed persons or employees and the unemployed. Table 3.1 indicates that the labour force decreased by 418 000 or 2.39 per cent from Q2:2009 to Q3:2009 and decreased annually by 700 000 or 3.94 per cent from Q3:2008 to Q3:2009.

Table3.1: South African labour market: key indicators

	Jul/Sep 2008	Apr/Jun 2009	Jul/Sep 2009	Quarter change	% Change	Annual change	% Change
	Thousands						
Population 15-64 yrs	30,801	31,080	31,172	92	0.30%	371	1.20%
Labour force	17,777	17,495	17,077	-418	-2.39%	-700	-3.94%
Employed	13,655	13,369	12,885	-484	-3.62%	-770	-5.64%
Formal sector (non-agricultural)	9,439	9,356	9,073	-283	-3.02%	-366	-3.88%
Informal sector (non-agricultural)	2,175	2,109	1,993	-116	-5.50%	-182	-8.37%
Agriculture	767	710	653	-57	-8.03%	-114	-14.86%
Private households	1,274	1,194	1,166	-28	-2.35%	-108	-8.48%
Unemployed	4,122	4,125	4,192	67	1.62%	70	1.70%
Not economically active	13,024	13,585	14,095	510	3.75%	1,071	8.22%
Discouraged work-seekers	1,071	1,517	1,632	115	7.58%	561	52.38%
Other (not economically active)	11,953	12,068	12,463	395	3.27%	510	4.27%
Rates (%)							
Unemployment rate	23.2	23.6	24.5	1.0		1.4	
Employed/population ratio	44.3	43.0	41.3	-1.7		-3.0	
Labour force participation rate	57.7	56.3	54.8	-1.5		-2.9	

Source: Quarterly Labour Force Survey September 2009.

Quarterly employment change fell by 484 000 or 3.62 per cent from Q2:2009 to Q3:2009 with annual formal sector employment rates declining by 366 000 or 3.88 per cent during Q3:2008 and Q3:2009. However, total unemployment increased by 70 000 or 1.70 per cent annually from Q3:2008 to Q3:2009, whilst the number of discouraged workers – persons who desire to work but are not actively seeking employment – increased substantially on an annual basis by 52.38 per cent. Unemployment increased from 23.2 per cent to 24.5 per cent between Q3:2008 and Q3:2009.

Recent contributors to the literature regarding labour market issues in South Africa are Naudè (2008), Magruder (2009), Hofmeyr (2010) and Haveman and Kearney (2010).

Naudè (2008), proposes that there exists a spatial mismatch in the South African metropolitan labour market which produces significant differences in unemployment levels amongst black and white populations due to 1) inefficient suburbanisation of working opportunities, 2) the lack of residential integration whilst areas closer to central business districts are growing in residential populations and 3) unemployment amongst blacks as a result of distance from city centre, though this does not hold for white population groups. Discrimination, lack of adequate information, residential integration and commuting costs contribute to considerable divergence in unemployment rates. The racial segregation of metropolitan areas during apartheid caused limited spatial access to jobs Furthermore, Naudè claims that unnatural residential patterns have caused a spatial mismatch between unemployment and population groups. The Spatial Mismatch Hypothesis (SMH) argues that the suburbanisation of economic activity within metropolitan areas has produced greater unemployment amongst low-skilled workers living in central business districts. Thus, while low-skill jobs are being created in suburban areas, low-skill workers remain situated in central city areas uninformed about these employment opportunities, thereby leading to increased unemployment. On the other hand, high-skill black households may be more able to move towards the employment opportunities, being less exposed to the spatial mismatch. In conclusion, evidence suggests that spatial restrictions related to mobility and the spatial structure within South African cities have had an impact on employment creation amongst black and white populations in metropolitan labour markets.

Magruder (2009) examines the effect of labour regulations on employment levels within large and small firms in South Africa. Due to strict labour market regulations and strong trade unionism, firms became reluctant to absorb labour supply, stimulating a climate of small-scale employment and high unemployment. Magruder explains that whilst there are a number of labour market regulations, the lack of employment growth in small firms of South Africa is a result of bargaining council systems. Within this system, trade unions may participate in bargaining councils, thereby extending agreements beyond only firms and workers represented at the council, making these agreements binding to all workers within an industry even if they do not participate in negotiations.

Magruder's (2009) estimated model includes a spatial dimension, assuming that whilst local labour markets are spatially continuous, bargaining council agreements are enforced in a spatially discontinuous way. In conclusion, Magruder (2009) finds that by using spatial fixed effects and assuming the spatial continuity of labour markets, bargaining councils are associated with approximately 8-14 per cent lower employment within a particular industry, 10-21 per cent higher wages and 7-15 per cent less employment in small firms. Furthermore, an additional setback within the informal sector is due to the relatively low numbers of employees at small firms in general. By not even being part of a trade union, small firms cannot begin to compete with large firms, unionised or not, which places South Africa's unemployment situation in an ever greater predicament.

Hofmeyr (2010) analyses the extent to which social networks influence workers in engaging in certain occupations which eventually become ethnic occupational niches. According to Hofmeyr (2010:107), an ethnic occupational niche is defined as 'the concentration and specialisation of members of an ethnic group in a particular occupational activity'. This occurrence is heightened by social networks facilitating the transmission of job-related behaviour between individuals and is believed to be a useful tool due to the significance that personal contact has within labour markets and the probability of securing a job. Hiring through social networks provides employers with a richer pool of applicants in terms of quality and size which results in the formation of ethnic niches. Individuals of the same niche continue to be informed of job opportunities whilst those who are not part of the niche remain excluded, causing ethnically segregated working environments. Using data from a 10 per cent sample of the 2001 Census, occupations in certain geographical areas are identified as niche or non-niche. Furthermore a linear

probability model is implemented in order to estimate the extent to which social networks influence the probability of niche employment in the manufacturing sector. Magisterial districts are indicative of the geographic area and language groups represent the respective ethnic niches. Hofmeyr's (2010) results identify corporate managers, general managers and other professionals as the three occupations with the most prominent incidence of ethnic niche employment. In terms of language groups, English speakers are dominant in these occupations, followed by Afrikaans speakers. Moreover, due to higher education levels and, to some extent the legacy of apartheid, high ranking positions are reserved for white South Africans, noted as highly skilled occupations. These occupations in which ethnic niches exist are also the highest paid, advantageous niches. On the other hand, traditional black language groups such as IsiZulu and IsiXhosa speakers are mostly in low-wage, low-skill occupations, classified as disadvantageous niches.

Hofmeyr (2010:128) concludes by verifying that social networks significantly influence the probability of being employed within a particular niche. Furthermore results indicate that, whilst traditional black language groups are concentrated in low-wage, low-skill, disadvantageous niches, English and Afrikaans speakers find themselves in concentrated groups of advantageous niches, boasting highly skilled, highly paid workers.

3.1   Hours Worked

The policy debate concerning working hours in the South African labour market has received much attention recently through a discussion on the impact of a legal reduction in the number of hours worked on employment and labour costs. The National Labour and Economic Development Institute (Naledi) launched a research project on hours of work in South Africa in an attempt to shed more light on the matter. Focusing on four sectors in South Africa, namely long-haul trucking, the metal sector, retail and gold mining, findings indicate that South Africans working in these industries log substantially longer hours than workers in the same industries in most other countries. In particular, employees classified as production workers work the longest hours in comparison to office workers, and this segmentation appears to take on a racial dimension. Reductions in working hours have been introduced in many countries including South Africa, where attempts have been made to implement a 40-hour working week in order to improve workers' welfare, increase employment opportunities, productivity and prevent excessive working hours (Barker, 2007:77).

In terms of legislation, the Basic Conditions of Employment Act (BCEA) 75 of 1997 was promulgated to improve labour market standards by regulating the working conditions of employees. The Act specifies the working time of employees in chapter 2 of the BCEA, stating that "employees must be arranged so as not to endanger their health and safety, keeping family responsibilities in mind" (BCEA, 1997:8). Basic conditions of employment with regards to ordinary working hours declare that employees may not work more than:

- Forty-five hours in any week;

- Nine hours in any day should the employee work five days or less in a week;

- Eight hours in any day should the employee work more than five days per week.

Agreements involving overtime must be negotiated, as employers may not demand employees to work more than:

- Three hours overtime a day;

- Ten hours overtime per week.

Wages should be calculated at one and one-half times the employee's ordinary wage. When ordinary daily hours of work are required to be extended, a written agreement should state that an employee may work for up to twelve hours per day without receiving overtime pay. Limits on working hours are not applicable to:

- Senior managers,

- Travelling sales personnel regulating their own hours of work,

- Employees working less than 24 hours per month for an employer,

- Workers receiving an annual salary of more than R115 572 (Department of Labour 2004), and

- Workers involved in emergency work.

Although appropriate limitations on working hours should be implemented by labour legislation, this does not necessitate increased employment but is rather found to have fuelled unemployment in South Africa (Barker, 2007:33).

Table 3.2 indicates the usual hours worked by the South African labour force in September 2009. 53 per cent of all employees worked between 40 and 45 hours per week in Q4:2009, whilst 30 per cent of all employees logged more than 45 hours per week in Q4:2009. More than half of the total female workers worked between 40 and 45 hours, with approximately one quarter working more than 45 hours per week in Q4:2009. 54 per cent of male workers recorded between 40 and 45 hours of work per week with 35 per cent of male employees registering more than 45 hours of work in one week during Q4:2009. Although these numbers have declined compared to previous quarters, a substantial number of workers are logging more hours than stipulated by labour legislation. This implies that working conditions of some employees require them to work longer hours, stimulating some sort of competitive or rivalrous environment and that exploitation of workers and their working conditions are still present despite labour legislation enforced to assist workers.

Oosthuizen and Goga (2007) investigate changes in the number of hours worked in South Africa between 2000 and 2005 using data from the Labour Force Surveys of 2000 and 2005 respectively. Findings show that formal sector, non-agricultural employees working 24 hours or more per month, earning more than R89 455 annually averaged 47.6 hours per week in 2000. During 2005, the average number of hours of work per week for employees earning the adjusted income cut-off of R115 572 per annum totalled 49.1, increasing by approximately an hour and a half (Oosthuizen & Goga, 2007:6). In terms of demographic characteristics, some interesting findings were made. With regards to race, it appears as though all citizens have increased the average hours worked from 2000 to 2005, with Africans working the longest hours (49.9), followed by Asians (47.3), Whites (46.3) and Coloureds (46.2) during 2005.

Table 3.2: South African labour force: Usual hours of work

	Jul-Sep 2008	Apr-Jun 2009	Jul-Sep 2009	Quarter change	% Change	Annual change	% Change
	Thousand	Thousand	Thousand	Thousand	Per cent	Thousand	Per cent
Working Hours							
Both genders	13655	13369	12885	-484	-3.6%	-770	-5.6%
< 15 hours per week	300	284	272	-12	-4.2%	-28	-9.3%
15-29 hours per week	811	843	812	-31	-3.7%	1	0.1%
30-39 hours per week	1,039	972	971	-1	-0.1%	-68	-6.5%
40-45 hours per week	6,965	7,187	6,864	-323	-4.5%	-101	-1.5%
> 45 hours per week	4,540	4,083	3,966	-117	-2.9%	-574	-12.6%
Female	6,034	5,973	5,782	-191	-3.2%	-252	-4.2%
< 15 hours per week	201	182	164	-18	-9.9%	-37	-18.4%
15-29 hours per week	550	566	543	-23	-4.1%	-7	-1.3%
30-39 hours per week	642	629	615	-14	-2.2%	-27	-4.2%
40-45 hours per week	3,011	3,110	3,009	-101	-3.2%	-2	-0.1%
> 45 hours per week	1630	1485	1451	-34	-2.3%	-179	-11.0%
Male	7621	7397	7102	-295	-4.0%	-519	-6.8%
< 15 hours per week	99	102	108	6	5.9%	9	9.1%
15-29 hours per week	261	277	269	-8	-2.9%	8	3.1%
30-39 hours per week	397	343	356	13	3.8%	-41	-10.3%
40-45 hours per week	3954	4077	3855	-222	-5.4%	-99	-2.5%
> 45 hours per week	2910	2598	2515	-83	-3.2%	-395	-13.6%

Source: Labour Force Survey, September 2009.

Differences in the number of hours worked differ considerably between male and female employees, however, male workers continued logging more working hours than females both in 2000 and in 2005. Males recorded an average of 50 hours' work in 2005, whilst females increased their average working hours in a week from 44.9 in 2000 to 46.8 in 2005. When combining race and gender, African males averaged the most hours per week (50.8) in 2005, followed by Asian and White males (48.3). African females worked the most amounts of hours per week (48.2) and White females logged the least amount of average hours in a week (44.5). Dividing average hours within different age categories indicates that, from 2000 to 2005, all ages groups increased the amount of hours worked. In 2005, employees aged between 25 to 34 years worked 1.5 hours more than in 2000 (from 48.1 to 49.6), whilst 35 to 44 year olds worked 1.2 hours extra per week (from 47.2 to 48.4).

Oosthuizen and Goga (2007) further analyse changes in the number of average hours worked between 2000 and 2005 in terms of education, wages, type of work, province, union membership, employment type, sector of work and occupation, as illustrated in Table 3.4. Findings indicate that workers with no education averaged the most hours per week in 2000 (51.7). During 2005, workers with incomplete general education training (GET) logged 50.2 hours per week and employees with completed GET's

worked 49.8 hours per week. More significant to this paper, degree-holders are found to work less than those with lower education levels (from 43.6 hours per week in 2000 to 42.8 hours per week in 2005). However, Oosthuizen and Goga also find that the proportion of degree-holders averaging more than 55 hours per week increased from 2000 to 2005.

In terms of geography, Oosthuizen and Goga (2007:17) measure average hours worked in the nine provinces of South Africa. Table 3.3 illustrates that Limpopo clocked an average of 52.6 hours per week, followed by Kwazulu-Natal, increasing by ten per cent from 47.5 hours per week in 2000 to 52 hours per week in 2005. Gauteng employees maintained an average of 47.6 working hours per week between 2000 and 2005, whilst the Western Cape clocked 46.2 hours per week on average.

Table 3.3: Average hours worked by province, 2000-2005

	2000	2005	Change	
Province			Hours	Per cent
Western Cape	45.6	46.2	0.60	1.32%
Eastern Cape	45.7	46.5	0.80	1.75%
Northern Cape	48.1	48.5	0.40	0.83%
Free State	47.8	48.1	0.30	0.63%
KZN	47.5	52.0	4.50	9.47%
North West	48.9	49.1	0.20	0.41%
Gauteng	47.6	47.6	0.00	0.00%
Mpumalanga	50.3	50.7	0.40	0.80%
Limpopo	50.2	52.6	2.40	4.78%

Source: Oosthuizen & Goga, 2007.

Furthermore, Oosthuizen and Goga (2007:21) divide mean hours worked amongst occupational categories and Table 3.3 shows that all professions increased the average amount of hours worked between 2000 and 2005. Professionals (includes technical and associate professionals) and managerial occupations, defined earlier as skilled workers, clocked fewer hours on average than semi-skilled (clerical, service, craft and trade, operators and assemblers) and unskilled (elementary) occupations.

Table 3.4: Average hours worked by occupation, 2000-2005

	2000	2005	Change	
Province			Hours	Per cent
Managerial	47.4	48.5	1.10	2.32%
Professional	43.6	44.3	0.70	1.61%
Clerical	44.7	45.4	0.70	1.57%
Service	52.2	53.8	1.60	3.07%
Craft and trade	48.2	49.1	0.90	1.87%
Operators and assemblers	50.1	51.7	1.60	3.19%
Elementary	47.5	48.8	1.30	2.74%

Source: Oosthuizen & Goga, 2007.

Table 3.4 further indicates that Service workers and Operators and assemblers, part of the semi-skilled occupations, logged the most hours per week in 2005, averaging 53.8 and 51.7 hours respectively. Oosthuizen and Goga (2007) conclude by stating that the average hours of formal sector non-agricultural workers experienced little change from 2000 to 2005 with regards to mean hours worked per week. Some significant increases in working hours were observed between 2000 and 2005, and findings indicate that government's attempts at introducing a 40-hour work week were unsuccessful during this period.

3.2   Urbanisation and Labour Market outcomes in South Africa

As stated previously in Section 3.1, the urban share of total population in South Africa is rising implying that urbanisation presents challenges, in particular for citizens concentrated in agglomerated areas searching for employment. Because of the significant increases in the concentrations of labour and capital in cities, the probability of finding employment opportunities in urban areas is far greater than in other areas, thereby drawing more people to live in cities and strengthening population density (SACN: 2006). Cities boasting greater economic activity therefore contribute to agglomeration and concentration by attracting industries. Industry agglomeration brings about an increase in the supply of workers who are willing to work, increasing productivity and the intensity of labour supplied. Socio-economic outcomes such as finding employment and increasing welfare may increase as a result of increasing urbanisation and concentration of workers.

A recent article by Haveman and Kearney (2010) establish a positive relationship between the probability of finding employment and the degree of urbanisation within a geographic location. Because employment opportunities are far greater within metropolitan areas, the probability for citizens to continually search for work in these areas is also improved. Using data from the 2005 Labour Force Survey and urbanisation data from Census 2001, a multinomial logit model is implemented. Demographic factors such as age, gender, population group, marital status, education and skills training are used to determine whether they increase the probability of being employed and living in more urbanised areas. Results show that the degree of urbanisation is positively related to an individual who is male, of working age (between 15 and 64), non-black, educated, working for a wage on a permanent basis and heading a small household. Haveman and Kearney (2010: 13) conclude that whilst the development of people in terms of skill and education is important, geographic location proves to be equally important in improving people's welfare.

4.   Empirical Analysis

Taking into account the variables examined in the study by Rosenthal and Strange (2002), this paper attempts to use similar variables to evaluate the relationship between agglomeration and working hours within South Africa. Data for the measurement of rat race effects are sourced from the September 2007 South African Labour Force Survey (LFS). Focusing on labour issues, the LFS provides measures of labour supply and input, employment, unemployment and the extent to which labour time and human resources are utilised. The levels of spatial disaggregation are the nine provinces, 44 district councils, six metropolitan municipalities and five cross-border district councils in South Africa (Stats SA: 2008). Following Rosenthal and Strange (2002), only full-time workers, defined as those working between 35 and 140 hours per week, are included. Of the 65 380 respondents participating in the September 2007 LFS, 2 286 workers are classified as full-time and adhere to the criteria required for this particular

analysis. Furthermore, workers are divided into two occupational groups, namely professional and non-professional workers. Professional workers include legislators, senior professionals, technical and managerial workers. Non-professional workers are classified as clerks, service workers, skilled agriculture, craft and trade workers and plant and machine operators. Elementary occupations and domestic workers are grouped under 'other' workers, falling outside the scope of this paper. Figure 1 illustrates the distribution of professional and non-professional employees within the 44 district councils, six metropolitan municipalities and five cross border district councils in South Africa. It appears as though a sizeable number of respondents of the 2007 September Labour Force Survey are defined as non-professional. The Cape Town, Ekurhuleni and Nelson Mandela metropolitan municipalities have large shares of non-professional workers with 60.24 per cent, 66.67 per cent and 50.31 per cent of the labour force reached by the LFS classified as non-professional.

District municipalities with more than 60 per cent of employees defined as non-professionals include the Eden district municipality (65 per cent), Lejweleputswa (67.12 per cent), Umzinyathi (62.50 per cent), Uthungulu (66.67 per cent), Ehlanzeni (66 per cent), Bojanala (70.37 per cent), Sedibeng district municipality (61.11 per cent) and Metsweding cross-border district municipality (62.07 per cent). Amongst the 44 district municipalities a number of jurisdictions have defined more than 60 per cent of workers as professional workers, namely Namakwa (60 per cent), Karoo (63.64 per cent), Chris Hani (62.50 per cent), OR Tambo (76.47per cent), Northern Free State (62.50 per cent), Mopani (72.73 per cent), Central district municipality (64.29 per cent), Bophirima (60 per cent), Kgalagadi cross-border district municipality (68.42 per cent) and Southern district municipality (65.38 per cent).

Figure 4.1: Distribution of hours worked amongst professional and non-professional workers
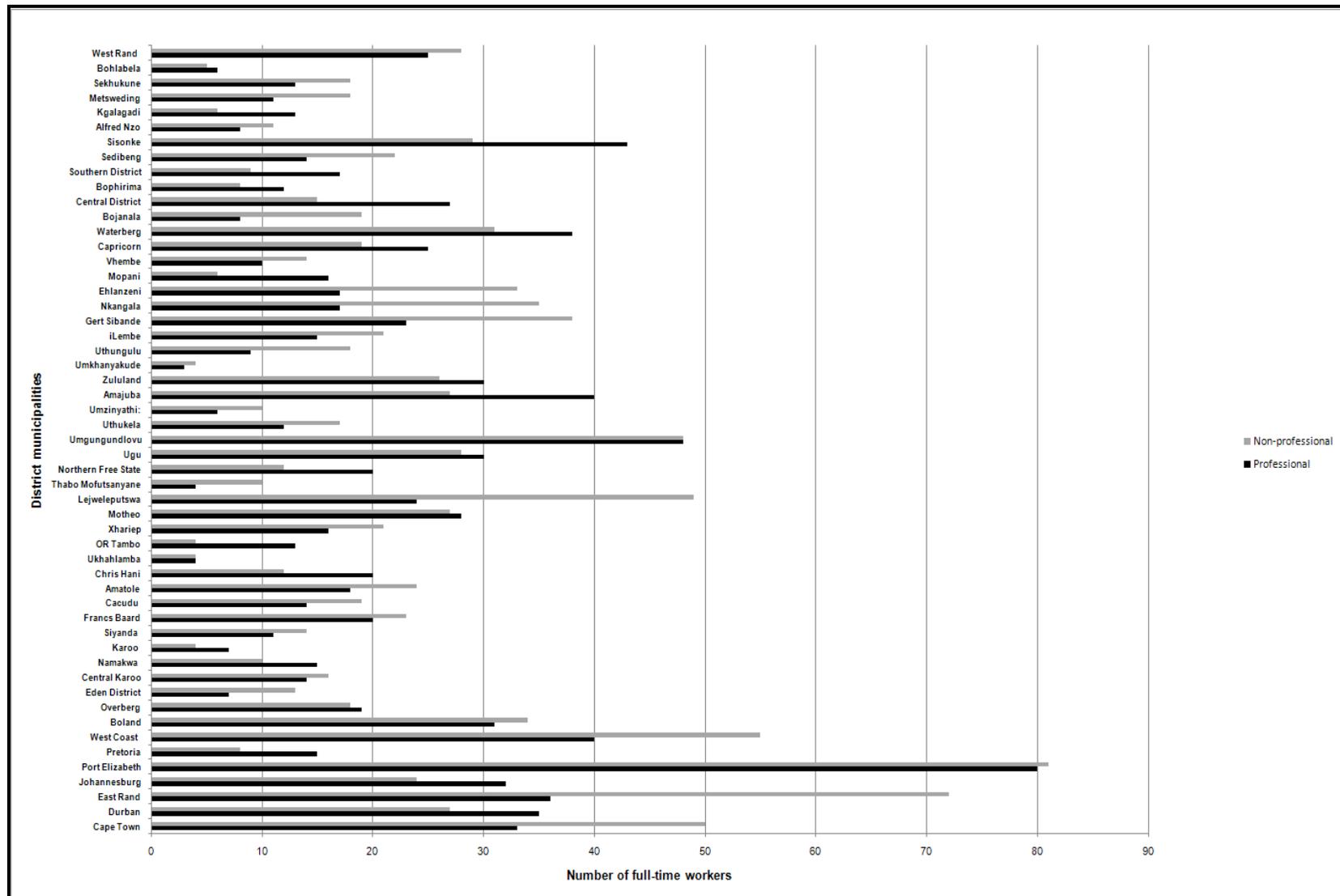
Source: Stats SA, Quarterly Labour Force Survey September 2007.

The metropolitan municipalities of Pretoria, Durban and Johannesburg have more professional workers with 65.22, 56.45 and 57.14 per cent grouped under professional employees[5]. Table 4.1 shows that approximately 452 full-time workers, or 42 per cent, work 40 hours per week whilst 452 full-time workers, or 20 per cent, work a total of between 41 and 45 hours per week. It appears as though non-professional workers are working more hours when full-time workers are averaging between 51 and 140 hours per week.

Table 4.1: Distribution of full-time workers in terms of hours worked

Hours worked per week	Professionals	Non-professionals	Total
35-39	151	38	189
40	487	469	956
41-45	206	246	452
46-50	92	173	265
51-55	33	56	89
56-60	62	101	163
61-70	30	43	73
71-80	15	40	55
81-90	7	18	25
91-140	9	10	22
Total	1092	1194	2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

Furthermore, the estimated models require employees to be divided into age groups, namely young and middle-aged workers, with young workers aged between 30 and 40 whilst middle-aged workers are aged between 41 through 50, as illustrated in Table 4.2. Of the 2 286 full time workers within the LFS, 1 335 or 58 per cent are classified as young, whereas 951 or approximately 42 per cent of employees are middle-aged.

In their analysis, Rosenthal and Strange (2002) control for a number of individual-specific attributes, however the South African Labour Force Survey does not contain data on the presence of children, marital status, years of residency in South Africa and commute times. Individual-specific attributes in this paper therefore only include the worker's level of education, age and race.

Table 4.2: Distribution of age groups within full-time workers

Age of workers	Professionals	Non-professionals	Total
30-40	601	734	1335
41-50	491	460	951
Total	1092	1194	2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

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[5] Note that this is not Census data, therefore the distribution of workers per occupational group may reflect the sampling of the LFS data.

Dividing professional and non-professional workers into the different race groups in South Africa reveals interesting results. Of the 2 286 full time workers used within the analysis, Table 4.3 shows that approximately 54 per cent are Black whilst only 15 per cent are coloured, 5 per cent are Indian or Asian and 26 per cent are white employees. Compared to the distribution of the population, there is over-sampling of the white population group, however, it reflects the racially-skewed labour market outcomes discussed in Section 3.2.

Table 4.3: Distribution of population groups amongst full-time workers

Population Groups	Professionals	Non-professionals	Total
Black	587	645	1232
Coloured	116	217	333
Indian/Asian	63	63	126
White	326	269	595
Total	1092	1194	2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

Table 4.4 indicates the distribution of education levels amongst full time workers, dividing professional and non-professional workers into two groups, namely those who have schooling up to Grade 12, and those who managed to complete a qualification[6] higher than Grade 12. Of the 2 286 full time workers participating in the survey, 360 professional workers, or 33 per cent completed only a secondary education, whilst 67 per cent graduated with a tertiary qualification of some kind. Within the distribution of non-professional workers, 79 per cent completed a secondary qualification and only approximately 21 per cent completed a tertiary education.

Table 4.4: Distribution of education levels amongst occupation groups

Education level	Professionals	Non-professionals	Total
Up to Grade 12 qualification	360	947	1307
More than a Grade 12	732	247	979
Total	1092	1194	2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

When evaluating trade union membership of professional and non-professional workers in the 2007 LFS, Table 4.5 illustrates that 65 per cent of professional workers are members of a trade union whilst approximately 34 per cent do not belong to a trade union. 52 per cent of non-professional workers within the survey stated that they were part of a trade union and 48 per cent were not.

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[6] A qualification higher than Grade 12 includes NTCI, NTCII, NTCIII, Diploma or Certificate, bachelor's degree, bachelor's and a diploma, honours, masters or doctorate degree.

Table 4.5: Trade union membership: professional and non-professional workers

Trade Union Membership	Professionals	Non-professionals	Total
Yes	611	527	1138
No	318	484	802
Total	929	1011	1940
Missing			346
Total			2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

A number of agglomeration variables have to be included when testing the relationship between agglomeration and hours worked in South Africa. In order to capture the influence of urbanisation, a log of population density within the particular district municipality is included. Data was sourced from the Regional Economic Explorer (REX) database compiled by Global Insight and contains the 2006 measurements of population density for each district municipality. Although population density is important in estimating the influence it has on hours worked, Rosenthal and Strange (2002:21) state that workers may be more willing to work longer hours if they were aware of the number of employees working within their particular occupation.

To capture this, a variable named occupation density was constructed to measure occupation-specific employment density within each district municipality. Adding the number of full time workers (working 35 hours or more per week) between the ages of 30 and 65 for professional and non-professional employees within a particular district municipality and then dividing this number by the geographic area of the district municipality produces a localisation variable capturing employment density within the two occupational groups. Rivalrous behaviour amongst employees is denoted by creating a variable isolating labour market rivalry. This was done by calculating an hourly wage distribution and grouping the distribution amongst young and middle-aged full time workers within each occupation. The result gives the number of rivals per occupation group per salary group. Table 4.12 indicates that as salaries increase, the number of rivals amongst professional workers increases. At the monthly salary levels of between R1 501 and R6 000 non-professional employees appear to have more competitive rivals than do professional workers.

Table 4.6: Number of rivals within different occupation groups and wage groups

Salary groups	Professional	Non-professional	Total
R1 – R200	3	29	32
R201 – R500	17	40	57
R501 – R1 000	21	76	97
R1 001 – R1 500	14	69	83
R1 501 – R2 500	25	153	178
R2 501 – R3 500	48	155	203
R3 501 – R4 500	74	154	228
R4 501 – R6 000	142	163	305
R6 001 – R8 000	189	137	326
R8 001 – R11 000	258	103	361
R11 001 – R16 000	147	68	215
R16 001 – R30 000	100	33	133
R30 001 or more	54	14	68
Total	1092	1194	2286

Source: Stats SA, Quarterly Labour Force Survey September 2007.

4.1   Empirical Tests

Section 2.5 of Chapter 2 discussed different theoretical arguments of why the urban rat race causes employees in agglomerated areas to work harder, namely signalling, thick markets and productivity and selection effects. In the signalling model, workers put in long hours and invest in education in order to signal their ability to prospective employers. Rivalry starts to present itself as employees receive compensation according to the number of hours worked. Market thickness implies that hours worked amongst employees increase as the worker populations concentrate and competition increases in urban areas. Productivity models indicate that employees work longer hours as they are compensated for doing so, whereas selection models require workers to choose longer working hours in anticipation of increased remuneration. Rosenthal and Strange (2002) find evidence that these effects determine the relationship between agglomeration and hours worked. Using cross-sectional data from the September 2007 Quarterly Labour Force Survey including worker-specific characteristics, dummy variables and several agglomeration variables, this paper aims to explore the relationship between agglomeration and hours worked in the urban areas of South Africa.

The hypothesis for the analysis is that the number of hours worked per week in South Africa depends on worker's level of education, occupation in terms of professional and non-professional workers, age, race and gender. Agglomeration variables included in the analysis are population density, occupation density, rivalry and a location dummy variable. Dummy variables are included in all models to control for occupation fixed effects.

4.2   Model Specification

A number of model specifications are used in the empirical analysis. The dependent variable remains the same throughout, but the explanatory variables differ between model specifications as some are added or excluded from the analysis. The base model is specified as:

LogHoursWorked = f(GenderMaleDum, Age, YoungProf, MiddleAgeProf, MiddleAgeNonProf, DumEducMoreThanGrade 12, DumPopBlack, DumPopColoured, DumPopIndian, LogPopDensity)

Where:

GenderMaleDum = Male worker dummy;

YoungProf = Professional workers between 30 and 40;

MiddleAgeProf = Professional workers between 41 and 50;

MiddleAgeNonProf = Non-professional workers between 41 and 50;

DumEducMoreThanGrade 12 = Dummy for education levels higher than Grade 12;

DumPopBlack = Black population group dummy;

DumPopColoured = Coloured population group dummy;

DumPopIndian = Indian population group dummy;

LogPopDensity = Log of population density within each district municipality.

Additional agglomeration variables measuring the effects of urbanisation, localisation and competition amongst workers are added to the model which includes occupation density, rivalry and dummies identifying the metropolitan municipalities in South Africa, namely a dummy for Gauteng (includes Johannesburg, Ekurhuleni and Pretoria), Cape Town, Durban and Port Elizabeth.

4.3   Results expected

According to findings made by Rosenthal and Strange (2003), it is expected that for young and middle-aged professional workers the number of hours worked will increase as education levels increase and that White population groups will work longer hours than other ethnic groups. The coefficient on population density, capturing the influence of urbanisation, is expected to have a positive relationship with hours worked whilst occupation density defined as a measure of localisation also influences hours worked positively amongst young and middle-aged professionals. As a result, the rivalry effect created by an increased presence of workers in the same occupation is expected to have a positive effect on hours worked amongst young professional workers and a negative, work-spreading effect between middle-aged professionals.

These results are consistent with the three models of selection, productivity and rivalry where Rosenthal and Strange (2003) describe that those young professionals choose to work longer hours in active professional environments where productivity, wages and rivalrous behaviour encourages hard work. For professional workers the effect of agglomeration on hours worked should result in increased hours worked, whereas non-professional workers will experience a negative effect as agglomeration spreads out the workload over a larger number of individuals.

With regards to non-professional workers, a pattern of work-spreading is expected to prevail as agglomeration causes non-professionals to work fewer hours. The anticipated coefficient on both the log of population density and occupation density is negative, implying that increases in city size and

increases in proximity to similar type workers cause work-spreading amongst non-professionals. The coefficient of rivalry between non-professional workers is expected to negatively influence hours worked as workloads are spread out across individuals reducing the amount of work hours. Due to work-spreading, non-professional workers are not expected to partake in signalling activities or rivalrous behaviour and therefore do not participate in an urban rat race.

4.4 Analysis of Results

Using cross-sectional data from the September 2007 South African Labour Survey, OLS regressions were run using the log of hours worked as the dependent variable and different worker attributes, dummy variables and agglomeration variables as explanatory variables. Results found using 2007 LFS data yields atypical results concerning the relationship between worker characteristics, agglomeration and hours worked. This will be discussed below. Robust standard errors are used in order to ensure the validity of variables in the presence of heteroscedasticity.

Table 4.7 illustrates the base model estimated by regressing the log of hours worked on worker attributes and the log of population density capturing the influence of urbanisation and a number of dummy variables. Contrary to expectations, young professional workers in South Africa work 1.89 per cent fewer hours than the base group of young non-professional workers this difference being highly significant; middle-aged professionals work 0.24 per cent fewer hours than young non-professional workers with this difference being insignificant. It is interesting to note that the number of hours worked amongst middle-aged non-professional employees is 0.44 per cent higher than the base of young non-professionals. In terms of education levels, it is noteworthy that individuals with an educational qualification higher than Grade 12 work 1.62 per cent fewer hours in comparison to the category of employees with Grade 12 as their highest qualification. Both of the latter variables are significant. The variable age does not have a significant impact on the estimated relationship.

Results of the race dummies indicate that black employees work 1.04 per cent less than white workers and that coloured and Indian employees work 3.14 and 1.47 per cent fewer hours than white population groups respectively. The estimate pertaining to race indicates that male workers spend 2.53 per cent more hours at work that their female counterparts. Lastly, the coefficient of the log of population density is indicative of a work-spreading effect, as hours worked decrease by 0.042 per cent for every one unit increase in population density, implying that in South Africa increased city size causes workloads to spread out. In Table 4.8, the variable occupation density, representing the concentration of workers in similar occupations within a district, is added to the base model in Table 6. Defined as a measure of localisation, Rosenthal and Strange (2003:21) state that occupation density evaluates whether or not a worker is more motivated to work when in the presence of workers in similar occupations. Although insignificant, the coefficient of occupation density is positive implying that the number of hours worked is 1.26 per cent higher for employees working in close proximity to similar occupations. Table 4.9 includes a variable named rivalry which captures the influence of rivalrous behaviour on hours worked when there is an increase in the number of employees working in similar occupations in the same income category.

By adding rivalry to the regression, the coefficient of occupation density becomes negative and insignificant, further adding to the theory of a work-spreading effect. The number of hours worked decreases by 0.02 per cent for every one unit increase in rivalry and is highly significant, implying that an increase in the amount of workers within similar occupation and salary groups causes workloads to spread across individuals therefore reducing the number of hours worked.

Table 4.7: Base model

Dependent Variable: LOGHOURSWORKED
Method: Least Squares
Sample: 1 2286
Included observations: 2286
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. error	t-statistic	Prob.
C	1.7296	0.0210	82.188	0.0000
EDUCMORETHANGRADE 12	-0.0162	0.0041	-4.0020	0.0001
AGE	-0.0015	0.0006	-2.7863	0.0054
DUMPOPBLACK	-0.0104	0.0043	-2.4070	0.0162
DUMPOPCOLOURED	-0.0314	0.0053	-5.8903	0.0000
DUMPOPINDIAN	-0.0147	0.0064	-2.3002	0.0215
GENDERMALEDUM	0.0253	0.0035	7.2532	0.0000
YOUNGPROF	-0.0189	0.0049	-3.8682	0.0001
MIDDLEAGEPROF	-0.0024	0.0037	-0.6488	0.5165
MIDDLEAGENONPROF	0.0044	0.0020	2.2266	0.0261
LOGPOPULATIONDENSITY	-0.0042	0.0024	-1.7723	0.0765

R-squared	0.0727	Mean dependent var	1.6539	
Adjusted R-squared	0.0686	S.D. dependent var	0.0863	
S.E. of regression	0.0833	Akaike info criterion	-2.1290	
Sum squared resid	15.7696	Schwarz criterion	-2.1014	
Log likelihood	2444.415	Hannan-Quinn criter.	-2.1189	
F-statistic	17.8234	Durbin-Watson stat	1.7883	
Prob(F-statistic)	0.00000			

Table 4.8: Base model with occupation density included

Dependent Variable: LOGHOURSWORKED
Method: Least Squares
Sample: 1 2286
Included observations: 2286
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. error	t-statistic	Prob.
C	1.7296	0.0211	82.130	0.0000
EDUCMORETHANGRADE 12	-0.0161	0.0041	-3.9783	0.0001
AGE	-0.0016	0.0006	-2.8002	0.0052
DUMPOPBLACK	-0.0105	0.0043	-2.4103	0.0160
DUMPOPCOLOURED	-0.0315	0.0054	-5.8923	0.0000
DUMPOPINDIAN	-0.0150	0.0065	-2.3033	0.0214
GENDERMALEDUM	0.0253	0.0035	7.2512	0.0000
YOUNGPROF	-0.0199	0.0055	-3.6396	0.0003
MIDDLEAGEPROF	-0.0024	0.0037	-0.6466	0.5179
MIDDLEAGENONPROF	0.0045	0.0020	2.2337	0.0256
LOGPOPULATIONDENSITY	-0.0043	0.0024	-1.7895	0.0737
OCCUPATIONDENSITY	0.0126	0.0351	0.3596	0.7192

R-squared	0.0727	Mean dependent var	1.6539	
Adjusted R-squared	0.0682	S.D. dependent var	0.0863	
S.E. of regression	0.0833	Akaike info criterion	-2.1282	
Sum squared resid	15.7686	Schwarz criterion	-2.0981	
Log likelihood	2444.490	Hannan-Quinn criter.	-2.1172	
F-statistic	16.2105	Durbin-Watson stat	1.7886	
Prob(F-statistic)	0.0000			

Increased proximity to similar type workers rather than city size could perhaps better support the explanation as to why work-spreading occurs in agglomerated areas of South Africa. This result does not provide evidence of rivalrous behaviour amongst employees in agglomerated areas within South Africa. Rosenthal and Strange (2003) explain that a positive and significant coefficient of occupation density provides evidence of a selection and productivity effect, however, the negative and insignificant value for the South African estimates on occupation density may imply that although workers are drawn to agglomerated areas in search of employment, this does not imply that workers are drawn to the professional occupational industries in urban areas or that agglomeration increases worker productivity.

In order to capture the effect of district municipalities' geographical locations on the number of hours worked, dummy variables are added for the metropolitan municipalities within South Africa. A dummy for Gauteng includes Pretoria, Ekurhuleni and Johannesburg. Cape Town, Port Elizabeth and Durban are included separately and are compared with the base group of all other district municipalities in South Africa. Results are presented in Table 4.10. Adding metropolitan dummies causes young professionals, middle-aged professionals, middle-aged non-professionals, the log of population density and occupation density to become insignificant. . The coefficient for Gauteng implies that the number of hours worked is 2.4 per cent lower than in the other district municipalities of South Africa, whilst workers in Port Elizabeth work 1.77 per cent fewer hours than other district municipalities of South Africa, this being significant. The coefficients of the variables of Durban and Cape Town are both insignificant and imply that the number of hours worked is respectively 0.49 per cent higher and 0.79 per cent fewer than other district municipalities within South Africa.

Table 4.9: Base model with occupation density and rivalry variables

Dependent Variable: LOGHOURSWORKED
Method: Least Squares
Sample: 1 2286
Included observations: 2286
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. error	t-statistic	Prob.
C	1.7466	0.0212	82.5990	0.0000
EDUCMORETHANGRADE 12	-0.0130	0.0041	-3.16270	0.0016
AGE	-0.0014	0.0006	-2.56434	0.0104
DUMPOPBLACK	-0.0102	0.0043	-2.36490	0.0181
DUMPOPCOLOURED	-0.0281	0.0054	-5.26518	0.0000
DUMPOPINDIAN	-0.0163	0.0065	-2.48619	0.0130
GENDERMALEDUM	0.0248	0.0035	7.18496	0.0000
YOUNGPROF	-0.0134	0.0055	-2.42742	0.0153
MIDDLEAGEPROF	-0.0010	0.0037	-0.27641	0.7823
MIDDLEAGENONPROF	0.0038	0.0020	1.91963	0.0550
LOGPOPULATIONDENSITY	-0.0036	0.0024	-1.53866	0.1240
OCCUPATIONDENSITY	-0.0303	0.0351	-0.86218	0.3887
RIVALRY	-0.0002	2.94E-05	-6.39702	0.0000

R-squared	0.0900	Mean dependent var	1.6539
Adjusted R-squared	0.0852	S.D. dependent var	0.0863
S.E. of regression	0.0825	Akaike info criterion	-2.1461
Sum squared resid	15.4742	Schwarz criterion	-2.1135
Log likelihood	2466.031	Hannan-Quinn criter.	-2.1342
F-statistic	18.7393	Durbin-Watson stat	1.8237
Prob(F-statistic)	0.0000		

Table4.10: Base model with agglomeration variables and dummy variables

Dependent Variable: LOGHOURSWORKED
Method: Least Squares
Sample: 1 2286
Included observations: 2286
White heteroskedasticity-consistent standard errors & covariance

Variable	Coefficient	Std. error	t-statistic	Prob.
C	1.7459	0.0212	82.4468	0.0000
EDUCMORETHANGRADE 12	-0.0129	0.0041	-3.1239	0.0018
AGE	-0.0015	0.0006	-2.5985	0.0094
DUMPOPBLACK	-0.0102	0.0043	-2.3727	0.0177
DUMPOPCOLOURED	-0.0279	0.0054	-5.1741	0.0000
DUMPOPINDIAN	-0.0167	0.0066	-2.5646	0.0104
GENDERMALEDUM	0.0247	0.0035	7.1650	0.0000
YOUNGPROF	-0.0072	0.0067	-1.0677	0.2858
MIDDLEAGEPROF	-0.0007	0.0037	-0.1961	0.8446
MIDDLEAGENONPROF	0.0038	0.0020	1.9346	0.0532
LOGPOPULATIONDENSITY	-0.0032	0.0024	-1.3165	0.1881
OCCUPATIONDENSITY	0.0378	0.0491	0.7688	0.4421
RIVALRY	-0.0002	3.01E-05	-6.4139	0.0000
DUMGAUTENG	-0.0244	0.0106	-2.2963	0.0218
DUMDURBAN	0.0049	0.0146	0.3330	0.7392
DUMCAPETOWN	-0.0079	0.0104	-0.7590	0.4480
DUMPE	-0.0177	0.0084	-2.1105	0.0349

R-squared	0.0934	Mean dependent var	1.6539
Adjusted R-squared	0.0870	S.D. dependent var	0.0863
S.E. of regression	0.0824	Akaike info criterion	-2.1463
Sum squared resid	15.4170	Schwarz criterion	-2.1037
Log likelihood	2470.269	Hannan-Quinn criter.	-2.1308
F-statistic	14.6087	Durbin-Watson stat	1.8299
Prob(F-statistic)	0.0000		

4.5   Conclusion

This section examined the relationship between hours worked and agglomeration in the urban areas of South Africa. Using cross-sectional data from the September 2007 Labour Force survey, a regression analysis was carried out to test for evidence of an urban rat race amongst professional workers.

Contrary to findings made by Rosenthal and Strange (2003) regarding hours worked amongst professional workers in agglomerated areas, results of the analysis for South Africa were uncharacteristic. In terms of education levels in South Africa, the number of hours worked decreases amongst workers who have an education higher than Grade 12 and as a result they work fewer hours than employees who possess a secondary qualification. As expected, male workers put in longer hours than females, whilst white employees log more hours than their black, Indian and coloured counterparts.

Furthermore, with regards to different occupational groups in South Africa, it is found that young professional workers aged between 30 and 40 years and middle-aged professionals aged between 41 and 50 years are working fewer hours than the base group of middle-aged non-professional workers. Adding agglomeration variables measuring the effect of urbanisation and localisation on hours worked continues to provide unexpected results. Population density, defined as the measure of urbanisation, continues to negatively influence hours worked, whilst occupation density measuring localisation between employees increases working hours but remains insignificant. To the extent that occupation density is an indicator of rivalry effects amongst workers, the negative and insignificant coefficients suggest inconsistency regarding the selection and productivity effects found by Rosenthal and Strange (2003: 22). This implies that workers may not be drawn to urban areas particularly for active professional environments. The highly significant coefficient of rivalry continues to negatively impact the number of hours worked within South Africa and fails to provide evidence of increased competition amongst employees in agglomerated areas of South Africa.

Tentative evidence of a work-spreading pattern is found between workers in agglomerated areas of South Africa. Young and middle-aged professional workers in particular are found to work fewer hours than middle-aged professional workers who are estimated to work the longest hours per week.

5.   Conclusion

To conclude, the focus of this paper was to test whether an urban rat race exists within South Africa's metropolitan and district municipalities by investigating the relationship between agglomeration and the number of hours worked. This paper has made three important contributions, namely:

   i)   Adding to the literature on geographical economics and labour market issues, in particular the effect of urbanisation on employment in South Africa.

   ii) Contributing to the policy debate regarding working conditions, in particular the number of hours worked in South Africa.

   iii) Providing an empirical analysis which tests the effect of agglomeration on the number of hours worked in South Africa.

Although the empirical analysis produced unexpected results in comparison to results by Rosenthal and Strange (2003), a few interesting observations can be made.

Firstly it appears as though labour regulations do play a role when evaluating the number of hours worked amongst professional and non-professional employees in the South African labour market.

Magruder (2009:2) explains that an extensive social safety net created by labour unions tends to increase the demand for leisure. Furthermore, Magruder finds that labour market agreements are enforced in a spatially discontinuous manner, implying that agreements vary amongst district councils and firms jump from border to border to avoid having to adhere to strict labour agreements. Data from the September 2007 LFS used in this paper indicate that the greater part of professional workers belong to a labour union, which may contribute to reductions in hours worked. Non-professional employees who are members of trade unions according to the 2007 LFS are relatively fewer than professional workers, and are found to work significantly longer hours than professionals in South Africa.

Secondly, this study found that white population groups work significantly longer hours than black, Indian and coloured races in South Africa. This may be in line with a study by Naudè (2008) which tests for evidence of a spatial mismatch between black and white population groups in the metropolitan labour market of South Africa. Whilst Naudè (2008) points out that variation in spatial access to employment result in different unemployment rates between race groups, this study indicates that differences in spatial access to employment may encourage different working hours amongst race groups, but does not discriminate between occupational groups. Nevertheless, a developing country such as South Africa requires an influx of skilled professional employees as increased density appears to favour both professional and non-professional workers irrespectively.

Thirdly, this paper concurs with Hofmeyr (2010) who studies the effect of social networks and occupational niches on labour market outcomes. Hofmeyr finds evidence of concentration and specialisation of members of an ethnic group in a particular occupational activity. Particularly within the manufacturing sector, a number of ethnic niches are identified keeping some language groups trapped in low-skilled, low-paying occupations whilst acting as a protective barrier to high-skilled, high-paying occupations. This paper suggests that longer hours are logged amongst members of a particular ethnic group and occupation. However, due to the limited scope of the September 2007 LFS data this statement requires more convincing empirical results.

Moreover, due to the limited supply of highly skilled professional workers in the South African labour market, this study finds evidence of a work-spreading effect between professional employees. The constrained supply of highly skilled workers in professional occupations in South Africa may compel occupational groups to implicitly collude to cap working hours rather than participate in rivalrous or competitive behaviour. Highly skilled professionals thus appear to work together in South Africa, dividing workloads and as a result diminishing the amount of hours worked.

Even though developing countries may depict cities as an urban problem due to congestion, overcrowding and inefficiency, the international phenomena of urbanisation, agglomeration and concentration of populations yield cities as clusters producing higher returns and better long-term opportunities than other areas. Policy regarding urban development and labour growth in South Africa should make a considerable attempt at providing sustained opportunities for highly skilled professional workers and informal sector non-professionals alike.

The aim of this paper was to find evidence of agglomeration affecting the number of hours worked amongst professional workers in South Africa. Some unexpected results obtained could suggest certain weaknesses that originate from the dataset used. In order to supply concrete results regarding the extent of the effect of agglomeration on hours worked, a thorough and diligent completion of survey data is recommended. Pooling a number of Labour Force Surveys together into one dataset may provide more significant results. The introduction of a separate survey collecting data on hours worked amongst employees in their capacity as professional workers may assist in better evaluating policy recommendations regarding the number of hours worked in South Africa.

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