

THE RELATIONSHIP BETWEEN FORMAL
AND INFORMAL EMPLOYMENT IN SOUTH AFRICA

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THESIS

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ABSTRACT

Over the last several decades several theories have dominated debates about the nature of informal employment in developing countries. The dualistic theory claims that the informal sector is a substitute for formal employment, the alternative theory claims that the informal sector is a compliment to formal employment, and the structural articulation theory claims that heterogeneous groups exist within the informal sector. This study contributes to the literature by providing empirical evidence that heterogeneous sub-sectors do exist within South Africa's informal sector, and that the Structural Articulation theory, with its focus on dynamic and static sub-sectors, is the most appropriate framework to adopt when thinking about informal employment in South Africa . Furthermore, the study also adds to the literature by providing evidence that race is a significant identifier of informal sub-sectors and that a national poverty line can be used to identify the dynamic and static sub-groupings within South Africa's informal sector. Finally, I suggest that the existence of heterogeneous sub-groupings implies the need to better target policy interventions for the informal sector.

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CHAPTER 1: INTRODUCTION

Over the last 15 years South Africa's government has been transformed from an oppressive, racist, Apartheid state to a democratically-inclusive, development-oriented state focused on overcoming poverty and underdevelopment. However, despite the government's focus on economic stability and the provision of public services, economic growth and job creation has been modest over the last decade, resulting in nearly one in four people unemployed (in 4th quarter of 2010 – www.statssa.gov.za). In fact, unemployment is seen by many to be South Africa's greatest economic challenge, as is evidenced by a recent speech from South Africa's President, Jacob Zuma. In the speech he mentioned job creation as a major priority for his government, and then announced \$2.7 billion in tax breaks to encourage manufacturing investment and \$1.25 billion for additional job-creation programs (NY Times, Feb 10, 2011).

Because South Africa's unemployment rate has garnered so much attention, labor market outcomes and the nature of employment in South Africa have been ripe areas of research. Many analysts have endeavored to uncover constraints to employment growth and propose appropriate solutions (Chandra et al., 2001 & 2002; Cichello et al., 2005; Kingdon and Knight, 2007; Nattrass, 2001; Lewis, 2001; Skinner, 2005). While much of the attention is spent on formal employment, a large fraction of workers (24% in 2007) are employed in the informal sector.

Before proceeding further, let me provide a brief definition of formal *versus* informal employment as applied to South Africa. In South Africa, the formal sector is defined as economic activity that occurs within the purview of state regulation and formal employment is defined as employment originating from a business or firm that is registered with the state. On the other hand, the informal sector is defined as economic activity that occurs outside the purview of state regulation and informal employment is defined as employment originating from a business or firm that *is not* registered with the state (South Africa Statistics, 2001 & 2007). Throughout the length of this thesis these definitions will apply when discussing formal/informal employment or formal/informal sectors.

In both academic and policy circles, there is much debate over the relationship between the formal and informal sectors, and whether informal employment is a benefit or liability for the overall economy. Those adopting the dualistic labor market approach envision informal employment as a substitute for formal employment. This group sees informal employment as a residual “sponge” that soaks up unskilled, surplus labor from the formal sector. In this view, informal employment is involuntary, requires little to no capital, utilizes traditional production methods and only provides a subsistence wage. In addition, this theory of informal labor posits that there are very few connections between the informal and formal sectors, and that informal output is not sold in formal markets. As such, the informal sector is incapable of generating capital accumulation or economic growth, and is ultimately seen as a liability for the overall economy (Kingdon and Knight, 2007). Such sentiments can be inferred from the following quote by former president Mbeki where he describes South Africa’s informal sector as one that is:

“characterised by underdevelopment, contributes little to GDP, contains a big percentage of our population, incorporates the poorest of our rural and urban poor, is structurally disconnected from both the first and the global economy and is incapable of self-generated growth and development.” (Devey, Skinner & Valodia, 2005).

In the dualistic framework, the informal sector is, at best, seen as a safety net for unemployed workers. Consequently, the most appropriate policies are those that alleviate poverty or provide insurance during extended periods of unemployment.

On the other hand, those adopting the alternative (or neo-liberal) approach see informal employment as a compliment to formal employment. This group sees the informal sector as a voluntary strategy where entrepreneurs are able to establish new firms and contracts. In this view, the sector represents a cost saving strategy for small firms trying to avoid arduous and costly labor regulations. The owners of these firms accumulate considerable capital to establish their business, and are intimately connected to formal markets through business relations and output demand from the formal sector. As such, the informal sector is capable of capital

accumulation and growth and represents a benefit to the overall economy (Maloney, 1998). Support for this view can be inferred from a recent news article where the Economist Magazine describes South Africa's labor laws as some of the most stringent in the world and attribute the lack of formal sector employment to these regulations (Economist Magazine, Feb 24, 2011). In such a situation it is not unreasonable to think that business owners and entrepreneurs would enter the informal sector to avoid additional labor costs. In this particular view, informal employment is seen as a potential engine of growth and appropriate policies are those that lower producer costs or provide business services to emerging entrepreneurs.

A third theory of informal employment, known as the Structural Articulation approach, sees both the dualistic view and alternative view as overly simplistic. In this view, the informal sector is heterogeneous and made up of at least two distinct sub-sector (Portes and Schauffler, 1993). One of these sub-sectors represents entrepreneurs and small firms trying to grow by avoiding costly regulation. This sub-sector benefits the overall economy by providing lower consumer prices and labor costs. Because this sub-sector is driven by labor demand, this so-called dynamic sub-sector demonstrates pro-cyclical behavior with the overall economy. On the other hand, the structural articulation approach also claims that another sub-sector exists that is largely disconnected with the formal economy and demonstrates countercyclical behavior. This static sub-sector is driven by excess labor supply and represents the involuntary subsistence strategies of unskilled workers who cannot find employment in the formal sector. In this view, both poverty alleviation and growth policies are required to be discriminately applied to the appropriate sub-sector. However, in order to appropriately target policies, analysts must first accurately identify each sub-sector. As a result, the structural articulation approach attempts to divide informal employment along other socioeconomic lines in an effort to identify both dynamic and static sub-sectors.

Because a substantial amount of South Africa's labor supply is employed in the informal sector, the role of public policy to support the informal sector has become an important aspect of the political debate around employment. Depending on one's particular theoretical view, vastly

different policies are imagined. For example, if the alternative or neo-liberal framework accurately describes the informal sector, the deregulation is key to supporting informal sector employment; however, if the dualistic perspective is correct, then poverty alleviation policies might be more appropriate. As such, there is a need to study the nature of South Africa's informal sector in order to adequately target policy interventions.

The purpose of this study is to determine which of these views most accurately describe the relationship between formal and informal employment in South Africa. In so doing, I hope to take a step forward in identifying appropriate policy solutions for informal employment in South Africa. For example, if the alternative view correctly describes informal employment in South Africa, then the appropriate policy may well be to deregulate the formal employment sector. In the next section, I will provide an in-depth overview of the theoretical approaches used to frame the concept of informal employment, as well as provide some evidence as to which theory may be most applicable to South Africa. Following this, I will explain my methods for testing the applicability of this particular theory within South Africa and then present my results. Finally, I will discuss the implications of my results for public policy targeted toward supporting the informal sector.

CHAPTER 2: INFORMAL SECTOR PARADIGMS

According to Chaudhuri and Mukhopadhyay, three theoretical approaches dominate the informal sector literature: the dualistic labor market approach, the alternative approach and the structural articulation approach (2009). In this section I will review these theoretical perspectives to situate my research question, provide empirical evidence for each of these theories, as well as evidence of each theory's applicability to South Africa. I hope to show how my research question, as applied to South Africa, can contribute important empirical results to the overall debate on informal employment.

DUALISTIC LABOR MARKET THEORY

In his seminal work "Economic Development with Unlimited Supplies of Labor", Lewis first presented the Dualistic Labor Market theory as a general model of development in less developed countries (1954). His model divides the economy into two sectors: a modern, industrial sector and a traditional, agricultural sector. The modern sector is characterized by capital modes of production, capital accumulation and economic growth and the traditional sector is characterized by subsistence agriculture, pre-capitalist modes of production and an absence of economic growth.

Because many developing countries were experiencing high rates of population growth in the 1950s (due primarily to the introduction of sanitation and preventative medicine), Lewis assumed that an unlimited supply of unskilled labor was readily available in the traditional sector. Since the traditional sector was crowded with labor, the average product of each worker was very low and the marginal product equaled zero. As such, capitalists from the modern sector could acquire unskilled labor at a subsistence wage. For Lewis, economic development occurred as unskilled labor was reallocated from the traditional sector to the modern sector. As the modern sector was able to match unskilled labor with capital, productivity and output would increase and consumer prices would fall. As a result, consumer demand would increase and additional profits would accrue to capitalists. Lewis assumed that capitalists, consumed by the profit motive, would reinvest profits in capital so that output and revenues would continue to increase. In turn, reinvestment in capital would increase demand for unskilled workers from

the traditional sector. This process would continue until all surplus labor in the traditional sector was reallocated to the modern sector and wages in the traditional sector began to rise above subsistence levels. The end result would be modernization, an increase in the level of employment, and an increase in average income per capita.

Harris and Todaro further articulated the Lewis model by explaining the mechanism through which labor was reallocated from the traditional to modern sector (1970). This mechanism was rural-to-urban migration and their model explains the individual worker's decision to migrate from the rural farm to the industrial city, even in the presence of urban unemployment. Harris and Todaro assume that a wage gap exists between rural and urban areas because of a high minimum urban wage and the inability of labor to move costlessly back to the rural area once they have migrated to the city. As a result, the search for urban employment is not costless and a certain level of unemployment exists within urban areas. Consequently, a rural worker only chooses to migrate to the city if the present value of his expected urban wages exceeded the present value of his expected rural wages, where expected urban wages are based on the probability of finding employment in the formal manufacturing sector. As a result, migration will ensue to reallocate labor until *expected* rural wages equal *expected* urban wages.¹ Thus, even in the presence of urban unemployment, migration would occur as long as expected urban wages exceeded expected rural wages.

However, Fields believed that the dualistic approach was overly simplistic and that a third option existed for rural migrants, namely, employment in the urban informal sector (1975). Consequently, he modified the Harris and Todaro model to demonstrate how the existence of an urban informal sector can result in a lower unemployment rate than predicted by Harris and Todaro. Unlucky rural migrants who do not find work in the formal manufacturing sector ended up accepting employment in the urban informal sector. In his model, the informal sector is attractive to unemployed migrants because there are few barriers to entry. Fields believed that informal employment activities such as petty trading, domestic service, and petty commodity

¹ It is important to note that for this equilibrium to occur barriers must exist that prevent people from moving back to rural areas.

production were activities with free entry. In addition, informal employment provided migrants with a subsistence wage and flexible hours that allowed them to continue their job search in the formal sector.

Thus, in the dualistic labor market approach informal employment is an involuntary solution to unemployment. It is perceived by rural migrants as a temporary survival strategy while they wait for job opportunities to open up in the formal sector. As a result, Fields predicted that wages in the informal urban sector would be even lower than wages in the traditional rural sector. In this sense, the informal sector is not dynamic or capable of growth; it is merely a second best strategy that substitutes for a lack of formal sector employment. As such, the informal sector is thought of as a “sponge” that can absorb the surplus labor that exists in the economy. However, because the sector is incapable of capital accumulation and growth, a permanent informal sector is seen to have the same negative effects on an economy as open unemployment. For example, in 1973 Paul Bairoch described the informal sector as an “abnormally swollen, overdistracted sector” (quoted in Moser, 1978: 1048). For Bairoch the informal sector was a result of excessive urban population growth relative to economic growth, and the solution to this problem was to focus policy efforts on agricultural development (Moser, 1978).

Along with the negative view of informal employment shown by South African politicians, evidence for this dualistic view is also provided by Kingdon and Knight. In their recent study of unemployment in South Africa they argue that the country’s high unemployment rate is caused by rapid growth in the labor force participation rate relative to growth in formal sector labor demand. They claim that an increase in labor force participation is primarily due to the end of Apartheid restrictions on movement and the perceived employment opportunities that this created, especially among women and Black South Africans (2007). Furthermore, the large informal settlements that have formed around major towns and cities over the last several decades attest to the rural-to-urban migration that has taken place and provide additional evidence for the dualistic view.

Kingdon and Knight claim that the formal sector is unable to absorb this surplus labor (2007). They describe the formal sector of South Africa as a regulated, middle-income, mineral-based economy that has a comparative advantage in capital-intensive and skill-intensive manufacturing. As a result, this segment of the economy is unable to absorb the low-skill, surplus labor that was created by the old Apartheid regime. Borat and Hodge provide further evidence of this view by using a growth decomposition technique to decompose labor demand growth via occupation and sector categories from 1970 to 1995. Their results demonstrate that over time the South African economy has responded to changes in technology and deepening capital by favoring production methods that require fewer, but more highly skilled employees. In addition, their results also show that structural change toward information technology and producer services has also favored firms that require fewer, but more highly skilled employees (1999). Furthermore, Jenkins adds to this view by using a growth decomposition technique to decompose labor demand growth via processes of globalization, such as trade, technology transfer and foreign direct investment. His results demonstrate that changes in the South African economy related to globalization have also favored a labor demand structure that requires fewer, but more highly skilled workers (2006). In addition, South Africa's long history of restriction on Black movement, business formation and human capital accumulation have created a formal economy that has trouble absorbing large numbers of unskilled workers.

Based on this evidence, Kingdon and Knight claim that the segmented labor market, suggested by the dualistic theory, is the most appropriate way to interpret labor market outcomes in South Africa. Because of extensive labor market regulations, such as bargaining council agreements, the right to strike, protection against dismissal, and minimum standards concerning wage, leave and overtime, formal sector wages are set above market clearing prices and the residual labor force is distributed between informal, subsistence employment and open unemployment (2007). In other words, South Africa's informal sector developed in response to a lack of formal sector labor demand and should actually be seen as an involuntary, residual sector that disguises open unemployment (2007).

However, despite the correlation between the increase in labor supply, unemployment and informal employment in recent years, Kingdon and Knight provide no formal test of this hypothesis, which leaves a gap in the empirical literature as to how well the dualistic perspective applies to South Africa (2007).

THE ALTERNATIVE THEORY

Chaudhuri and Mukhopadhyay point out a second theoretical approach from which to consider informal employment in less-developed countries (2009). They call this perspective the Neo-liberal approach; however, others prefer a more general naming convention such as the Alternative theory. In this discussion, I will adopt the latter since it allows a fuller discussion of the theory. The Alternative theory developed in response to the dualistic view's failing to acknowledge the ability of informal workers to engage in job creation, creative enterprises and capital accumulation in the urban environment (Porters and Schaffler, 1993).

The approach was first articulated by anthropologist Keith Hart in 1973 and was based on his ethnographic study of the informal sector in Accra, Ghana. Hart described formal and informal employment opportunities in Accra and attributed the former to salaried jobs and the later to self-employment (1973). He highlighted the "dynamism of self-employed entrepreneurs whose activities went well beyond those of 'shoeshine boys and sellers of matches'" (quoted in Portes and Schaffler, 1993: 38). This characterization led to an alternative perspective on informal employment. Instead of being a second best substitute for formal employment, as espoused by the dualistic view, the alternative theory saw the informal sector as one that contained low barriers to entry for entrepreneurs. The sector was conceived as one where low levels of physical capital would be compensated by higher levels of human capital and ingenuity. As such, the sector was seen as a voluntary strategy where savvy entrepreneurs could start their businesses at low cost.

Hernando De Soto built upon this original characterization in his famous book *The Other Path*, where he attributes the development of the informal sector not to surplus labor, but to costly government regulations such as health care mandates, high minimum wage, lengthy

incorporation procedures, collective bargaining agreements, etc.² For example, De Soto claimed that in Peru, a lack of well-defined private property rights induced small-scale entrepreneurs toward informal activity (1989). Thus, the informal sector is not an involuntary substitute for insufficient job creation, but a voluntary cost-savings strategy for small business owners and entrepreneurs trying to avoid excessive government regulations (Portes and Schauffler, 1993). In this sense, the informal sector actually compliments the formal sector's entrepreneurial need by offering a low-cost strategy for business formation. As such, the sector is dynamic and has the ability to contribute to economic growth.

A key attribute of the informal sector in this alternative approach is that voluntary nature of informal employment. There is much literature from Latin America to demonstrate that informal employment is primarily a voluntary savings strategy instead of an involuntary subsistence strategy. For example, Maloney lists results from several household surveys across Latin America which identify the voluntary nature of informal self-employment. In Mexico, over 60% of those in the informal, self-employed sector left their previous job voluntarily. The main reasons cited for entering the informal sector were a desire for greater independence or higher pay. In Brazil, over 62% of self-employed men were happy with their job and were not looking for formal sector employment. In Argentina, survey data revealed that 80% of the self-employed had no desire to change jobs and only 18% of the self-employed perceived their job to be a temporary substitute for formal sector employment. In Paraguay, only 28% of those in the informal sector stated a desire to change occupations, implying that the vast majority of those in the sector had chosen their employment voluntarily (Maloney, 2004).

Maloney also reports the results of Markov transition matrices, using panel data on worker transitions from Argentina, Brazil and Mexico. The results of these matrices all reject self-employment as an entry occupation from school and provide little evidence that self-employment is a holding pattern for young workers looking for jobs (2004). In addition, Maloney's 1998 study of Mexico's National Urban Employment Survey shows that the

² Note that this view is not totally inconsistent with the Harris-Todaro model since they both require government regulation to generate unemployment and informal employment.

transition into self-employment from other paid sectors occurred 4-6 years later than the transition into formal salaried work (1998). Furthermore, Maloney's multinomial logit regression demonstrates that the probability of moving into self-employment from other sectors is associated with greater experience and higher real wage (1998). All of this evidence points to the idea that the Latin American informal sector is not a temporary substitute for formal sector employment. Instead, the evidence seems to indicate that the sector is a dynamic environment for entrepreneurship and that entry requires a high degree of business expertise. However, the evidence is mixed when it comes to South Africa. As mentioned previously, the analysis of Kingdon and Knight suggested that the dualistic theory is the most appropriate framework to apply to South Africa. That said, they also noted some peculiar characteristics of the South African informal sector. For example, the size of the informal sector relative to the overall labor force (19% in 2002) is very small when compared to other regions such as sub-Saharan Africa (outside of South Africa), Latin America and Asia. In addition, they also compare the small ratio of informal employment to unemployment in South Africa (0.7) to larger ratios in sub-Saharan Africa (4.7), Latin America (7.0) and Asia (11.9), suggesting that the informal sector in South Africa is not acting as a residual sector for excess labor. They question why the unemployment rate would be so high if the informal sector was acting as a residual "sponge" that provided jobs for low skilled labor (2007). This is contrary to the predictions of the dualistic theory, where the informal sector is assumed to be an open-entry sector that will absorb all surplus labor.

In addition, Kingdon and Knight also find that informal sector workers have both higher incomes and subjective well-being than their unemployed counterparts (2007). So why don't more of the unemployed join the informal sector? The implication is that they can't because there are barriers to entry. In a recent survey of informal firms in Johannesburg, Chandra et al. identify lack of access to capital, low demand, lack of access to infrastructure & business services, and lack of training as the top constraints to informal business growth (2002). Other academic surveys identify similar constraints to informal business growth in Cape Town and Durban (Cichello, 2005 & Skinner, 2005). However, Kingdon and Knight note that these are

problems experienced by most developing countries and do not explain the relatively small size of South Africa's informal sector (2007).

The authors then suggest that the lack of informal self-employment may be due in part to the legacy of Apartheid. According to Kingdon and Knight, the repression of Black South Africans under Apartheid inhibited the development of human capital, business experience, entrepreneurship and social capital, all of which are vitally importance to successful business formation (2007). Because of the paucity of skills, South Africa's informal sector may be more akin to the informal sectors across Latin America, where barriers to entry exist because the sector is reserved for the business-formation activity of skilled entrepreneurs. Kingdon and Knight's probit analysis adds evidence to support this alternative theory. Their analysis of the probability of unemployment finds that younger workers are more likely to be unemployed than older, more experienced workers (2007). If this is true, then the legacy of Apartheid may be posing significant barriers to entry for young workers across sectors (formal and informal). If this is the case, then the informal sector should not be seen as an open entry sector that can absorb all surplus labor. Instead, involuntary unemployment should be seen as the primary means by which surplus labor is absorbed; and the informal sector should be considered more like those found in Latin American economies.

However, despite this evidence, the author's study provides no direct test of the relationship between formal and informal employment. As such, it is hard to tell which theory is most appropriate for South Africa, especially since their article provides evidence to support both the dualistic and alternative perspectives (2007).

THE STRUCTURAL ARTICULATION THEORY

Because of the theoretical shortcomings of both the dualistic and alternative perspective, a third perspective has emerged, known as the Structural Articulation Theory. This theory acknowledges that the condition of excess labor supply created by rural-to-urban migration has had more complex consequences than either the dualistic or alternative perspective acknowledges. It recognizes that the informal sector is heterogeneous, and at the very least,

two distinct class positions should be distinguished: informal micro-entrepreneurs with access to some capital and labor resources, and unprotected workers who involuntarily eke out a subsistence wage. In addition, the theory does not see the informal sector as isolated from the formal economy. Instead, the theory views informal activity as closely linked to the formal sector (Portes and Schauffler, 1993).

This perspective is labeled “structuralist” because its concern is with the structure of formal-informal relationships as part of a unified economic system. The theory is interested in describing the functions that are played by the informal sector in support of modern capitalist accumulation, specifically with the potential of the informal sector to lower consumption and labor costs within the formal sector. For example, this perspective claims that one of the main linkages between the formal and informal sectors is the provision of low-cost goods and services to workers in the formal sector. Examples include petty trade of inexpensive clothing and footwear, cheap auto repairs and transportation services, provision of inexpensive housing (such as that found in many of the shantytowns across the developing world), trading of second-hand appliances, etc. The provision of informal goods and services has several beneficial effects within the developing economy. First, it lowers the cost of consumption and increases the purchasing power of the urban middle class. Second, it allows poor households to make ends meet. Third, it provides formal capitalist enterprises with a subsidy that allows them to keep wage costs lower than it would be if worker consumption occurred entirely within formal markets. In addition, the informal sector also provides a supply of unprotected labor, through off-the-books hiring and subcontracting, which allow formal sector firms to avoid costly labor regulations (Portes and Schauffler, 1993).

As mentioned earlier, another important contribution of the Structural Articulation theory is the idea that the informal sector is internally heterogeneous. Structuralists have attempted to classify informal activity based on motivation and goals. For example, Portes, Castells and Benton propose the following typology: activity by autonomous, informal firms that have access to modern technology and are motivated by capital accumulation goals, informal activity which

is subordinate to formal sector enterprises and motivated by labor cost reduction (such as off-the-books hiring and subcontracting), and informal activity with direct subsistence goals (Portes, Castells, and Benton, 1989 as cited in Portes and Schauffler, 1993). These categories are usually proxied by class of worker such as owner, salaried, self-employed, unpaid family worker, and domestic servant. The first two worker categories are assumed to be associated the informal sub-sector that is dynamic and focused on capital accumulation. The last four categories of workers are assumed to be associated with the informal sub-sector that is static and focused on subsistence (Florez, 2002).

Evidence for such a typology can be found in a recent study of Columbia's informal sector. Using metropolitan data from Columbia's National Household Survey Program, Florez finds that the informal sector as a whole displays counter-cyclical behavior, shrinking during periods of macroeconomic growth and expanding during periods of recession. She claims that this is the case because the subsistence subsector makes up 63% of the informal sector, and as a majority, lead the behavior of the entire sector. However, once she divides the informal sector into the dynamic and static classes mentioned above, very different results emerge. The subsistence sub-sector continues to follow counter-cyclical behavior, but the capital accumulation sub-sector displays pro-cyclical behavior, expanding with macroeconomic growth and contracting when growth declines (2002). This evidence suggests that the informal sector is indeed heterogeneous. It further suggests that the subsistence subsector supports the dualistic view and serves as a residual sector for surplus labor; while the capital accumulation subsector supports the structural articulation view of a sector that is integrated to the formal economy (directly via subcontracting and indirectly via the provision of inexpensive consumer goods). However, Florez notes that the subsistence subsector has a limited capacity to absorb workers, and that during recession open unemployment may increase (2002). This seems to closely match the evidence presented from South Africa, where surplus labor is distributed across the subsistence subsector and open unemployment because the informal sector has limited capacity (Kingdon and Knight, 2007).

An alternative typology identifies the capital accumulation and subsistence sub-sectors by industry sector and firm size. Informal activity within manufacturing, construction and transportation industry is assumed to be part of the capital accumulation sub-sector and informal activity within the retail trade and personal services industry is assumed to be part of the subsistence sub-sector. In addition, informal firms with more than 5-10 employees are often assumed to be in the dynamic sub-sector, while informal firms with less than 5 employees are assumed to be in the subsistence sub-sector (Ranis and Stewart, 1999). Using survey data from the informal sector of Manila and Bangkok during the mid-1980s, Ranis and Stewart divide the informal sector into dynamic and static components based on the industry and size categories just mentioned. They then compare the growth of these two components to macroeconomic growth in the Philippines and Thailand during the same period. This comparison yields results similar to those found in the Columbian study. The capital accumulation sub-sector displayed pro-cyclical growth and the subsistence sub-sector displayed counter-cyclical growth (Ranis and Stewart, 1999).

Given the mixed evidence presented by Kingdon and Knight, it seems plausible that South Africa's informal sector may contain a heterogeneous mix of dynamic and subsistence sub-sectors (2007). If this is the case, then the Structural Articulation approach would be a more appropriate theoretical framework than either the dualistic or alternative framework. However, to my knowledge no study has directly tested this hypothesis or tried to show the relationship between each of these sub-sectors and formal sector employment. In order to fill this gap, my thesis will attempt to identify a dynamic and subsistence sub-sector within the informal sector and then determine the relationship between these informal sub-sectors and formal sector employment. I will attempt to answer these questions using South African census data.

Before moving on to my hypothesis, I will first give a brief comparison of worker characteristics between formal and informal employment and across informal employment sub-sectors. I will begin with the comparison between formal and informal employment (see Table 1). A hypothetical formal sector worker is more likely to be a paid employee in an industry, such as

finance or business services, which requires a high level of education or skill. A formal sector worker is also more likely to earn a higher income and be male. On the other hand, a hypothetical informal sector worker is more likely to be self-employed in an industry, such as retail trade or construction, which requires a lower level of education or skill. Similarly, an informal sector worker is more likely to earn a lower income. The informal sector is divided pretty evenly between males and females, and although Black South Africans make up the vast majority of employment across the formal and informal sector, the proportion of Black South Africans is higher in the informal sector.

Now I will compare worker characteristics between informal sub-sectors (see Table 2). In this particular comparison, I divide informal employment into dynamic and static sub-sector based on a hypothetical poverty line of R800/month. Given this definition, the following comparison holds true for the dynamic and static sub-sector. First, the dynamic informal worker is much more likely to be an employer while the static informal worker is much more likely to be an unpaid family worker. Dynamic workers are more likely to be involved in small scale manufacturing, such as dress-making, carpentry or metal working, or involved in other occupations that require a higher level of skill or capital, such as repair and maintenance, shebeen management (bars), or transportation services (Leslie et al., 1996). On the other hand, static workers are more likely to be involved in occupations or industries that require little skill or capital and only provide a subsistence wage, such as small spaza shops (retail shops), street hawking, hairstyling, and child day-care (Leslie et al., 1996). Dynamic informal workers are more likely to have higher levels of education than their static counterparts. In addition, males are more likely to be found in the dynamic sub-sector, while females are more likely to be found in the static sub-sector. Finally, a majority of informal white workers are found in the dynamic sub-sector, while a majority of informal Black workers are found in the static sub-sector.

HYPOTHESIS

Based on my interpretation of the literature and the mixed results presented by Kingdon and Knight (which seem to support the existence of a heterogeneous informal sector), I hypothesize

that the Structural Articulation theory is the most appropriate framework from which to consider informal employment in South Africa (2007). In order to test this hypothesis I first attempt to identify the dynamic and subsistence components of informal employment in South Africa. I will do this by dividing informal employment by race, geographic location, worker status, and industry sector. I then aggregate these divisions by the dynamic and static groupings suggested by the literature. Following this, I test the relation between each of these sub-sectors and formal sector employment to see if the results match the theoretical expectation of the structural articulation framework. If the subsistence sub-sector displays a significant, negative relation with formal employment, then this provides evidence that it is a residual sector that provides involuntary employment for those who can't access opportunities in the formal sector. Furthermore, if the dynamic sub-sector displays a positive relation to formal employment, then this provides evidence that the sector is connected to the formal sector and is capable of sustaining economic growth. If both of these relation hold up under empirical scrutiny, then it will provide new evidence that the structural articulation approach is a more appropriate framework to use when thinking about informal employment in South Africa.

In addition, the use of census data will also contribute to the empirical record because other studies that have attempted to identify components of informal employment mostly do so by using survey data (Florez, 2002 & Ranis and Stewart, 1999).

Table1: Formal vs. Informal Employment

2007 Community Survey

Worker Characteristic		Employment	
		Formal	Informal
Paid Employee	→	79.4%	17.4%
Self-employed	→	36.2%	60.5%
Finance Sector	→	83.6%	13.1%
Construction Sector	→	61.5%	34.1%
Professional Occupation	→	91.0%	5.8%
Elementary Occupation	→	42.5%	53.9%
Income > R800/month	→	54.6%	11.0%
Income < R800/month	→	2.6%	4.4%
Education ≥ HS Diploma	→	48.8%	6.2%
Education < HS Diploma	→	11.8%	7.2%
Male	→	22.0%	6.3%
Female	→	13.4%	6.0%
Black	→	13.1%	6.7%
White	→	42.6%	3.3%

Table 2: Informal Employment Sub-sectors

2007 Community Survey

Informal Worker Characteristic		Sub-sector*	
		Dynamic	Static
Informal Poverty Line (R800/month)	→	45.6%	48.2%
Informal Unpaid Family Worker	→	18.5%	79.3%
Informal Employer	→	50.1%	38.1%
Informal Retail Trade	→	42.7%	51.1%
Informal Transportation Services	→	63.4%	28.8%
Informal Agriculture Worker	→	31.6%	64.6%
Informal Craft Worker	→	57.1%	35.6%
Informal Worker Education ≥ HS Diploma	→	30.0%	59.7%
Informal Worker Education < HS Diploma	→	52.6%	42.3%
Informal Male Workers	→	52.6%	40.2%
Informal Female Workers	→	38.8%	56.0%
Informal Black Workers	→	42.2%	52.7%
Informal White Workers	→	72.8%	9.3%

*Informal employment divided into sub-sectors along R800/month poverty line.

CHAPTER 3: EMPIRICAL MODEL

In her study of informal employment in Columbia, Florez uses time-series data to explore the relation between the dynamic and static informal sub-sectors and overall economic performance. She finds evidence of counter-cyclical behavior in the static sub-sector and pro-cyclical behavior in the dynamic sub-sector. Although South Africa does not have a good set of time-series data to test the relationship between formal and informal employment across time, South Africa Statistics does provide cross-sectional data that can be used to test the relation between formal and informal employment across space. If the informal, dynamic sub-sector displays a significant, positive relation to formal employment, it suggests that the sub-sector is connected to the formal sector in a way that allows for potential growth. Likewise, if the informal static sector displays a significant, negative relation with formal employment, it suggests that the sub-sector is not connected to the formal sector and is acting as a subsistence strategy for surplus labor that cannot find employment in the formal sector. In addition, if this hypothesis holds under empirical scrutiny, it also provides evidence that the Structural Articulation theory is a more appropriate approach to use when thinking about informal employment in South Africa.

MODIFIED LABOR DEMAND MODEL

To test this hypothesis, I use a modified labor demand framework to explore the relationship between formal employment and various sub-sectors of informal employment. Labor demand theory posits that the level of employment is a function of total output, labor costs (wage) and labor productivity (Hamermesh, 1993; Borjas, 2008; Borhat & Hodge, 1999). This model seems to provide an ideal framework through which to test the relationship between formal and informal employment. Since the employment level is already positioned as the dependent variable, the model can be modified fairly easily to test the relationship between formal and informal employment. The basic labor demand specification uses cross-sectional data to measure the relation between employment, output, wage and productivity. Natural log forms are often used to measure elasticities and increase the normality of variable distribution:

$$\ln E_i = a_0 + a_1 \ln Y_i + a_2 \ln W_i + a_3 \ln LP_i + e$$

where LnE_i is the natural log of total employment of firm i

LnY_i is the natural log of total output of firm i

LnW_i is the natural log of the wage bill of firm i

$LnLP_i$ is the natural log of labor productivity of firm i

In this basic labor demand framework, employment is expected to display a significant, positive relation with total output since firms that face higher levels of consumer demand are expected to demand more labor to help them meet this demand. On the other hand, employment is expected to display a significant, negative relation with wage since firms that face a higher wage bill are expected to use less labor in order to preserve profit levels. Finally, employment is expected to display a significant, positive relation with labor productivity since firms that enjoy higher levels of labor productivity are expected to produce more output at a lower cost. Consequently, this capacity will allow these firms to increase market share, which will lead to an increased demand for labor. Thus, labor productivity is expected to be positively correlated with overall levels of employment.

However, other studies show that this demand specification is very basic and that other factors, such as exports and location specific factors can also affect the level of employment (Feser & Isserman, 2006; Jenkins, 2006). Thus, it is not uncommon to add additional variables to the right-hand side if they are thought to affect the level of employment. In this particular study, I am interested in measuring the relationship between formal and informal employment. To do so, I will modify the previous equation by replacing the left-hand side with formal employment and adding various measures of informal employment to the right-hand side. In addition, I will also adopt the convention of transforming variables to their natural log form.

Unfortunately, South Africa Statistics does not provide cross-sectional data on employment, output, wage and productivity at the firm level; and although it is well known that estimating labor demand parameters over aggregated data may introduce bias to the parameters, the purpose of this study is not to specifically estimate labor demand at the firm level (Hamermesh, 1993). Instead, the purpose of this study is to but to explore the relationship between informal

and formal employment, through a labor demand framework, at the labor market scale. As such, suitable proxies must be substituted at a scale similar to a labor market region. In South Africa, this means finding proxy variables and estimating parameters at the municipal scale. When municipal boundaries were redrawn by South Africa's Municipal Demarcation Board in the early 2000s, many towns and townships were agglomerated into a single municipal entity. Because a substantial amount of commuting occurs between town and township, these new municipal boundaries actually serve as good proxies for labor market regions. However, an exception to this rule will be observed in South Africa's major metro regions, such as Cape Town, Johannesburg and Durban, where the built environment often sprawls across municipal lines. Implications of this will be discussed in the Spatial Dependence section. Furthermore, since this study seeks to establish a general relationship between formal and informal employment, the exact measurement of each labor demand parameter is not as important as its sign and significance.

Fortunately, South Africa Statistics does provide several variables at the municipal level that can be used as suitable proxies for output, wage and productivity. For example, I can proxy total output with total income since income is a subset of output. In addition, total municipal income represents a good proxy for labor market size, which should be positively correlated with levels of employment since larger labor markets require larger numbers of workers. Consequently, it is likely that a positive correlation exists between the two variables, and that each would have a similar, positive effect on employment. In the case of labor productivity, I can use a measure of educational attainment as a proxy. Specifically, I use the portion of municipal population that has attained a high school diploma or greater level of education. Because a well-known correlation exists between labor productivity and educational attainment, I believe that educational attainment will have a similar, positive effect on employment demand (Borjas, 2008).

Furthermore, to identify labor demand, I need a variable that affects labor supply and varies across my observations. I can proxy labor supply with number of births per household. The

rationale behind this proxy is less intuitive and requires some explanation. In a typical labor demand equation, wage is negatively correlated with labor demand. However, wage is determined simultaneously by labor supply and demand. Therefore, I cannot include wage in the equation. Instead, I must use another behavioral variable that affects only the decision to participate in the labor force, thus influencing labor supply. In a developing country, like South Africa, it is plausible that an increase in the number of births/household will increase the household reservation wage by inducing more mothers to stay home with their kids. This behavior will result in decreasing levels of labor supply. Since the births per household variable affects employment only through labor supply, it acts as a control in the model by capturing the effects of labor supply on employment. This ensures that the relationship between employment and the other right-hand side variables is attributable to the effects of labor demand.

Finally, to ensure that the effects of population size is accounted for in the relationship between formal employment and other right-hand side variables, total population is also included as a control variable on the right-hand side. Thus, with proxies and controls in place the model specification now becomes:

$$LnFE_i = a_0 + a_1LnI_i + a_2LnBHH_i + a_3LnHS_i + a_4LnPop_i + a_5LnIE_i + e$$

where $LnFE_i$ is the natural log of total formal employment in municipality i

LnI_i is the natural log of total income in municipality i

$LnBHH_i$ is the natural log of average births per household in municipality i

$LnHS_i$ is the natural log of the population with at least a HS diploma in municipality i

$LnPop_i$ is the natural log of total population in municipality i

$LnIE_i$ is the natural log of informal employment sub-sectors in municipality i

The most important relation in this model is the relation between formal and informal employment. It is through this relation that I will formally test the hypothesis that heterogeneity exists in the informal sector. To do this, I first divide informal employment by race, geographic location, worker status, and industry sector and then aggregate these divisions by the dynamic and static groupings suggested by the literature (Florez, 2002; Ranis & Stewart,

1999). I then include both the dynamic and static informal employment variables in the model to determine their relationship to formal employment. Thus, the informal employment variable noted above actually represents a family of informal employment variables that will be used in various specifications to test the existence of heterogeneity within the informal sector.

SPECIFICATION 1 – BASE MODEL

In my first specification, I leave informal employment as a single, aggregated variable so that I can test the average relationship between formal and informal employment. This approach will allow me to see which sub-sector, dynamic or static, dominates the relationship. Given South Africa's long history of restricting access to formal labor markets and retarding human capital development among the majority of its population, I suspect that the dominate relationship between formal and informal employment will be negative.

SPECIFICATION 2 – RACE

To confirm these suspicions, my second specification divides informal employment by racial groups (Black, Coloured, Indian/Asian, and White). If my suspicions are correct than informal Black workers will display a significant negative relationship to formal employment and the informal White workers will display a significant positive relationship to formal employment. Given South Africa's history, this result would not be surprising. Although, it would give evidence to the hypothesis that heterogeneous groups exist within the informal sector, even if it is distasteful that the static and dynamic sub-sectors are still divided along racial lines.

SPECIFICATION 3 – FORMER HOMELANDS

Likewise, in my third specification I interact informal employment with dummy variables that indicate whether a municipality used to be part of a former homeland area. I include these interaction terms to see if informal employment in former homeland areas has a different relationship to formal employment than informal employment in non-homeland areas. Again, given South Africa's history, I assume that informal employment in former homelands represents a static sub-sector while informal employment in non-homeland areas represents a dynamic sector. However, this assumption may be tenuous given the fact that rural-to-urban migration may have changed this relationship in recent years.

SPECIFICATION 4 – WORKER STATUS

In my fourth specification I divide informal employment by a worker status variable that divides employment into five worker categories: employer, paid employee, self-employed, paid family worker and unpaid family worker. In their study on informal employment in the Philippines and Thailand, Ranis and Stewart suggest that self-employed workers and family workers represent the informal static sub-sector, and that employers and paid contractors represent the informal dynamic sub-sector (1999). Consequently, I follow their lead by aggregating informal employers and informal paid employees into a dynamic sub-sector, and then aggregating informal self-employed workers, informal paid family members and informal unpaid family members into a static sub-sector. The dynamic sub-sector makes up 57% of total informal employment in 2007 and the static sub-sector makes up 43% of total informal employment in 2007 (see Table 8). If my divisions accurately identify the dynamic and static informal sub-sectors, then I expect the dynamic sub-sector to display a significant, positive relationship with formal employment and the static sub-sector to display a significant, negative relationship with formal employment.

SPECIFICATION 5 – ECONOMIC SECTOR

Likewise, in my fifth specification I divide informal employment by industry category and then aggregate these divisions into a dynamic industry sub-sector and static industry sub-sector. In their study, Ranis and Stewart also find evidence suggesting that informal dynamic industries include mining, utilities, manufacturing and transportation, while informal static industries include personal services and petty trading (1999). Again, I follow their lead by including informal mining, manufacturing, utilities, construction, transportation and finance in my dynamic sub-sector, and informal agriculture, trading and personal services in my static sub-sector. It seems plausible to assume that, even in the informal sector, entry to these dynamic industries would require a significant amount of start-up capital and skill. As such, the dynamic sub-sector is likely to include a greater concentration of business owners and skilled entrepreneurs. On the other hand, informal agriculture, trading and personal services are the informal static industries assumed in the literature to be open to unskilled workers for subsistence wages (Portes & Schauffler, 1993; Ranis & Stewart, 1999). One constraint to full employment in South Africa may be that territorial disputes, fierce competition and low

demand may prevent these sectors from absorbing all excess labor. According to my own calculations, the dynamic industry sector made up 29% of informal employment in 2007, while the static industry sector made up 32% of informal employment in 2007. In addition, approximately 38% informal workers did not specify or adequately define their industry category in 2007 (see Table 9). As a result, a large portion of informal employment is unable to be included in either the dynamic or static industry sub-sectors. However, this is a large portion of the informal sector and should be included to prevent bias in coefficient estimates. As such, I will include this group in the model as a separate “Undetermined” variable in order to insure that the entire informal sector is accounted for in the analysis.

SPECIFICATION 6 – INCOME LEVEL

In this final specification I divide informal employment by income levels as reported by South Africa Statistics. I then aggregate workers in lower and higher income levels into dynamic and static sub-sectors. The aggregation is based on South Africa Statistic’s proposed national poverty line. Using a “Cost of Basic Needs” approach, South Africa Statistics calculates an upper and lower bound poverty line using local price levels from 2000. The upper bound poverty line is calculated at R593 per month and the lower bound poverty line is calculated at R322 per month. South Africa Statistics describes the lower bound poverty line as an austere poverty line (Woolard & Leibbrandt, 2006). With reference to the upper bound poverty line proposed by South Africa Statistics, and in an effort to ease the computational burden of aggregating workers in various income brackets, I chose R800 per month as the dividing line between dynamic and static income levels.

Workers who earn less than R800 per month are included in the Static Worker Income Status. These workers are assumed to be negatively related to the formal sector because they report incomes levels close to or below the national poverty line. As such, they are likely to be those who cannot find formal sector employment and are forced to accept an informal subsistence strategy that does not allow for capital accumulation. On the other hand, workers who earn more than R800 per month are included in the Dynamic Worker Income Status. These workers are assumed to be positively related to the formal sector because they report incomes levels

well above the national poverty line and should be able to save in a way that allows for small amounts of capital investment. If these assumptions prove accurate under empirical scrutiny, then income level may prove to be a simple way to identify the dynamic and static sub-sectors within the informal sector. According to my calculations, the dynamic income category makes up 46% of informal sector employment, while the static income category makes up 54% of informal employment (see Table 10).

IDENTIFICATION STRATEGY

Although it would be ideal to use data from one time period, doing so creates endogeneity between the dependent and independent variables. Income, births per household, educational attainment and informal employment do help determine the level of formal employment, but the level of formal employment may also determine levels of income, births per household, educational attainment and informal employment in the same time period. For example, during a time of recession, it is logical to think that decreasing levels of formal employment would expand the number of workers that are forced to eke out a subsistence wage in the informal static-sub-sector. A common strategy used to reduce the effects of endogeneity is to substitute lagged endogenous variables on the right hand-side. Since formal employment levels from time period t will not simultaneously affect levels of income, births per household, educational attainment and informal employment from time period $t-1$, these lagged endogenous variables become exogenous by definition (Gujarati, 2003). However, preliminary analysis indicates that this temporally lagged version of the model does not hold up well to theoretical expectations (see Appendix – Table 13). This result is not entirely unexpected because I am using data from a developing country where the relationship between socioeconomic variables may not remain constant over time.

In addition, because of discrepancies between the formal/informal question asked in 2001 and 2007 and the response options given to survey takers, significant differences were reported in the levels of informal/formal employment between 2001 and 2007 (see Appendix – Figure 18). Because this discrepancy is a primarily a statistical artifact, the measure of informal and formal

employment is not directly comparable between 2001 and 2007. This is another reason why the temporally lagged labor demand model did not hold up well to theoretical expectations.

Thus, in an effort to decrease issues of endogeneity while maintaining the relationship between dependent and independent variables from the same time period, and in an effort to account for the discrepancies between formal/informal employment reporting between the two time periods, I have chosen to place my labor demand model in an instrumental variable framework. This method is a two-stage least square framework where I regress each endogenous right-hand side variable from time period t on all lagged endogenous right-hand side variables from time period $t-1$. For example, in the first stage income from time period t is regressed on all lagged endogenous variables from time period $t-1$, including income, births per household, educational attainments, and the appropriate informal employment variables (depending on specification). The fitted values from these first stage regressions are then used as independent variables in the second stage OLS regression (Gujarati, 2003):

$$\ln FE_{i07} = a_0 + a_1 \ln I_{iIV} + a_2 \ln BHH_{iIV} + a_3 \ln HS_{iIV} + a_4 \ln Pop_{iIV} + a_5 \ln IE_{iIV} + e$$

where $\ln FE_{i07}$ is the natural log of formal employment in municipality i (2007)

$\ln I_{iIV}$ is an instrumented variable of the natural log of total income in municipality i (2007)

$\ln BHH_{iIV}$ is an instrumented variable of the natural log of births per household in municipality i (2007)

$\ln HS_{iIV}$ is an instrumented variable of the natural log of educational attainment in municipality i (2007)

$\ln Pop_{iIV}$ is an instrumented variable of the natural log of total population in municipality i (2007)

$\ln IE_{iIV}$ is an instrumented variable of the natural log of informal employment in municipality i (2007)

Since South Africa Statistics collected all variables of interest during the 2001 Census and again during the 2007 Community Survey, I am able to implement this approach because I have comprehensive geographic coverage for two time periods. However, in order for this approach to be valid, I need some assurance that I've met the exclusion restriction for valid instruments. In other words, I need assurance that my instruments are both correlated with my endogenous variables and that my instruments only affect the dependent variable through my endogenous variables. A test of the first criteria can be conducted by observing the R^2 and overall P-stat values from each first stage regression. If the R^2 value has moderate explanatory power and the

P-stat is significant then my instruments are correlated with my variable of interest. In my case, the R^2 values from all first stage regressions ranged from .36 to .99 and the P-stat was significant every time (see Appendix – Tables 14-19). Consequently, I am confident that my instruments are correlated with my endogenous variables.

But I still need to test that my instruments only affect the dependent variable through my endogenous variables. I conduct an informal test of the exclusion criteria on each model by regressing the dependent variable on all endogenous variables and their instruments. In this case, the instruments are temporal lags of each endogenous variable. I then run a Wald test on all of the instrument coefficients to determine if they are collectively and significantly different from zero. If the instruments are not significantly related to the dependent variable then I would expect the test statistic to be insignificant. However, results from this test indicate that the instruments are collectively and significantly different from zero (at a 0.01 level or greater) in each model specification (see Appendix – Table 20). Thus, temporal lags alone do not fulfill the exclusion criteria for valid instruments. In this particular model it is likely that the temporal lag of educational attainment is preventing the instruments from meeting this criterion. In many of the regressions mentioned above the temporal lag of educational attainment is significantly related to formal employment. It is possible that this is the case because a worker's human capital from a past time period still influence his or her employability in the current time period. In addition, this same worker may have also gained additional on-the-job training that enhances the human capital and employability gained in a past period. As such, it is not surprising that educational attainment from 2001 is significantly related to formal employment in 2007.

However, to meet the exclusion criteria, the instrument should not directly affect formal employment in the current time period. To correct this issue, I replace the temporal lag of educational attainment as an instrument with a spatial, temporal lag of educational attainment. Moreover, I also add a spatial, temporal lag of income and births per household as instruments in order to run the Sargan's chi-squared test, a more formal test of the exclusion criteria. This

test is calculated after running the instrumental variable procedure for each model. It tests whether the instruments collectively over identify the endogenous variables. In other words, the test determines whether the instruments collectively explain the dependent variable directly in addition to explaining the endogenous variables. If the test statistic is insignificant, then it provides evidence that the instruments do not directly affect the dependent variable. Results from this procedure indicate an insignificant test statistic for each model specification (see Table 3). Thus, replacing the temporal lag of educational attainment with a spatial, temporal lag allows each model to meet the exclusion criteria for valid instruments.

Table 3: Exclusion criteria for instrument coefficients

H0: instrument coefficients collectively not different from zero

Model Specification*	Sargan Test	P-value
Base Model	0.4423	0.8016
Race	1.6751	0.4328
Homelands	0.8886	0.6413
Worker Status	1.4858	0.4757
Economic Sector	0.3495	0.8397
Income	0.0541	0.9733

*EduAttain01 replaced with wEduAttain01 as an instrument. | DV = formal employment.

SPATIAL DEPENDENCE

Because my data sets are a spatial cross-section based on the geographic distribution of South Africa’s municipalities, it is likely that spatial dependence may cause bias in the coefficient estimates through the influence of a spatially lagged dependent variable, or that the standard errors may be inefficient because of the influence of a spatially correlated error term. As such, it is prudent to test for spatial dependence in the model by calculating Moran’s I and Lagrange Multiplier tests for each model specification (see Table 4). Results of these tests indicate the existence of spatial dependence through the influence of a spatially correlated error term in every model specification, except the race specification. As such, these specifications also need to be embedded in a spatial error model to explicitly account for the effects of a correlated error term:

$$LnFE_{i07} = a_0 + a_1LnI_{iIV} + a_2LnBHH_{iIV} + a_3LnHS_{iIV} + a_4LnPop_{iIV} + a_5LnIE_{iIV} + \rho We + u$$

where $LnFE_{i07}$ is the natural log of formal employment in municipality i (2007)
 LnI_{iIV} is an instrumented variable of the natural log of total income in municipality i (2007)
 $LnBHH_{iIV}$ is an instrumented variable of the natural log of births per household in municipality i (2007)
 $LnHS_{iIV}$ is an instrumented variable of the natural log of educational attainment in municipality i (2007)
 $LnPop_{iIV}$ is an instrumented variable of the natural log of total population in municipality i (2007)
 $LnIE_{iIV}$ is an instrumented variable of the natural log of informal employment in municipality i (2007)
 ρWe is a spatially correlated error term
 u is an i.i.d random error term

One disadvantage of using municipal level data when measuring labor market outcomes is that the data do not always correspond with labor market boundaries. In addition, the municipal data sets are place of residence (not place of work) data. Both of these shortcomings mean that commuting flows are not always accounted for in my units of measurement. This inexact measurement could be the cause of the spatially correlated error term observed in the model specifications. However, there is good reason to believe that spatial dependence is primarily a problem around the metropolitan areas of Cape Town, Durban and Johannesburg. In the mid-1990s, the Municipal Demarcation Board re-drew the boundaries of all municipalities throughout the country. The reason for doing this was to ensure that the Apartheid system of separating town and township was done away so that the townships could receive better service delivery. As such, the Board decided to redraw the boundaries in such a way that town and township were contained in the same municipal boundary (<http://www.demarcation.org.za>). In terms of labor markets, it means that most municipal boundaries now better represent actual labor market boundaries since most commuting flows occur primarily between township and town. However, this is not necessarily the case with the major metropolitan areas where labor market boundaries and commuting flows still cross municipal lines. Regardless, to control this type of spatial dependence, I place the labor demand framework in R's spatial error model. This method allows me to account for the spatially correlated error term without having to go back to the drawing board in terms of data manipulation.

It is also important to note that testing for spatial dependence in R requires that variables be instrumented manually. This results in an inefficient error term. Correcting for this is somewhat

difficult in R and introduces a trade off in my modeling procedure. I can correct for spatial dependence in R, but am unable to account for a heteroskedastic error terms, or I can correct for heteroskedasticity in STATA but not account for spatial dependence directly. To account for both problems I will report results from both the spatial error model and the robust IV model side-by-side so that the reader can see how heteroskedasticity affects the standard errors in the spatial model.

DIAGNOSTICS AND TECHNICAL METHODS

To implement these fairly complex model specifications, I leveraged the computing power of several statistical packages, including STATA, R and GeoDa. To begin, I generated first stage regressions and predicted values in STATA and then transferred the data to R. Once in R, I used the predicted values from each model specification to run a second stage, OLS regression. As mentioned previously, this manual 2SLS approach causes the error term to be calculated inefficiently. As a result, studentized Breusch-Pagan test statistics indicated the presence of heteroskedasticity in each model specification (see Table 4). Furthermore, as mentioned earlier, spatial diagnostics also indicate the presence of a spatially correlated error term in every model specification, except the race specification.

Table 4: Diagnostics for Heteroskedasticity & Spatial Correlation

Manual 2SLS Framework from R

Model Specification	BP Statistic	Moran's I	Robust LM (error)	Robust LM (lag)
1. Base Model	46.361***	3.590***	8.816**	0.880
2. Race	86.798***	2.148*	2.339	0.074
3. Homeland	55.747***	2.694**	5.286*	0.109
4. Worker Status	72.496***	3.720***	9.325**	0.016
5. Sector	69.232***	3.370***	7.500**	0.007
6. Income	59.732***	3.050**	5.884*	0.000

***significant at 0.001 level, **significant at 0.01 level, *significant at 0.1 level

To correct for spatial dependence, I first generated a Queen weights matrix in GeoDa using a municipal shapefile provided by South Africa Statistics. I then use this weights matrix, as well as the predicted values from first stage regressions, to run specifications 1, 3, 4, 5, and 6 using R's GMM spatial error procedure ("GMerrorsar" command found in the "spdep" package).

However, after running these spatial error models, correcting for heteroskedasticity becomes

much more difficult. To compare the effects of heteroskedasticity, I transferred the data back to STATA and re-ran all specifications in a non-spatial, IV framework using the built-in, two-stage “ivreg” procedure. This procedure automatically corrects the inefficiencies created in the first stage and also allows for automatic calculation of robust standard errors. Consequently, I compare the result of the homoskedastic, non-spatial model to the result of the spatial error model to determine how heteroskedasticity affects the standard errors in the spatial model. As mentioned previously, there is a trade-off associated with this method. The non-spatial model does not account directly for spatial dependence in calculating the error term. On the other hand, the spatial error model accounts for spatial dependence, but does not correct for potential heteroskedasticity or the inefficiency generated from errors in variable calculation using predicted explanatory variables. Both results will be reported so the reader may observe for himself how this trade-off affects the results.

Lastly, to test for the presence of multicollinearity, I compared the R^2 values of the non-spatial IV model to auxiliary IV regressions for each regressor. If the R^2 value of an auxiliary regression exceeded the R^2 value of the original model, I then calculated the Variance Inflation Factor (VIF) to determine the presence of multicollinearity (see Table 5). These results indicate that the population variable introduces multicollinearity in each of the model specifications. Specifically, population is highly correlated with educational attainment in all model specifications. In addition, population is highly correlated with the informal employment variables in the base, worker status, economic sector and income models. The presence of multicollinearity via the population variable does not affect the coefficient results, but will affect the significance of the standard errors. However, not controlling for population creates an even more serious omitted variable bias that creates a false positive relationship between formal and informal employment. Thus, I chose to acknowledge the presence of multicollinearity and its effect on standard errors in order to avoid the more serious omitted variable bias that affects coefficient results. Furthermore, multicollinearity is also present in the homeland model because of the high correlation between homeland and non-homeland informal employment. I will discuss this in more detail in the Results section.

Table 5: Diagnostics for Multicollinearity

Instrumental Variable Routine from STATA

Variable	Model Specification	R² of Aux Model	R² of Base Model	Variance Inflation Factor
Population	Base	0.9500	0.9247	20.00
Population	Race	0.9503	0.9264	20.12
Population	Worker Status	0.9517	0.9210	20.70
Population	Income	0.9523	0.9425	20.96
Population	Industry Sector	0.9526	0.8619	21.10
Population	Homeland	0.9501	0.9345	20.04
HL Informal	Homeland	0.9937	0.9345	158.73
Non-HL Informal	Homeland	0.9818	0.9345	54.95

CHAPTER 4: DATA AND VARIABLES

In this section of the paper I provide summary stats and a brief discussion about each variable of interest in my model specifications. I hope this will give the reader a better sense of how these variables are distributed throughout the country and how they are related to the other variables of interest. However before doing this I would like to provide a brief discussion about data collection and manipulation.

GENERAL DATA CONSIDERATIONS

To test my hypothesis I use cross-sectional data from South Africa's 2001 Census and 2007 Community Survey. The South Africa Census and Community Survey are collected every ten years on a five year staggered rotation. Both the census and the survey allow respondents to categorize their employment as formal or informal. As mentioned previously, formality is defined by business registration. If a worker's firm is registered, he is considered formally employed, and if a worker's firm is not registered, he is considered informally employed. Although there may be an incentive for respondents to not answer the formality question correctly, I can't imagine where this incentive might originate. I know of no government program that links registration enforcement to answers given by respondents, and most of the subsidy programs in South Africa are linked to measures of income, not employment.

In addition to collecting information on employment, the census and survey also collect data on other socioeconomic variables such as income, household size, number of children, age, sex, race, educational attainment, industry sector, occupation, worker status, migration, access to basic services, etc. The data are collected from individual respondents and then aggregated to various levels of geography such as small areas, main places, municipalities, provinces and the nation (see Appendix – Figure 17). The municipal level is the smallest scale for which comprehensive geographic coverage is freely available on the web. In addition, it is also the scale that best approximates regional labor market boundaries. As such, I plan to derive my datasets from Census and Community Survey data available for South Africa's 262 municipalities.

To access the data users should direct their browser to www.statssa.gov.za, click on the “interactive data” link, set up a free account, and then click on the “Nesstar” link to access Census and Community Survey data. The online program allows the user to view variable descriptions, cross-tabulate data, apply population weights, create variable subsets, and download datasets in Excel format. When aggregating data by municipality, it is important to ensure that the 2001 municipal category is chosen in both the Census and Community Survey so that the number of municipalities will be as closely matched as possible. Even so, the number of municipalities for which data are available differs slightly between the 2001 Census, 2007 Community Survey, and municipal shapefile. The main difference is that there are a few nature reserve municipalities for which data are not reported in the 2001 Census and 2007 Community Survey. As such, the user must add these missing municipalities back into the dataset either in Excel or ArcGIS for each variable set that is downloaded. Although this requires the replacement of null values with zero (since null values cannot exist when spatially analyzing a geographic dataset), it is not likely that these zero values will affect results much since few if any people actually reside or work in these nature reserves. Once these discrepancies are corrected, the data can be joined to the municipal shapefile in ArcGIS.

Once the data are joined, I transferred the shapefile to GeoDa to create a Queen weights matrix and conduct some exploratory analysis on each variables distribution. This was done on both 2001 and 2007 datasets, and the analysis indicated that formal employment, total income, educational attainment and informal employment were all non-normally distributed in both time periods, with large clusters of data centered around South Africa’s major urban centers (Johannesburg, Cape Town, and Durban). This type of distribution is not surprising given the nature of the data. Geographic data that includes cities and towns is never distributed normally across a region. However, normality is still an important assumption in OLS regression, and as such, I transformed all variables to natural log scale in order to improve the normality of their distributions.

Now I will turn to a brief discussion about how each variable of interest is related to the other variables of interest. Table 6 provides summary statistics for each variable of interest from the 2007 period, including formal employment, informal employment, total income, educational attainment, and average per household births. In addition, Table 7 provides correlation coefficients for each variable of interest from the 2007 period. This table reveals that all variables of interest are positively correlated with each other. Formal and informal employment are highly correlated with each other, as well as total income and educational attainment. However, formal and informal employment are only moderately correlated with average births per household and the former homelands dummy. Likewise, total income and educational attainment are highly correlated with each other, as well as formal and informal employment. However, total income and educational attainment are only moderately correlated with average births per household and the former homeland dummy. Conversely, average births per household and the former homelands dummy are highly correlated with each other, but only moderately correlated with formal employment, informal employment, total income and educational attainment. Population is highly correlated with formal employment, informal employment, total income and educational attainment. As mentioned earlier, the high correlations associated with population, and especially as it relates to educational attainment, may cause multicollinearity within each model.

Furthermore, Figure 1 provides a scatter graph of residuals and predicted values from the manual 2SLS regression used in R's spatial error model. The graph clearly shows a distinct pattern of heteroskedasticity caused by the 2SLS procedure. However, once the model is run through the non-spatial instrumental variable procedure in STATA, this problem is automatically corrected and the residuals become much more randomly distributed. Figure 1 also demonstrates this outcome.

However, even with this correction, the residuals, and especially the outliers, still display a subtle pattern heteroskedasticity. A few of these outliers are worth noting. For example, the moderate outliers on the left hand side of the graph are the major metropolitan areas in South

Africa (Cape Town, Durban, Johannesburg, etc.), and the more extreme outliers on the right and bottom of the graph represent nature reserves for which data are not often collected. The influence of these outliers may contribute to the existence of a spatially correlated error term, as demonstrated by the results of the Moran's I statistic and Robust Lagrange multipliers (see Appendix). If spatial correlation and non-spatial heteroskedasticity exist simultaneously within the error term, then correcting for spatial dependence will not be enough to produce efficient standard errors. As mentioned previously, since it is difficult to account for all these errors in a single software package, I choose instead to run both a spatial error routine and a robust IV routine and then present their results side-by-side.

Table 6: Summary Statistics

2007 (Observations = 262)

Variables	Mean	Std. Dev.	Median	Min.	Max.
Informal07	8.82	2.16	9.04	0.00	13.85
lninformal07	8.03	2.16	8.28	0.00	12.57
lnincome07	17.60	3.49	18.11	0.00	23.29
lnEduAttain07	7.42	2.13	7.71	0.00	12.89
InperHHbirths07	0.51	0.32	0.51	-1.16	1.19
lnPop07	10.92	2.14	11.30	0	15.18
homelands	0.41	0.49	0.00	0.00	1.00

Source: Author's calculations based 2007 Community Survey.

Table 7: Variable Correlation

2007 (Observations = 262)

Variables	lnFE07	lnIE07	lnI07	lnHS07	lnBHH07	lnPop07	homeland
Informal07	1						
lninformal07	0.93	1					
lnincome07	0.94	0.9	1				
lnEduAttain07	0.95	0.95	0.89	1			
InperHHbirths07	0.27	0.38	0.33	0.33	1		
lnPop07	0.91	0.94	0.89	0.93	0.41	1	
homelands	0.18	0.35	0.24	0.3	0.57	0.42	1

Source: Author's calculations based 2007 Community Survey.

At this point I would like to turn to a brief discussion about each variable of interest in order to give the reader a better understanding of how each variable is constructed and distributed across geographic space, as well as an understanding of any idiosyncratic characteristics within each variable. As mentioned previously, the unit of analysis in each variable is a single municipality. Although the total number of municipalities has varied slightly in recent years, my

analysis is based on the 262 municipalities that existed during the collection of the 2001 Census.

SPECIFIC VARIABLE DEFINITIONS

In this section I will provide a description of each variable used in the analysis. I will also discuss calculations involved in creating each variable as well, as well as other data considerations such as size and distribution.

Informal07: This variable is the natural log of formal employment. It is the dependent variable of the analysis. The data were collected during the 2007 Community Survey when respondents were asked whether their firm was part of the formal sector (see Appendix – Figure 18). As mentioned previously, in South Africa, formality is defined by business registration. If a firm is registered with the government then its workers are in the formal sector. If a firm is not registered with the government then its workers are in the informal sector. In South Africa, formal sector employment is concentrated in urban centers and the resource-rich lands in the western part of the country (see Appendix – Figure 2).

Ininformal07 / Ininformal: This variable is the natural log of informal employment from the 2007 Community Survey and 2001 Census (respectively). The data were collected when respondents were asked to identify whether they or their firm was part of the informal sector. However, because of discrepancies between the formal/informal question asked in 2001 and 2007 and the response options given to survey takers, significant differences were reported in the levels of formal and informal employment between 2001 and 2007 (see Appendix – Figures 3 & 18). Because this discrepancy is a primarily a statistical artifact, the measure of informal and formal employment is not directly comparable between 2001 and 2007. This is another reason why the temporally lagged labor demand model did not hold up well to theoretical expectations. It is also one of the reasons I decided to use an instrumental variable framework. However, despite the discrepancy in levels, the distribution of informal employment is consistent between the two time periods. Informal employment is concentrated in South Africa's urban centers as well as rural areas in the eastern part of the country that used to be

part of the former homeland system (see Appendix – Figure 3). This seems consistent to South Africa's history and the rural-to-urban migration that has taken place in recent years.

Inincome07 / Inincome: This variable is the natural log of total municipal income as calculated from the 2007 Community Survey and 2001 Census (respectively). The data are reported as the number of people in a range of different income bins. Total municipal income was calculated by taking the median value of each bin and multiplying it by the number of people in each bin. This value is then summed across the range of bins to get total municipal income. For mapping purposes, total municipal income can be divided by total municipal population to get income per capita. This data can then be mapped across South Africa's municipalities to reveal that income is concentrated in urban areas and the resource-rich lands of the west (see Appendix – Figure 4).

InEduAttain07 / InEduAttain: This variable is the natural log of educational attainment as calculated from the 2007 Community Survey and 2001 Census (respectively). In this particular study educational attainment is defined as the number of people in a municipality that have attained a high school diploma or greater level of education. Education levels are reported as the number of people in a range of bins. These bins range from those who have some or no primary education to those who have attained a PhD or greater. The educational attainment variable is calculated by summing the number of people in a municipality who have attained a high school diploma or greater. This variable seems to be concentrated in urban areas or municipalities that contain a university (see Appendix – Figure 5).

InperHHbirth07 / InperHHbirth: This variable is the natural log of the average number of births per household as calculated from the 2007 Community Survey and 2001 Census (respectively). The data are reported as a range of bins representing the number of times a woman has given birth. The bins are then populated with the number of women matching that descriptions. The average number of births per household is calculated by multiplying the number of women in each bin by the number of times they have given birth. This number is then summed across bins

and divided by the total number of households in each municipality to calculate average births per household. This variable seems to be concentrated in rural areas in the eastern part of the country that used to be part of the former homeland system (see Appendix – Figure 6).

Inpop07 / Inpop: This variable is the natural log of total municipal population as counted in the 2007 Community Survey and 2001 Census (respectively). Unsurprisingly, this variable is concentrated in large urban areas (see Appendix – Figure 11). Since many of the other variables used are reported in levels, the population variable is used to control for the effects of population size.

homeland / non-homeland: These are dummy variables that proxy the location of former homeland boundaries. The variables were calculated from provincial maps obtained from the Municipal Demarcation Board's website (www.demarcation.org.za – scroll over the “download” link and click on “maps & statistics”, then proceed to each provincial link and begin downloading individual provincial maps). Each map displayed the geographic boundaries of current municipalities and former homeland areas. If the location of a current municipality partially or completely overlapped the location of a former homeland area then it was assigned a one (1). If a municipality did not overlap a former homeland area then it was assigned a zero (0). The reverse procedure was followed to produce a non-homeland proxy. Following this method resulted in dummy variables that approximated, reasonably well, the location of former homelands (see Appendix – Figure 7). The variable's creation was necessary since South Africa Statistics no longer provides shapefiles of former homeland locations. Ultimately, I exported the variable to my data file and interacted it with my informal employment data to divide the informal sector by homeland location.

The previous variables represent those needed to run the basic labor demand framework that measures the relationship between formal and informal employment. However, in order to learn whether heterogeneous groups exist within the informal sector, it is necessary to divide informal employment by other socioeconomic variables. The following section will provide a

brief description of the variables produced by cross-tabulating informal employment with other selected variables.

Inihomeland07 / Inihomeland: This variable was calculated by interacting the homeland dummy with the natural log of informal employment from both time periods. It was created to divide the informal sector by homeland location so that I could determine the effect of informal homeland employment on formal employment. The experiment is meant to determine if the spatial legacy of Apartheid still affects the relationship between the informal and formal sectors.

Ininohmland07 / Ininohmland: This variable was calculated by interacting the non-homeland dummy with the natural log of informal employment from both time periods. It was created to divide the informal sector by non-homeland location so that I could determine the effect of informal non-homeland employment on formal employment. The experiment is meant to determine if the spatial legacy of Apartheid still affects the relationship between the informal and formal sectors.

Iniblack07 / Iniblack: This variable is the natural log of informal Black workers from both time periods. Data on racial groups is provided by the 2007 Community Survey and 2001 Census. The variable is calculated by cross-tabulating informal employment by the number of Black workers in each municipality over each time period. The variable's distribution corresponds well with the distribution of the overall Black population, both of which are concentrated in the eastern part of the country (see Appendix – Figure 12). The variable is meant to determine the relationship between informal Black employment and formal employment.

Inicolor07 / Inicolor: This variable is the natural log of informal Coloured workers from both time periods. Data on racial groups is provided by the 2007 Community Survey and 2001 Census. The variable is calculated by cross-tabulating informal employment by the number of Coloured workers in each municipality over each time period. The variable's distribution

corresponds well with the distribution of the overall Coloured population, both of which are concentrated in the western part of the country (see Appendix – Figure 13). The variable is meant to determine the relationship between informal Coloured employment and formal employment.

Iniindian07 / Iniindian: This variable is the natural log of informal Indian/Asian workers from both time periods. Data on racial groups is provided by the 2007 Community Survey and 2001 Census. The variable is calculated by cross-tabulating informal employment by the number of Indian/Asian workers in each municipality over each time period. The variable's distribution corresponds well with the distribution of the overall Indian/Asian population, both of which are concentrated to a few rural areas in the west and the Durban metropolitan area (see Appendix – Figure 14). The variable is meant to determine the relationship between informal Indian/Asian employment and formal employment.

Iniwhite07 / Iniwhite: This variable is the natural log of informal White workers from both time periods. Data on racial groups is provided by the 2007 Community Survey and 2001 Census. The variable is calculated by cross-tabulating informal employment by the number of White workers in each municipality over each time period. The variable's distribution corresponds well with the distribution of the overall White population, both of which are concentrated in urban areas and a few resource-rich areas in the western part of the country (see Appendix – Figure 15). The variable is meant to determine the relationship between informal White employment and formal employment.

Inidworkerstatus07 / Inidworkerstatus: This variable is the natural log of informal dynamic workers. It was calculated by cross-tabulating informal employment with worker status over each time period. Worker status is a variable that divides employment by various worker categories, including: employer, paid employee, self-employed, paid family worker and unpaid family worker. By cross-tabulating informal employment by worker status, I am able to divide the informal sector by these worker categories. Following the literature, I then aggregate

informal employers and informal paid employees into an informal dynamic worker category. This category makes up 57% of the total informal sector in 2007, most of which is composed on informal paid employees (see Table 8). If South Africa follows the same informal worker trends observed in other countries than this informal dynamic category should represent workers who use the informal sector as a growth strategy. The distribution of this variable is concentrated in urban areas and the resource-rich west (see Appendix – Figure 8).

Inisworkerstatus07 / Inisworkerstatus: This variable is the natural log of informal static workers. It was calculated by cross-tabulating informal employment with worker status over each time period. Worker status is a variable that divides employment by various worker categories, including: employer, paid employee, self-employed, paid family worker and unpaid family worker. By cross-tabulating informal employment by worker status, I am able to divide the informal sector by these worker categories. Following the literature, I then aggregate informal self-employed, informal paid family workers and informal unpaid family workers into an informal static worker category. This category makes up 43% of the total informal sector in 2007 (see Table 8)³. If South Africa follows the same informal worker trends observed in other countries than this informal static category should represent workers who use are forced to use the informal sector as a subsistence strategy. The distribution of this variable is concentrated around Johannesburg and in former homeland areas in the east (see Appendix – Figure 8).

Inidsector07 / Inidsector: This variable is the natural log of informal dynamic sector employment. It was calculated by cross-tabulating informal employment with an economic sector variable over each time period. The economic sector variable divides employment by various industry categories, including: mining, manufacturing, utilities, construction, transportation, finance, agriculture, retail & wholesale trading, and personal/social services.⁴ By cross-tabulating informal employment by economic sector, I am able to divide informal

³ The static worker status variable from 2007 also includes an “Undetermined” category containing 2% of the data. This category was created for responses that did not adequately define a worker status category.

⁴ Note that in the 2001 Census, economic sector data must be aggregated to 1-digit ISIC levels before it can be cross-tabulated with informal employment. This is possible using Census meta-data available at: www.statssa.gov.za.

employment by individual industry categories. Following the literature, I then aggregate informal mining, manufacturing, utilities, construction, transportation and finance into an informal dynamic sector category. This category makes up 29% of the total informal sector in 2007 (see Table 9). If South Africa follows the same informal industry trends observed in other countries than this informal dynamic category should represent sector employment in which workers are using the informal sector as a growth strategy. The distribution of this variable is concentrated around major urban areas (see Appendix – Figure 9). This is not surprising considering that the manufacturing sector is included in this variable.

Inisector07 / Inisector: This variable is the natural log of informal static sector employment. It was calculated by cross-tabulating informal employment with an economic sector variable over each time period. The economic sector variable divides employment by various industry categories, including: mining, manufacturing, utilities, construction, transportation, finance, agriculture, retail & wholesale trading, and personal/social services. By cross-tabulating informal employment by economic sector, I am able to divide informal employment by individual industry categories. Following the literature, I then aggregate informal agriculture, retail & wholesale trading, and personal/social services into an informal static sector category. This category makes up 32% of the total informal sector in 2007 (see Table 9). If South Africa follows the same informal industry trends observed in other countries than this informal static category should represent sector employment in which workers are forced to use the informal sector as a subsistence strategy. The distribution of this variable is concentrated around rural areas (see Appendix – Figure 9). This is not surprising considering that the agriculture sector is included in this variable.

Table 8: Informal Worker Status

2001-2007

Category	Percent of Informal Sector	
	2001	2007
Dynamic Worker Status	76%	57%
Static Worker Status	24%	43%

Source: Author's calculations based on 2001 Census and 2007 Community Survey.

Iniusector07 / Iniusector: This variable is the natural log of informal undefined sector employment. It is that portion of informal industry employment that was not adequately defined or unspecified by survey respondents. It makes up 38% of the informal sector in 2007 (see Table 9).⁵ Because the data are undefined it could not be added to the dynamic or static industry categories. However, because it also makes up a substantial portion of the informal sector, it was included as a separate variable to ensure that the informal sector was fully accounted for in the analysis. The variable was calculated by cross-tabulating informal employment with the economic sector variable over each time period, and then aggregating the “Other/Not Adequately Defined” and “Unspecified” categories. The distribution of this variable is concentrated in rural areas throughout the country (see Appendix – Figure 16).

Inidincome07 / Inidincome: This measure is the natural log of a variable which I call the Dynamic Worker Income Status. It is calculated by cross-tabulating informal employment by monthly income level, and then aggregating those workers whose monthly income is greater than a proposed national poverty line. Using a “Cost of Basic Needs” approach, South Africa Statistics calculates an upper and lower bound poverty line using local price levels from 2000. The upper bound poverty line is calculated at R593 per month and the lower bound poverty line is calculated at R322 per month. South Africa Statistics describes the lower bound poverty line as an austere poverty line (Woolard & Leibbrandt, 2006). With reference to the upper bound poverty line proposed by South Africa Statistics and in order to ease the computational burden of aggregating workers in various income brackets, I chose R800 per month as the dividing line between dynamic and static income levels. Workers who earn more than R800 per month are included in the Dynamic Worker Income Status. These workers are assumed to be positively related to the formal sector because they report incomes levels well above the national poverty line and should be able to save in a way that allows for small amounts of capital investment. The distribution of this variable is concentrated in urban areas and in rural areas in the southwest (see Appendix – Figure 10). In addition, the dynamic income category makes up 46% of informal sector employment (see Table 10).

⁵ Because of discrepancies in the way informal employment was measured between 2001 and 2007, the large increase in the undetermined industry variable between 2001 and 2007 is most likely to be a statistical artifact.

Inisincome07 / Inisincome: This measure is the natural log of a variable which I call the Static Worker Income Status. It is calculated by cross-tabulating informal employment by monthly income level, and then aggregating those workers whose monthly income is less than a proposed national poverty line. Using a “Cost of Basic Needs” approach, South Africa Statistics calculates an upper and lower bound poverty line using local price levels from 2000. The upper bound poverty line is calculated at R593 per month and the lower bound poverty line is calculated at R322 per month. South Africa Statistics describes the lower bound poverty line as an austere poverty line (Woolard & Leibbrandt, 2006). With reference to the upper bound poverty line proposed by South Africa Statistics, and in order to ease the computational burden of aggregating workers in various income brackets, I chose R800 per month as the dividing line between dynamic and static income levels. Workers who earn less than R800 per month are included in the Static Worker Income Status.⁶ These workers are assumed to be negatively related to the formal sector because they report incomes levels close to or below the national poverty line. These workers are likely to be those who can’t find formal sector employment, and as a result are forced into an informal subsistence strategy that does not allow for capital accumulation. The distribution of this variable is concentrated in rural areas that were part of the former homeland system (see Appendix – Figure 10). In addition, the static income category makes up 54% of informal employment (see Table 10).

Table 9: Informal Sector Employment
2001-2007

Category	Percent of Informal Sector	
	2001	2007
Dynamic Economic Sectors	27%	29%
Static Economic Sectors	62%	32%
Undefined Economic Sector	11%	38%

Source: Author's calculations based on 2001 Census and 2007 Community Survey.

⁶ In 2007 the calculation of the static worker income status also included 6% of informal sector workers did not indicate their monthly income level.

Table 10: Informal Worker Income Status

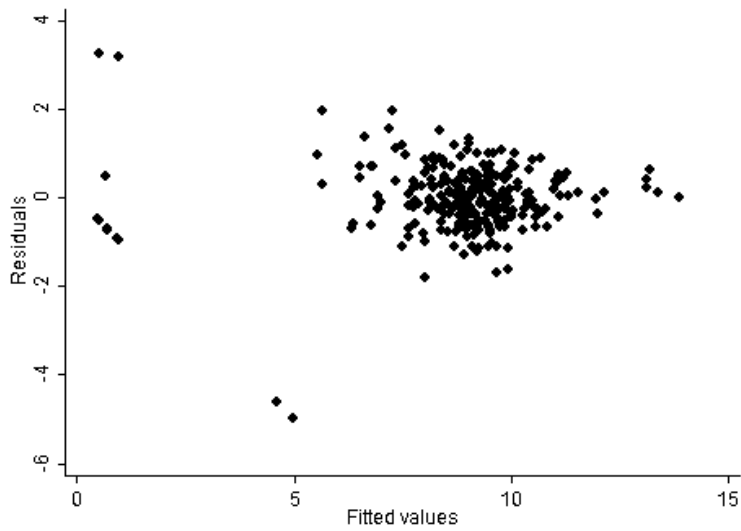
2001-2007

Category	Percent of Informal Sector	
	2001	2007
Dynamic Income Status	33%	46%
Static Income Status	67%	54%

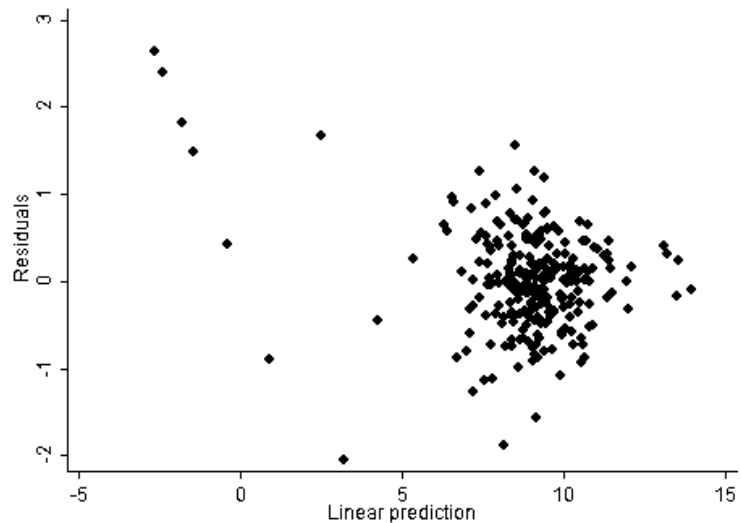
Source: Author's calculations based on 2001 Census and 2007 Community Survey.

Figure 1

Fitted values of formal employment from instrumental variable regression with uncorrected residuals



Fitted values of formal employment from instrumental variable regression with corrected residuals



CHAPTER 5: RESULTS

In this section I will report how the results of each model specification relate back to my original hypothesis that heterogeneous groupings exist in the informal sector and that the Structural Articulation perspective is the most appropriate theory to adopt when thinking about informal employment in South Africa. However, before I discuss results from individual model specifications, I will first discuss results from variables that are common to all specifications. Results from all model specifications are reported in Table 11.

LABOR DEMAND MODEL

First, total municipal income is positively and significantly related to formal employment in every model. This result is consistent across the spatial error and non-spatial IV models, except for the spatial error homeland model, indicating that overall heteroskedasticity is not severely affecting the size of the standard errors, and thus the significance of the coefficients, in the spatial models. This result also indicates that the variable conforms to theoretical expectations and that it is acting as an appropriate proxy for total output. In addition, the educational attainment variable is positively related to formal employment in all model specifications. However, it is only significant in the race and worker status model, although the t-values are above 1.0 in the base, homeland, and income models as well. Thus, the variable coefficients conform to theoretical expectations, but the standard errors are weakly significant. This is not surprising given the high level of correlation that exists between educational attainment and population. Because multicollinearity may be masking the significance of the educational attainment variable, I still think it is a reasonable proxy for labor productivity. Furthermore, the births per household variable is negatively related to formal employment in every specification, but is only significant in the homeland model. Although these results are a little more mixed, I think the variable is still a reasonable proxy for the influence of labor supply on formal demand considering the limited number of variables available to fill this role. In addition, because I am not directly interested in this variable's exact coefficient value, I think the results are satisfactory. Finally, the population variable is negatively related to formal employment in every specification, but is only significant in the base model specification. As mentioned earlier, this

variable is primarily to control the effect of population size in the labor demand framework. I am not directly interested in its coefficient values.

Overall, these results indicate that the variables meet the theoretical expectations of a labor demand model reasonably well. As such, I am satisfied that the base model is specified well enough to be able to accurately capture the general relationship between formal and informal employment. From this point forward, I will report the results of individual model specifications.

SPECIFICATION 1 – BASE MODEL

I first report the results from the base model specification. It is used to measure the average relationship between formal and informal employment. As observed from Table 11 (Base model (a) and (b)), the relationship between formal and informal employment is positive in both the spatial error model and robust, non-spatial model. However, neither of these results is statistically significant. The variable's insignificance is not surprising given the high degree of correlation between population and informal employment. In addition, the coefficient's insignificance may actually provide indirect evidence of heterogeneity within the informal relationship. If there is a sub-sector that displays a positive relationship to formal employment and another that displays a negative relationship, the aggregate effect may be to confound the overall relationship between formal and informal employment. However, the presence of multicollinearity between informal employment and population make it difficult discern this hypothesis. Further evidence for this hypothesis can only be obtained by dividing the informal sector into separate dynamic and static sub-sectors and then directly testing the relationship between formal employment and each sub-sector. This is the purpose of the remaining model specifications.

SPECIFICATION 2 – RACE

In specification 2, I divide informal employment by racial groups to see if there is significant heterogeneity along racial lines. I suspect there will be given South Africa's history. As mentioned previously, in this specification, spatial diagnostics did not indicate the existence of spatial correlation so I did not calculate a spatial lag regression. Results from this model indicate

that Coloured informal employment is negatively and significantly related to formal sector employment, while white informal employment is positively and significantly related to formal sector employment (see Table 11 – Race(b)). In addition, Black informal employment is also negatively related to formal employment, but the coefficient is not strictly significant, although it appears to be approaching significance since the t-value is above 1.0. This is not surprising given the fact that South Africa spent over a century attempting to exclude Black and Coloured South Africans from the formal labor market. The legacy of Apartheid policies does not disappear within the space of a few years. However, this result does prove that heterogeneous groups exist within the informal sector and that race is a significant identifying variable.

Along racial lines, the Structural Articulation perspective is a very appropriate way to think about informal employment. A century's worth of discrimination has served to erode the human capital base among Black and Coloured workers, as well as allow formal labor markets to evolve without consideration of Black and Coloured workers. This has made it difficult for current labor markets to absorb all the low-skilled labor in the country. In addition, South Africa's stringent labor regulations are also likely to prevent current markets from absorbing additional unskilled workers. For many informal Black and Coloured workers, the informal sector is likely to be acting as a subsistence strategy that substitutes for formal sector employment. The model's results support this intuition.

On the other hand, these same constraints do not hinder informal white workers. This sub-sector displays a positive relationship to formal sector employment, which means that it is a complement to the formal sector. It is likely that this sub-group has the capacity for capital accumulation and growth, and that many of the workers in this sector are there to avoid costly regulations and increase savings.

These results really are not all that surprising given South Africa's history. In addition, in terms of policy, the results are not very satisfying because at the very best the results are obvious and at the very worst they could lead to racial targeting. However, the results do prove the

existence of a dynamic and static sub-sector within the informal sector. In the next several model specifications, I will see if the dynamic and static sub-sectors can be identified along other socioeconomic lines that may be more useful to policy analysis. However, before doing this I would like to see if the spatial effects of Apartheid still act as a significant divider between the dynamic and static sub-sectors within the informal sector.

Table 11: Estimation Results

(a) = spatial lag model and (b) = robust IV model; absolute t-values in parenthesis

Variables	Base(a)	Base(b)	Race(b)	Homeland(a)	Homeland(b)
	lnFE07	lnFE07	lnFE07	lnFE07	lnFE07
lnI _{iv}	0.292*	0.364**	0.364***	0.300	0.348*
	(2.08)	(2.96)	(3.17)	(1.81)*	(2.48)
lnHS _{iv}	0.651	0.651	0.82*	0.475	0.545
	(1.36)	(1.48)	(1.74)	(1.06)	(1.43)
lnBHH _{iv}	-0.778	-0.715	-0.299	-0.796	-0.795*
	(1.22)	(1.23)	(0.90)	(1.38)	(1.82)
lnPop _{iv}	-0.389	-0.527*	-0.252	-0.214	-0.401
	(1.45)	(2.12)	(0.59)	(0.67)	(1.12)
lnIE _{iv}	0.328	0.352			
	(0.50)	(0.63)			
lnblack _{iv}			-0.146		
			(1.39)		
lnicolor _{iv}			-0.083*		
			(2.02)		
lniindian _{iv}			0.043		
			(0.77)		
lniwhite _{iv}			0.115*		
			(1.61)		
hl _{iiv}				0.579	0.468
				(0.94)	(0.99)
nhl _{iiv}				0.304	0.351
				(0.49)	(0.69)
homeland _{dummy}				-2.557	-1.064
				(3.32)***	(1.31)
Constant	0.868	0.884	0.089	0.365	0.635
	(0.32)	(0.32)	(0.09)	(0.44)	(0.68)
Observations	262	262	262	262	262
R ²	-	0.93	0.93	-	0.94

***significant at 0.001 level, **significant at 0.01 level, *significant at 0.1 level

Table 11 (continued): Estimation Results

(a) = spatial lag model and (b) = robust IV model; absolute t-values in parenthesis

Variables	Work Status(a)	Work Status(b)	Sector(a)	Sector(b)	Income(a)	Income(b)
	lnFE07	lnFE07	lnFE07	lnFE07	lnFE07	lnFE07
lnI _{iv}	0.272* (2.15)	0.322* (2.41)	0.487* (2.33)	0.542* (2.06)	0.273* (2.04)	0.304** (2.85)
lnHS _{iv}	0.850 (1.49)	1.049* (1.90)	0.261 (0.30)	0.557 (0.55)	0.596 (1.00)	0.528 (1.10)
lnBHH _{iv}	-0.325 (0.40)	-0.047 (0.07)	-0.506 (0.93)	-0.233 (0.47)	-0.373 (0.74)	-0.209 (0.62)
lnPop _{iv}	-0.294 (1.07)	-0.391 (1.28)	-0.279 (0.97)	-0.408 (1.05)	-0.230 (0.71)	-0.264 (0.97)
Indynws _{iv}	0.160 (0.50)	0.081 (0.26)				
lnstatws _{iv}	-0.106 (0.28)	-0.223 (0.52)				
Indyni _{iv}			0.476 (0.67)	0.381 (0.41)		
lnstati _{iv}			-0.913* (1.70)	-0.942 (1.58)		
lnunde _{iv}			0.713 (1.02)	0.561 (0.07)		
Indinc _{iv}					0.493 (0.87)	0.686 (1.51)
Insinc _{iv}					-0.245 (0.83)	-0.376* (1.72)
Constant		0.612 0.80	-0.080 (0.11)	-0.073 (0.07)	0.516 (0.79)	0.477 (0.83)
Observations	262	262	262	262	262	262
R ²	-	0.92	-	0.86	-	0.94

***significant at 0.001 level, **significant at 0.01 level, *significant at 0.1 level

SPECIFICATION 3 – FORMER HOMELANDS

This model interacts informal employment with two dummy variables that proxy the location of former homeland and non-homeland areas. Results display insignificant coefficients for both homeland informal employment and non-homeland informal employment (see Table 11 – Homelands(b)). This is probably due to the fact that these two sub-sectors are highly correlated with each other (see Appendix – Table 21). However, despite the lack of significant division between informal homeland and non-homeland employment, it is important to note that

legacy of Apartheid can still be observed by the influence of the homeland dummy on formal sector employment. This relationship is both negative and significant in the spatial error model. Again, this is not surprising given the fact that formal labor markets are not well-developed in these areas. In the next three specifications I will attempt to identify dynamic and static sub-sectors along socioeconomic lines that may be more useful for policy analysis.

SPECIFICATION 4 – WORKER STATUS

In this model specification I divide informal employment by worker status. As mentioned previously, I aggregated informal employers and paid employees into a dynamic sub-sector and informal self-employed, paid family member and unpaid family member into a static sub-sector. According to Ranis and Steward, employers and paid employees are likely to represent a dynamic class of workers that has adopted the informal sector as a low-cost growth strategy. Conversely, family workers and the self-employed are likely to represent a static class of unskilled workers that can't find formal sector employment (1999).

However, in South Africa, this model produces mixed results (see Table 11 – Worker Status (a) and (b)). According to theoretical expectations, the dynamic sub-sector displays a positive relationship to formal employment and the static sub-sector displays a negative relationship to formal sector employment, but these results are insignificant. Again, this is not surprising given the high degree of correlation between the population variable and both dynamic (0.98) and static (0.98) sub-sectors. If the results were significant, it would provide evidence that informal self-employment and family employment represent a substitute for formal sector employment, and that informal employers and paid employees represent a compliment to formal sector employment. However, since this relationship is not significant, I cannot derive evidence for the Structural Articulation theory from this model. However, antidotal evidence for dynamic and static sub-sectors can be found by looking at average monthly income levels of different worker status categories (see Table 12).

The table below shows that informal employer income is substantially higher than the income of other types of workers. As such, it is likely that informal employers may exhibit dynamic

characteristics because their higher income levels may allow for capital accumulation. However, I cannot determine this statistically because of the insignificant coefficient on my dynamic worker variable. In addition, disaggregating the informal sector by each worker status category does not add useful information because such a model results in insignificant coefficients on all informal worker categories. This is outcome may be the result of multicollinearity between population and so many informal employment variables. Furthermore, the paid employee category may also be adding to the insignificance of my dynamic variable. Since this group makes up over 50% of the informal sector and since paid employee income is much lower than employer income, there may be heterogeneity within the paid employee category. If this is the case then it would attribute to a less significant coefficient.

Table 12: Informal Worker Income
2007

Informal Worker Status	Avg Monthly Income	% Informal Emp	Avg Income Growth (2001-07)
Paid Employee	R 1,626	56.1%	68.2%
Paid Family Worker	R 1,226	4.7%	-13.0%
Self-Employed	R 2,675	29.0%	9.6%
Employer	R 3,923	1.1%	120.9%
Unpaid Family Worker	R 461	7.4%	-61.2%
Unspecified	R 1,383	1.7%	-

Source: Author's calculations based on 2001 Census and 2007 Community Survey.

In summary, it is likely that heterogeneity exists within my worker status variable because my dynamic and static sub-sectors do not display the same relationship to formal employment and because multicollinearity may be masking the true significance of each of these sub-sectors. If future studies are able to better identify statistically significant sub-sectors, then the worker status variable may be a useful tool way of targeting growth or poverty alleviation policy. For example, if it was known that certain workers displayed a negative relationship with formal employment, appropriate polices for this group may include poverty alleviation and human capital accumulation. On the other hand, if it were known that certain workers displayed a positive relationship to formal employment, then appropriate polices for this group may include business services and growth support. However, for the time being I cannot discern this

evidence from the informal worker status variable and need to move onto other socioeconomic divisions to identify such sub-sectors.

SPECIFICATION 5 – ECONOMIC SECTOR

In this specification I divide informal employment by economic sector to see if industry category is a useful way to identify the dynamic and static sub-sectors within the informal sector.

Following Ranis and Steward, I aggregate informal mining, manufacturing, utilities, construction, transportation and finance into a dynamic sub-sector and informal agriculture, trading and personal services into a static sub-sector (1999). As mentioned earlier, the dynamic sub-sector makes up 29% of informal employment and is assumed to represent informal industries where continued employment required substantial expertise and capital. As such, it is likely that this dynamic sub-sector compliments the formal sector by providing employers and entrepreneurs with a low-cost business strategy. On the other hand, my static sub-sector makes up 32% of informal employment and is assumed to represent informal industries that are open to unskilled workers. As such, it is likely that this static sub-sector is a substitute for a lack of formal sector jobs and does not have the capacity for sustained growth.

Unfortunately, this model also yields mixed results in South Africa (see Table 11 – Sector (a) and (b)). The static industry sub-sector displays a significantly negative relationship to formal employment in the spatial lag model, and a nearly significant, negative relationship to formal employment in the robust IV model (t-value = 1.58). This means that much of the petty trading and personal service activities often associated with the informal sector are actually a substitute for formal sector employment. As such, it is unlikely that such activities have the capacity to generate capital accumulation or growth. On the other hand, the dynamic industry sub-sector displays a positive relationship to formal employment across both models, but the relationship is not significantly different from zero. Again, the high degree of correlation between population and the dynamic sub-sector (0.98) may be responsible for the sub-sector's insignificance. Thus, I have successfully identified a static sub-sector that is statistically significant, but have failed to identify a dynamic sub-sector that is significant. Although a dynamic sub-sector is likely to exist among informal industries, I have not captured this group in

my model. If future studies are able to identify a statistically significant dynamic industry sub-sector, than industry categories may become more useful in targeting appropriate policy. However, for now this is not the case.

SPECIFICATION 6 – INCOME LEVEL

In my final specification I divide informal employment by income category and then test for heterogeneous sub-sectors. As mentioned previously, South Africa Statistics has recently proposed a national poverty line based on a “cost of basic needs” approach (Woolard & Leibbrandt, 2006). In my model I divide informal employment around this proposed poverty line. Informal workers whose monthly income is roughly above the poverty line are placed in a dynamic sub-sector and workers whose monthly income is roughly below the poverty line are placed in a static-sub sector.

When I test the relationship between each of these sub-sectors and formal employment, I find that dividing informal employment along a poverty line also produces mixed results (see Table 11 – Income (a) and (b)). For example, workers with incomes below the poverty line are significantly and negatively related to formal sector employment. This indicates that, for this group, informal employment is a substitute for formal employment. In addition, because this group’s income is below the poverty line it is very likely that there is no capacity for capital accumulation or growth. This is the group for which poverty alleviation support would be most appropriate. On the other hand, workers with incomes above the poverty line are positively related to formal sector employment. However, the result is marginally insignificant (t-value = 1.51). As in previous models, this is likely the case because of the high degree of correlation between population and the dynamic income category (0.98). If the result was strictly significant then it would indicate that informal employment was a compliment to formal sector employment for informal workers with monthly income levels above the poverty line. Because this group’s income is above the poverty line it is likely that there is capacity for capital accumulation and growth. Since the coefficient for this dynamic sub-sector is almost significant, it is also likely that some portion of this dynamic sub-sector uses the informal sector as a cost-

savings and growth strategy. In terms of policy, business services and growth support would be most appropriate for this sub-sector.

CHAPTER 6: DISCUSSION

The analysis presented above uses a geographic cross-section to clearly demonstrate the correctness of my original hypothesis – that heterogeneity exists within the informal employment sector of South Africa. Specifically, the analysis provides evidence of the existence of a dynamic sub-sector that is positively related to (compliments) formal sector employment and a static sub-sector that is negatively related to (substitutes for) formal sector employment. Although, it is important to note that the evidence for the existence of the static sub-sector is much stronger than the evidence for the dynamic sub-sector. This is the case for two reasons: first, the presence of multicollinearity between the population and informal employment variables may mask the significance of the dynamic sub-sector; second, my specific division of informal employment may not adequately identify the dynamic sub-sector. This second point bring me to another important finding of this study, namely, that accurate identification of these sub-sectors depends entirely upon the choice of variables and categories used to divide the informal sector. For example, in South Africa economic sector and income level provide better identification of the static sub-sector than do former homeland boundaries or worker status. Further refinement of the methods used to divide informal employment by these variables may also yield better identification of the dynamic sub-sector.

Furthermore, this study also demonstrates that the Structural Articulation approach, with its focus on typologies and functions, is a better way of conceptualizing the informal sector in South Africa than the simplistic notions espoused by the Dualistic or Alternative approaches. The existence of dynamic and static sub-sectors allows us to acknowledge the various roles that the informal sector plays in a developing economy. For many the informal sector provides a safety net that substitutes for a lack of formal sector employment and allows unskilled workers to eke out a subsistence wage. However, for others with the right combination of capital and skill, the informal sector provides a growth strategy that lowers costs and allows for capital accumulation. The cross-sectional results in this study are also akin to the time-series results Florez derived from her study of Columbia's informal sector and its relationship to overall economic performance (2002). In her study she demonstrates that the static sub-sector displays

counter-cyclical growth while the dynamic sub-sector displays pro-cyclical growth. If appropriate time series data were available in South Africa it is likely that the static sub-sector would grow during an economic downturn and shrink during an upturn. The reverse is likely to be true for the dynamic sub-sector. The positive/negative relationship between formal employment and dynamic/static sub-sectors is a cross-sectional manifestation of the temporal relationship uncovered by Florez (2002).

Finally, the existence of dynamic and static sub-sectors have important implications for policy. Because members of each sub-sectors have very different motivations and goals, a one-size-fits-all support policy for the informal sector is unlikely to help many of its intended beneficiaries. A better method would be to acknowledge the existence of dynamic and static sub-sectors and then craft a policy targeted to the needs of each sub-sector. For example, appropriate policies for the static sub-sector may include income support or unemployment insurance, depending on whether or not the beneficiary is in structural or stochastic poverty. On the other hand, appropriate policies for the dynamic sub-sector may include business services, de-regulation, micro-loans or other support policies that help promote growth. The important steps are to ensure that the dynamic and static sub-sectors are accurately identified and that policies are targeted to the needs and motivations of those in each sub-sector. This study provides evidence to suggest that a national poverty line may be an appropriate way to identify the dynamic and static sub-sectors in South Africa. In addition, the process of sub-sector identification and policy targeting also suggests that further research is needed to better identify the needs of the dynamic and static sub-sectors. For example, an analysis of poverty dynamics within the static sub-sector could help determine which members are in chronic or transitory poverty (Carter and Barrett, 2006). This type of information could then be used to better target appropriate policy interventions, such as the provision of an income subsidy for those in chronic poverty versus the provision of unemployment insurance for those in transitory poverty.

One limitation of this study is the use of cross-sectional data. Although this type of data can trace the formal-informal relationship across space, I am unable to provide direct evidence of this relationship across time, such as Florez does in her study of Columbia's informal sector (2002). In future years, as South Africa Statistics develops a more reliable time-series of local level statistics, it will be interesting to see if the various informal sub-sectors display the same relationship to overall economic performance as that found in Columbia and other Latin American countries.

CONCLUSION

Over the last several decades several theories have dominated debates about the nature of informal employment in developing countries. The dualistic theory claims that the informal sector is a substitute for formal employment. The alternative theory claims that the informal sector is a compliment to formal employment. Finally, the Structural Articulation theory claims that informal employment is both a substitute for and compliment to formal sector employment because heterogeneous groups exist within the informal sector. This study contributes to the literature by providing empirical evidence that heterogeneous sub-sectors do exist within South Africa's informal sector, and that the Structural Articulation theory, with its focus on dynamic and static sub-sectors, is the most appropriate framework to adopt when thinking about informal employment in South Africa . Furthermore, the study also adds to the literature by providing evidence that a national poverty line can be used to identify the dynamic and static sub-groupings within South Africa's informal sector. Finally, I suggest that the existence of heterogeneous sub-groupings implies the need to better target policy interventions for the informal sector.

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APPENDIX

In this section the reader will find those figures and tables referenced earlier in the paper. Many of the figures are presented as large map images. These were not included directly in the text to preserve the readability and flow of the paper. In addition, other figures and tables included are placed here because they are only indirectly related to the overall narrative of the study. The reader will find these figures and tables beginning on the next page.

Figure 2: Formal Employment
 2007 Community Survey & 2001 Census

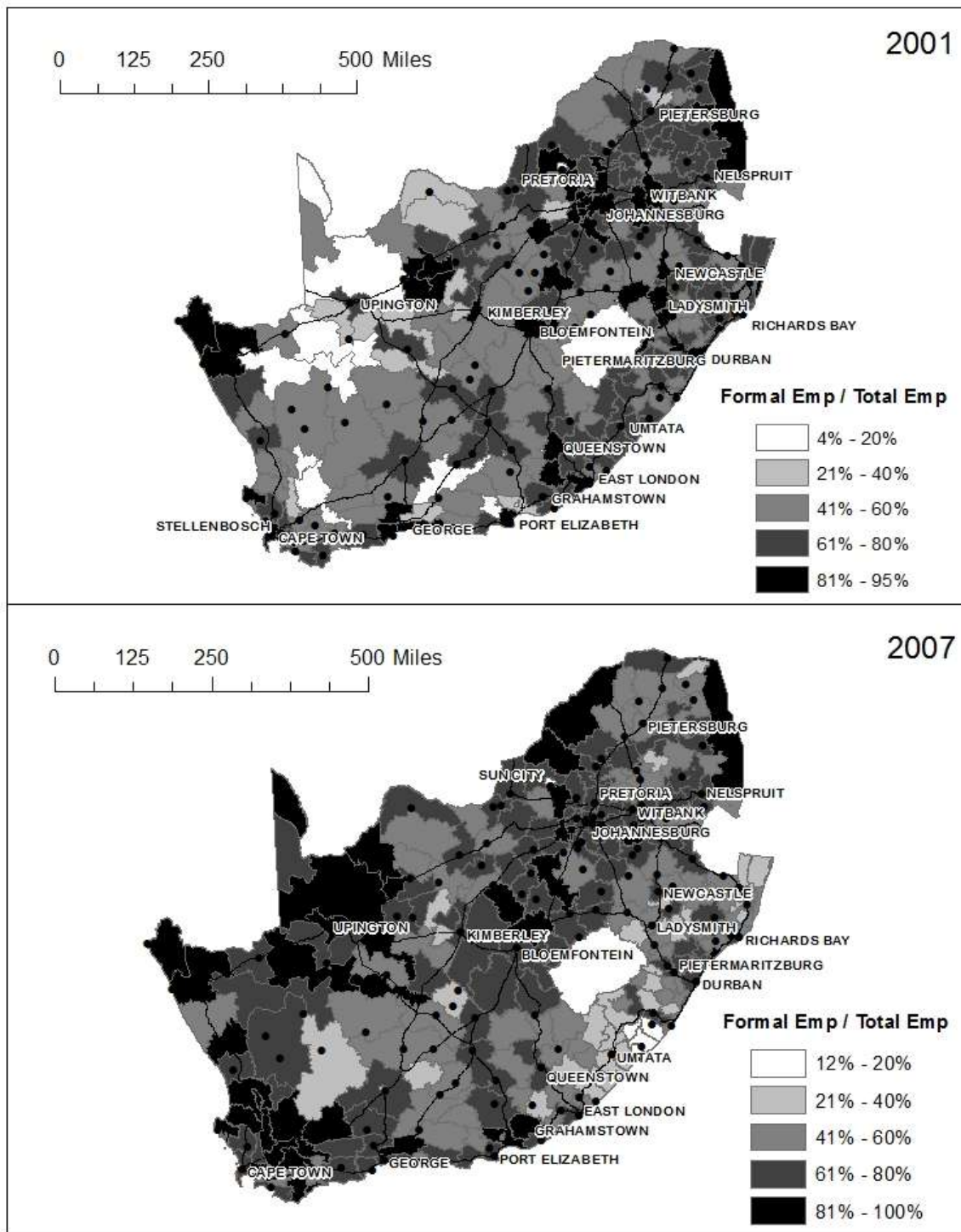


Figure 3: Informal Employment
 2007 Community Survey & 2001 Census

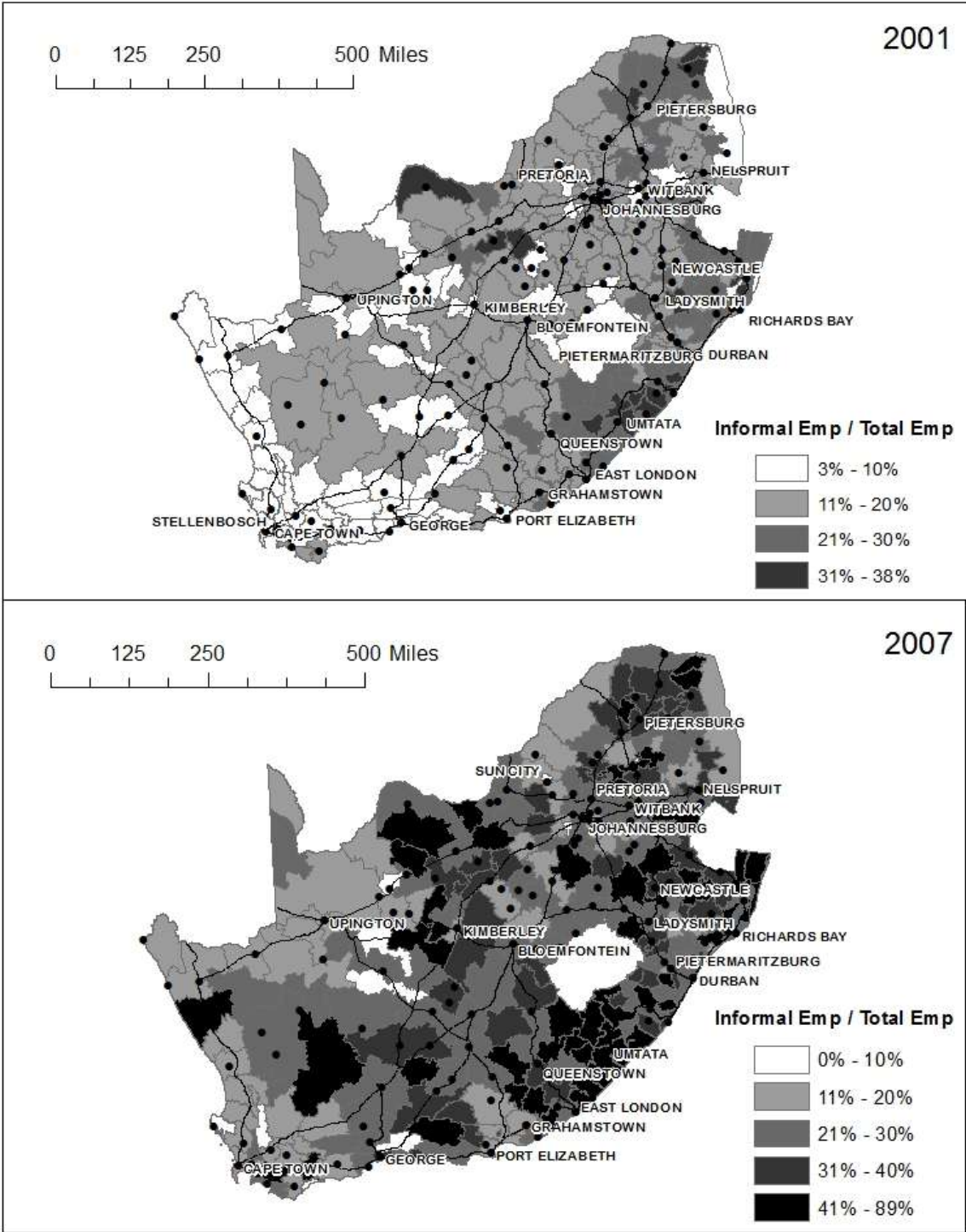


Figure 4: Income per capita

2007 Community Survey

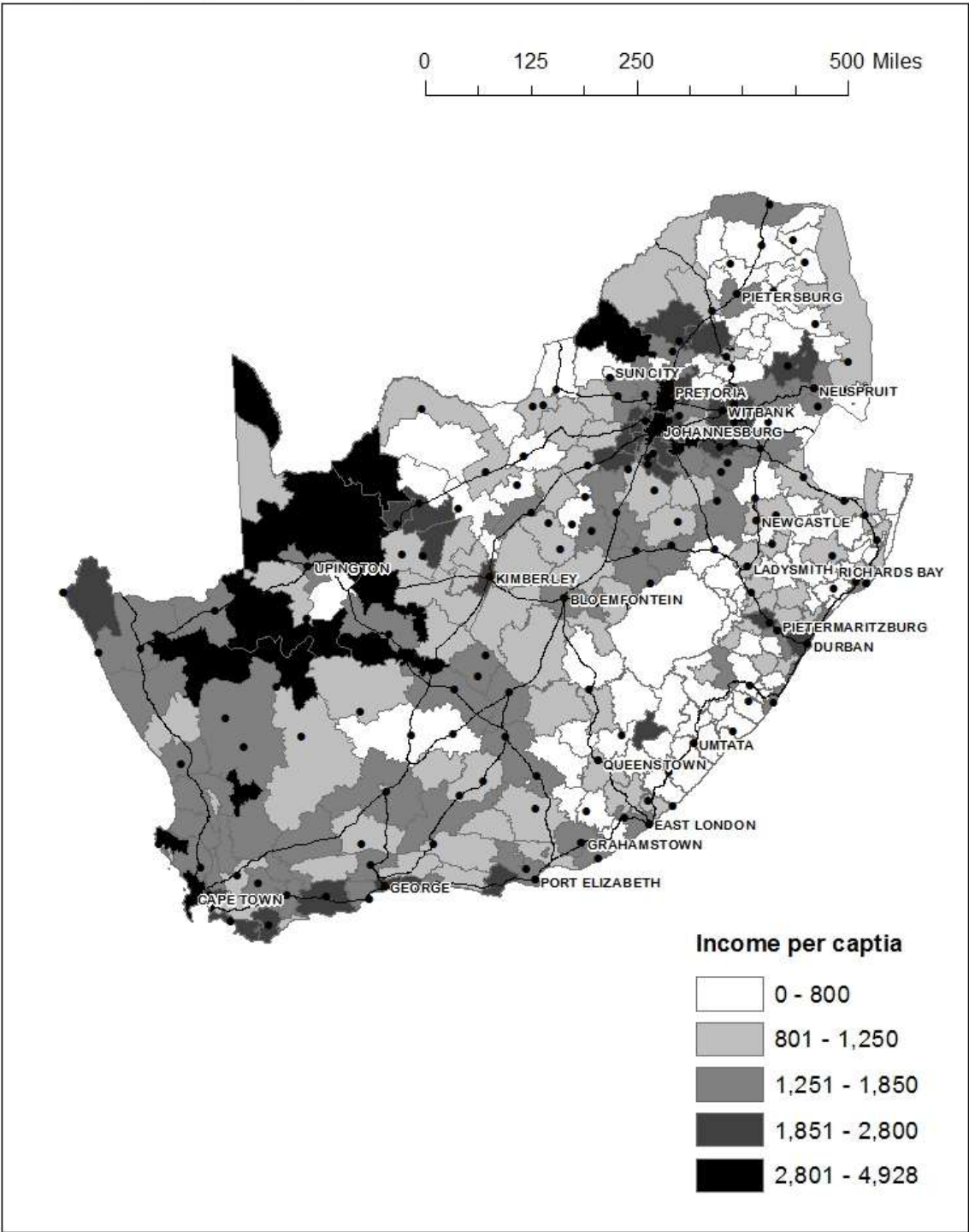


Figure 5: Educational Attainment

2007 Community Survey

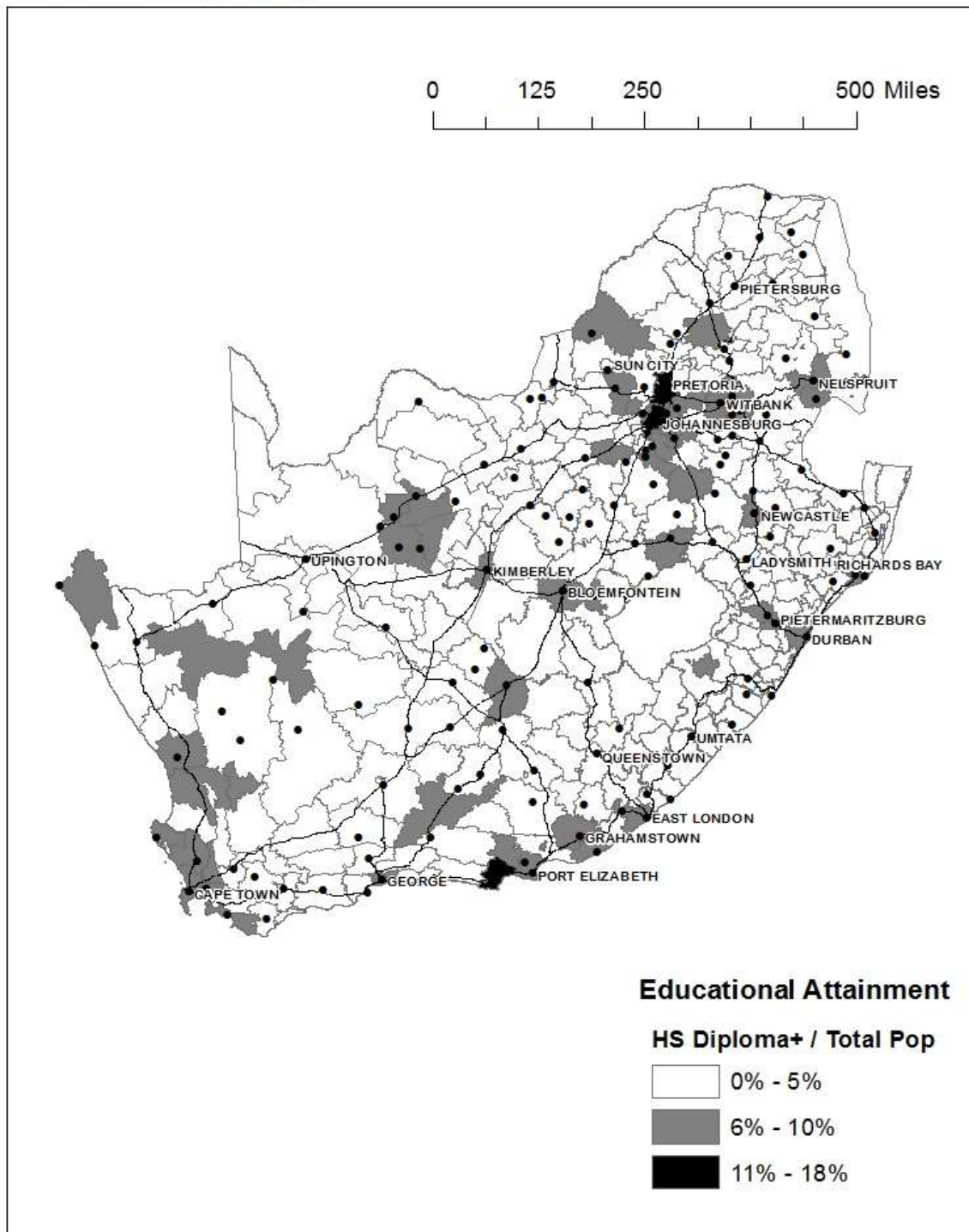


Figure 6: Average births per household
2007 Community Survey

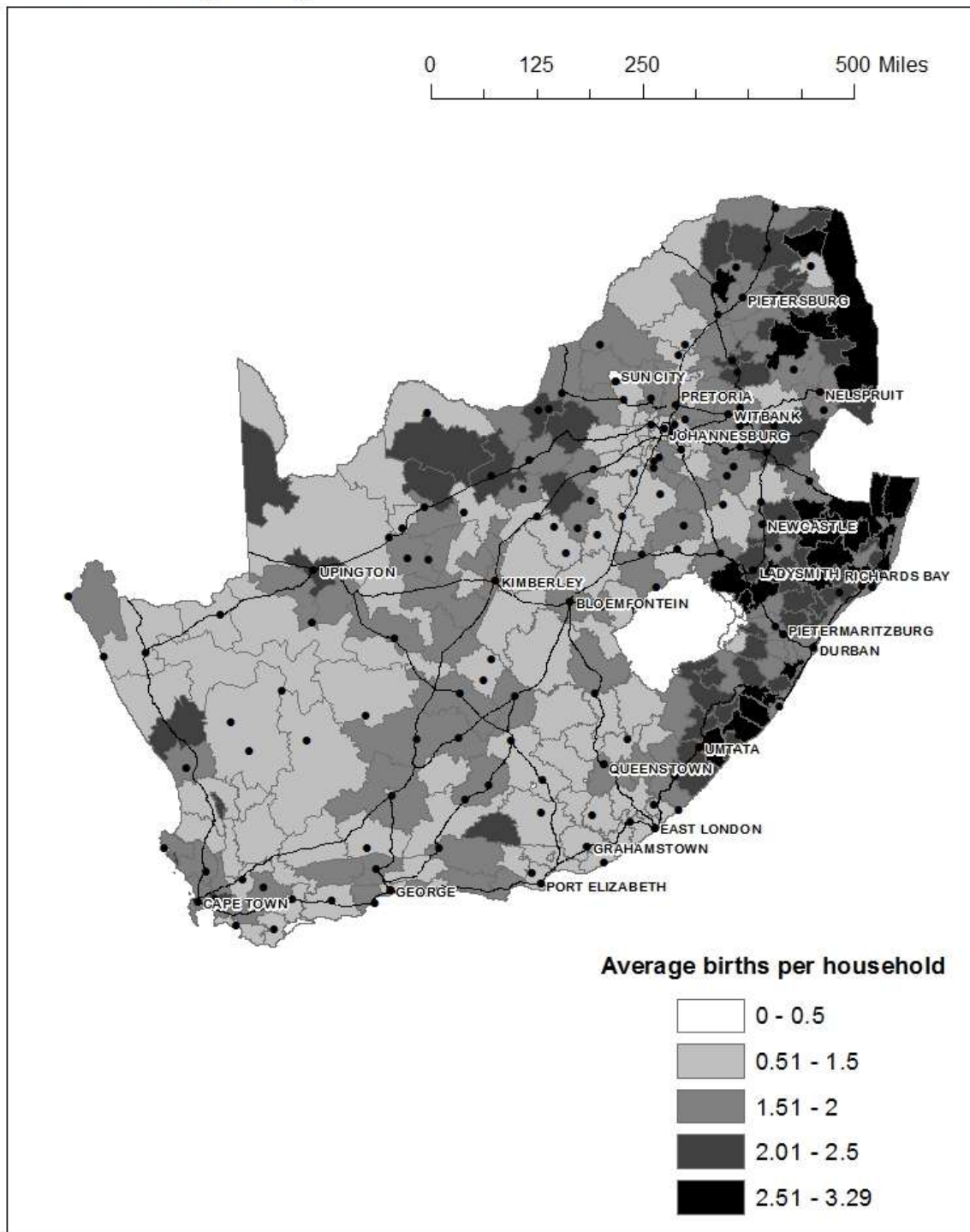


Figure 7: Former homeland proxy
Municipal Demarcation Board

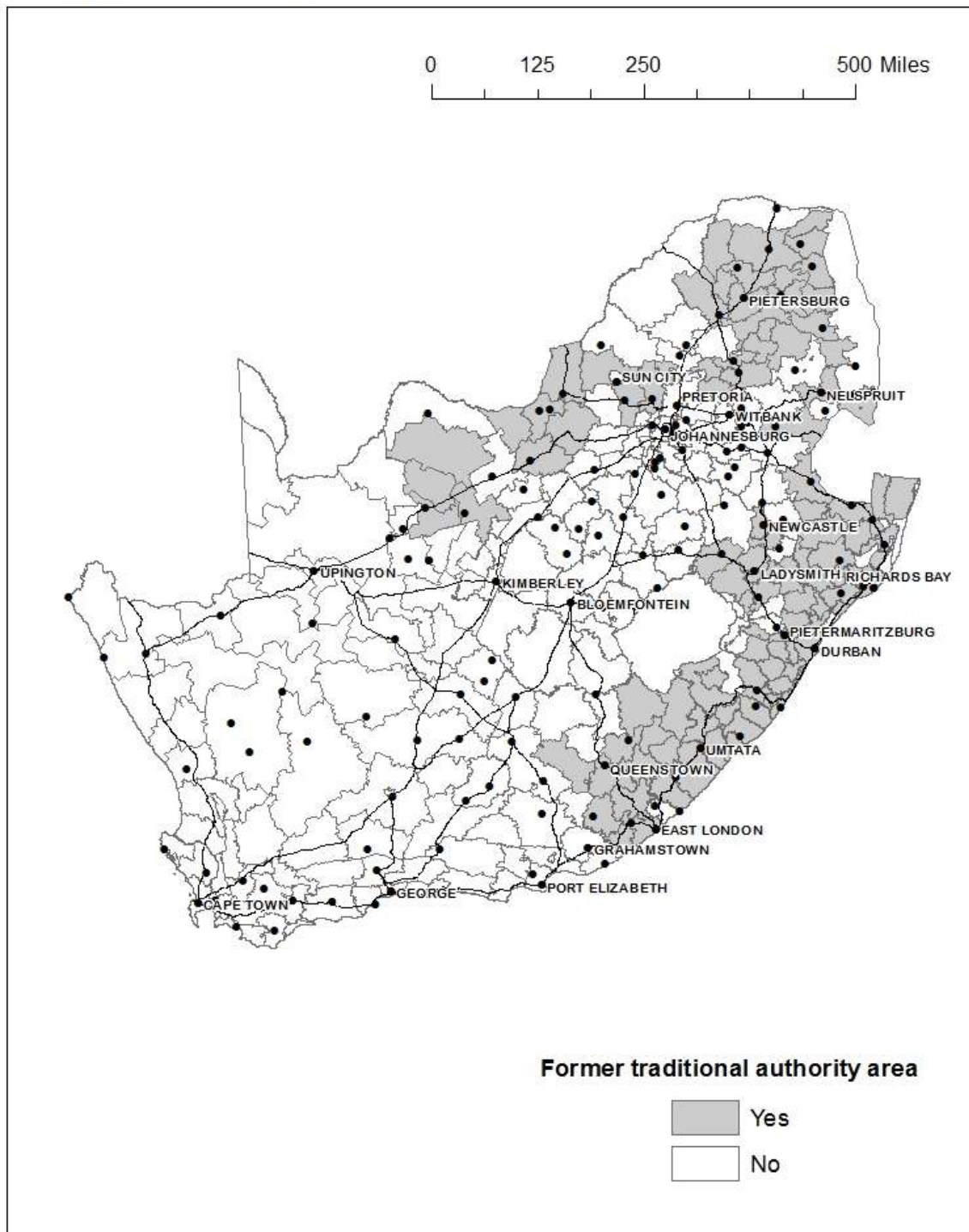


Figure 8: Informal Worker Status

2007 Community Survey

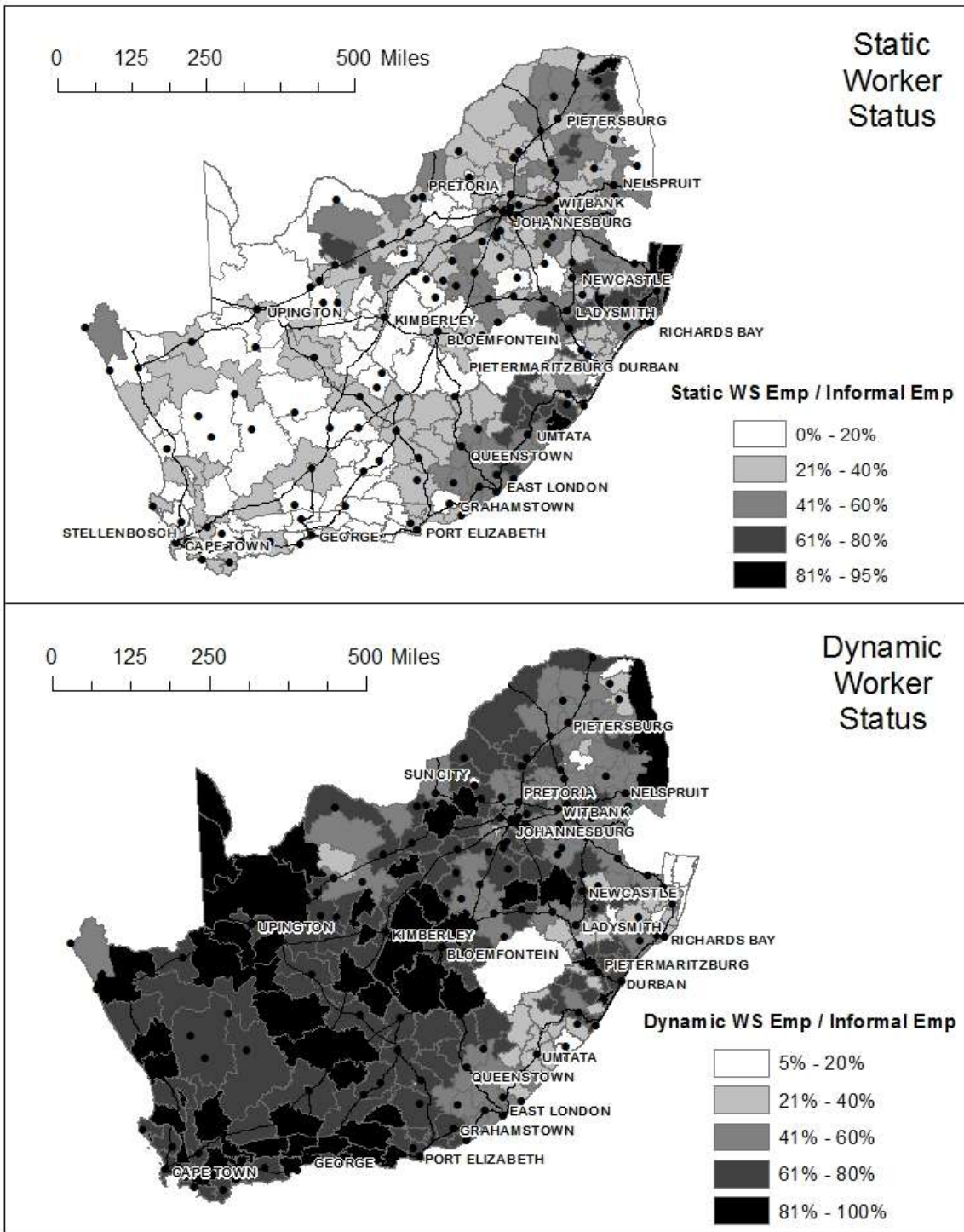


Figure 9: Informal Industry Employment
2007 Community Survey

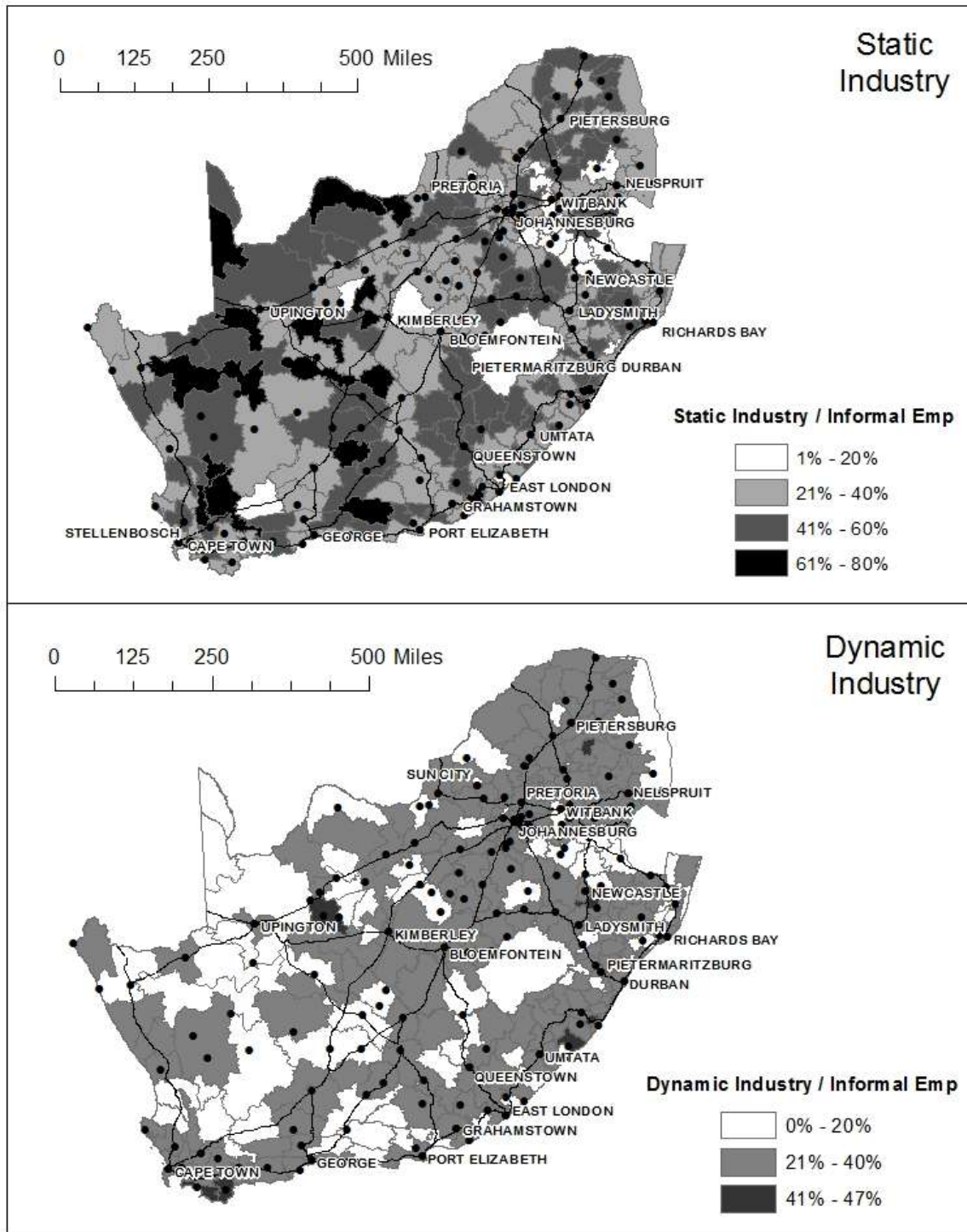


Figure 10: Informal Worker Income Status
 2007 Community Survey

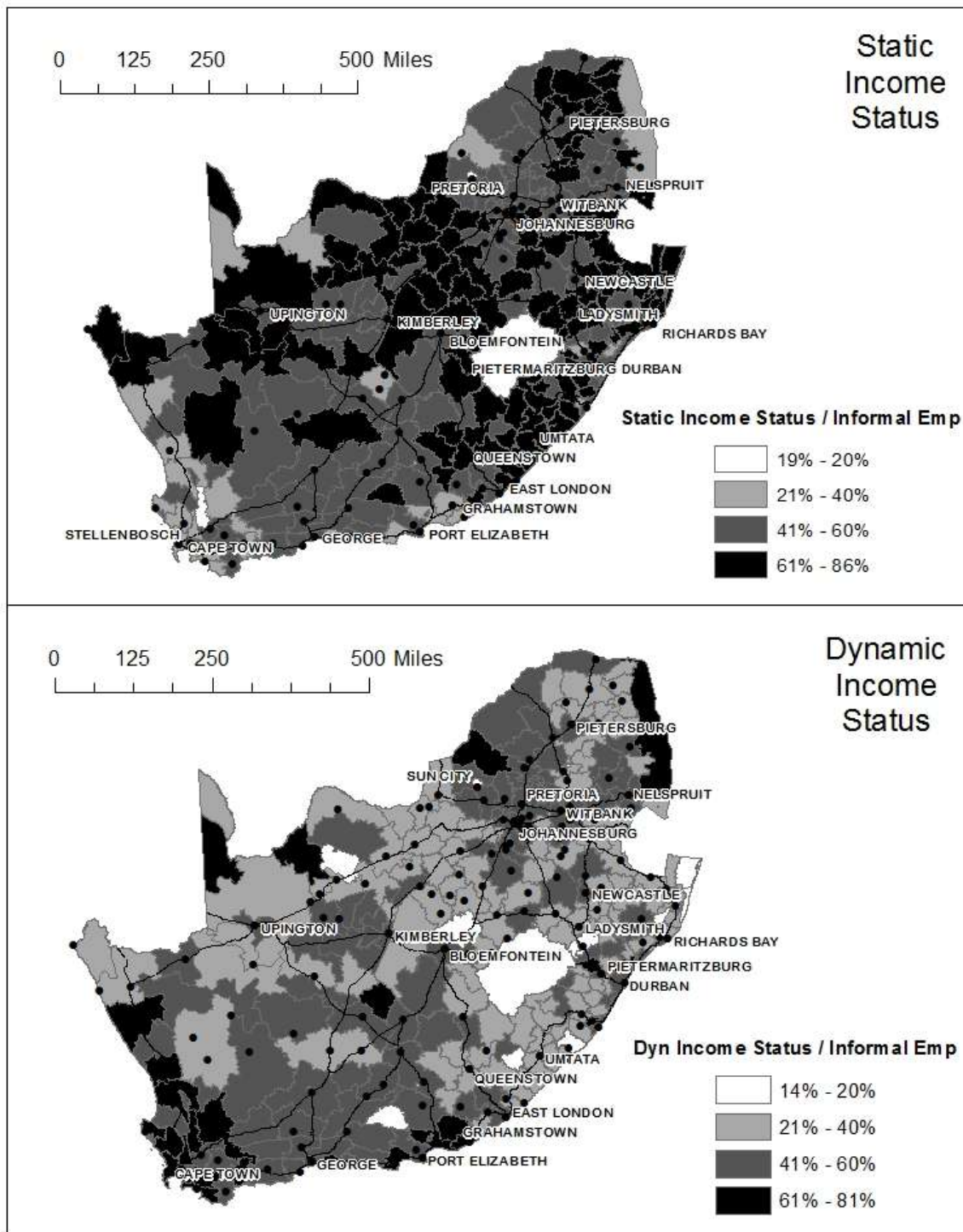


Figure 11: Population Density
2007 Community Survey

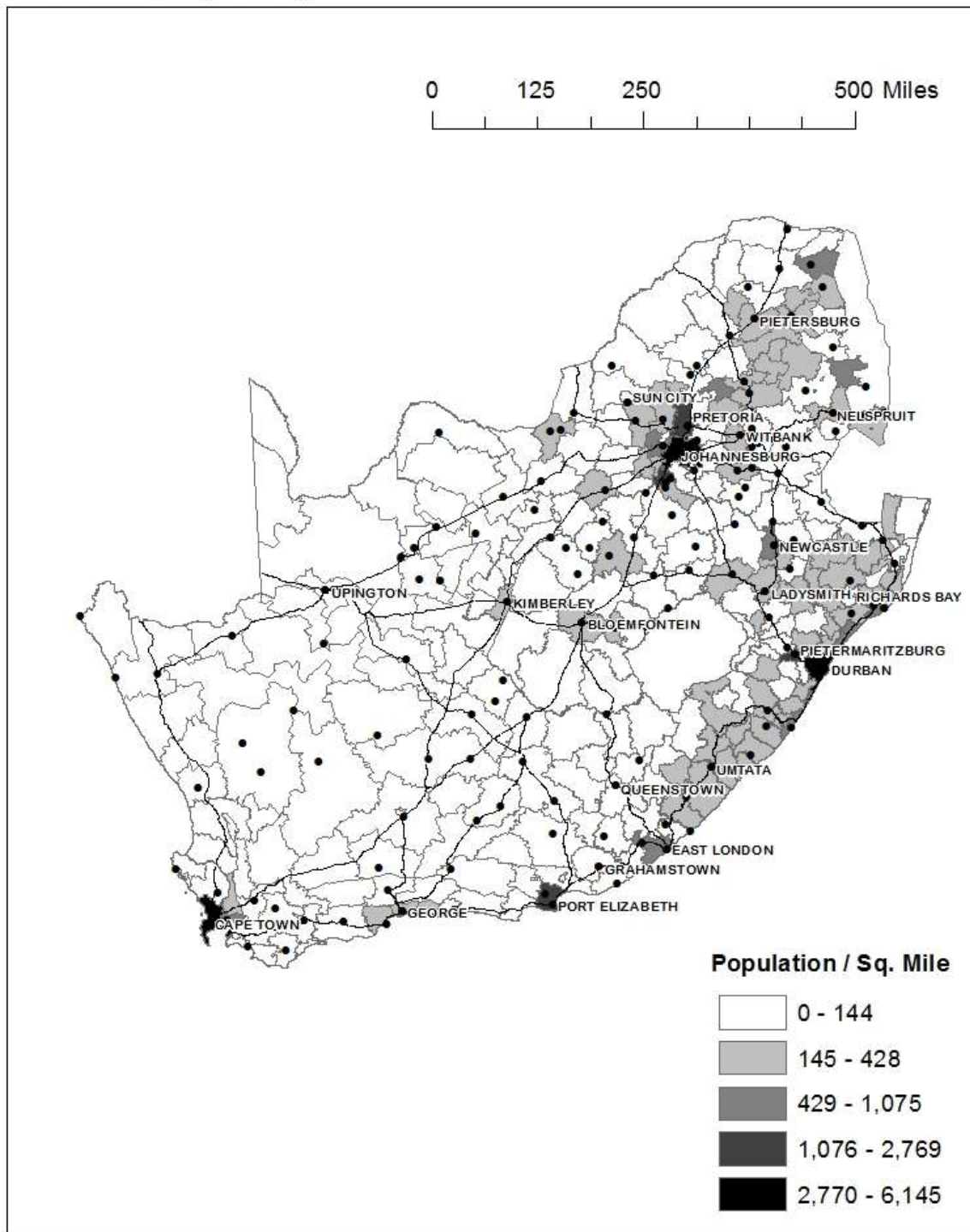


Figure 12: Informal Black Employment
 2007 Community Survey

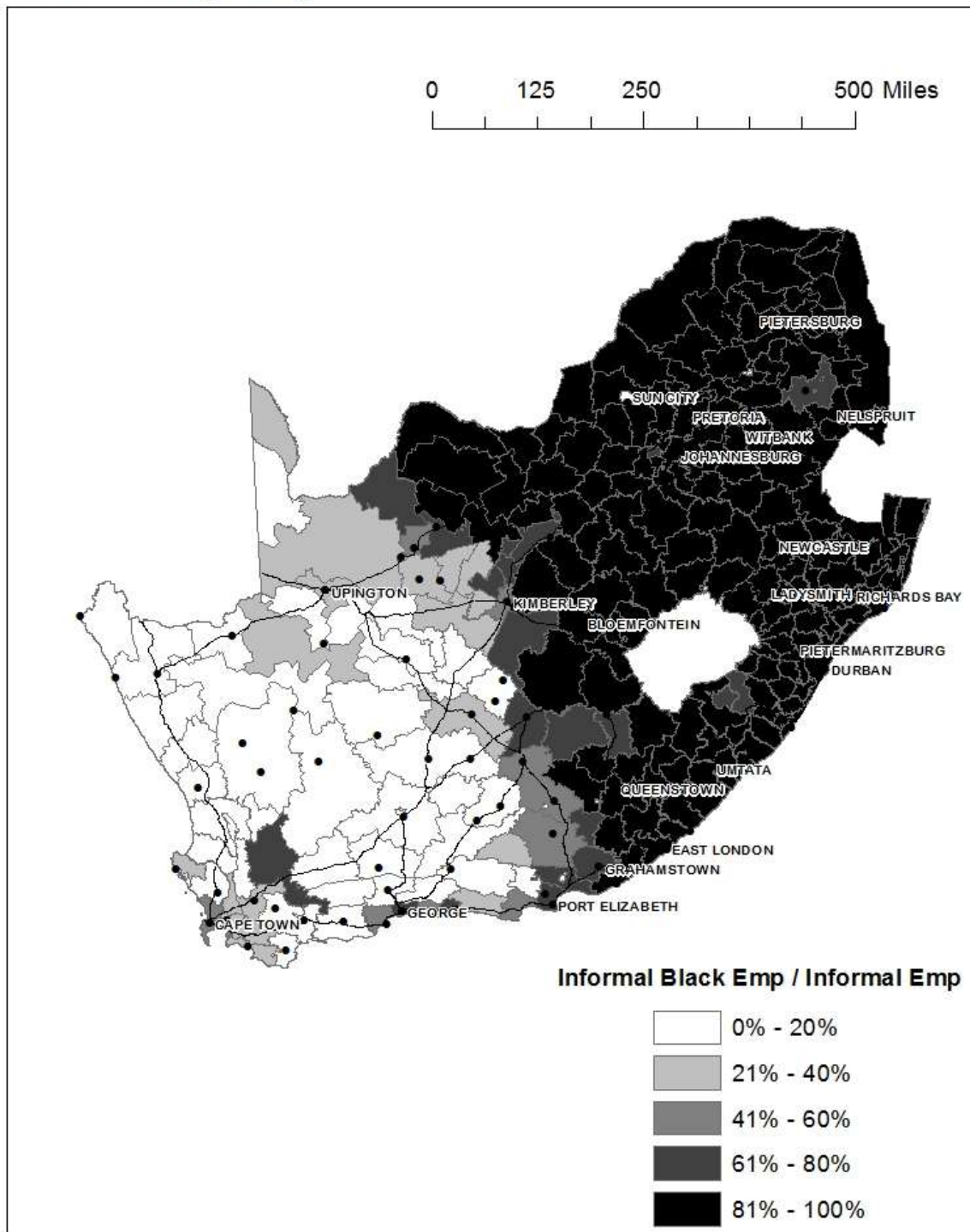


Figure 13: Informal Coloured Employment
 2007 Community Survey

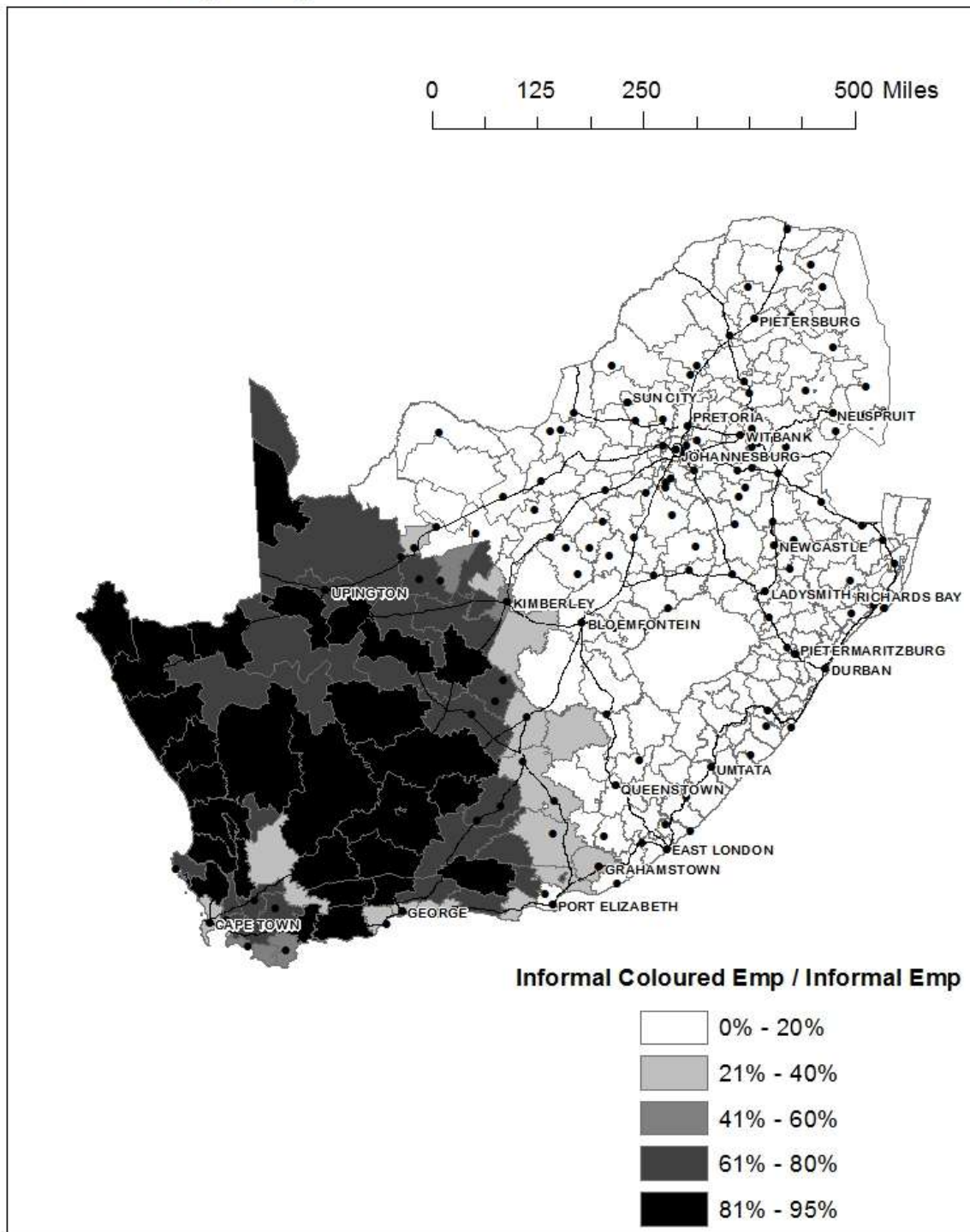


Figure 14: Informal Indian/Asian Employment
2007 Community Survey

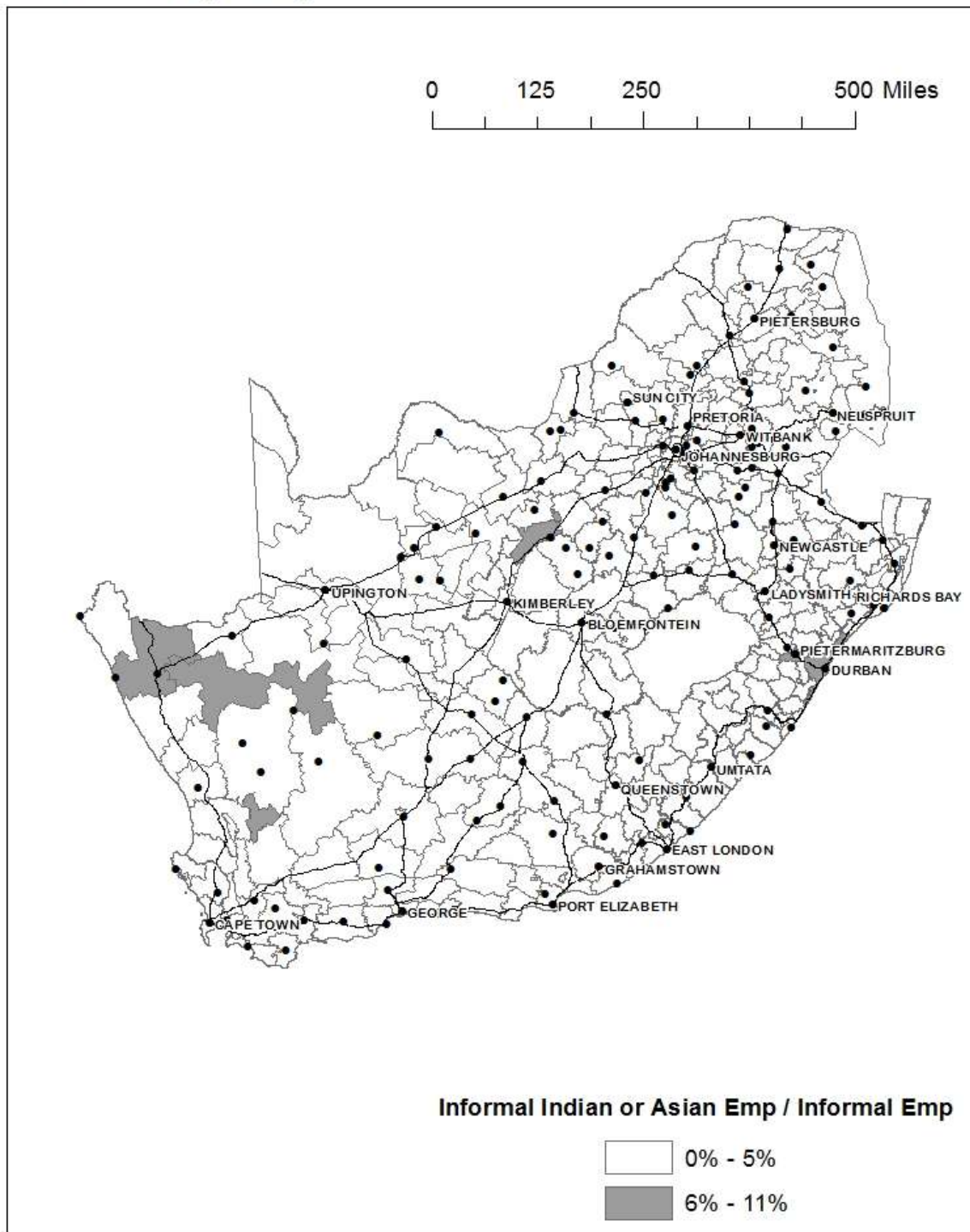


Figure 15: Informal White Employment

2007 Community Survey

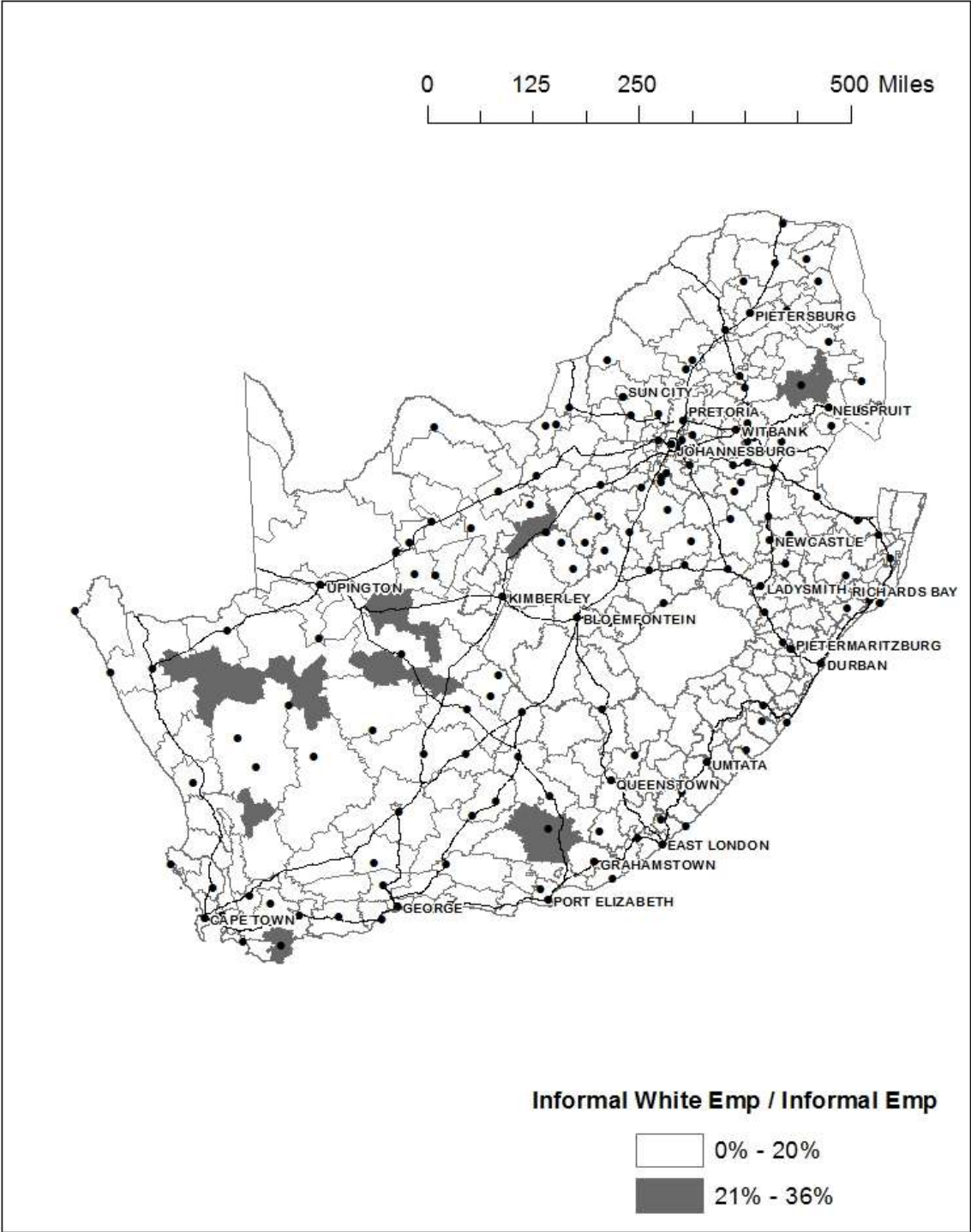


Figure 16: Informal Undetermined Industry Employment
 2007 Community Survey

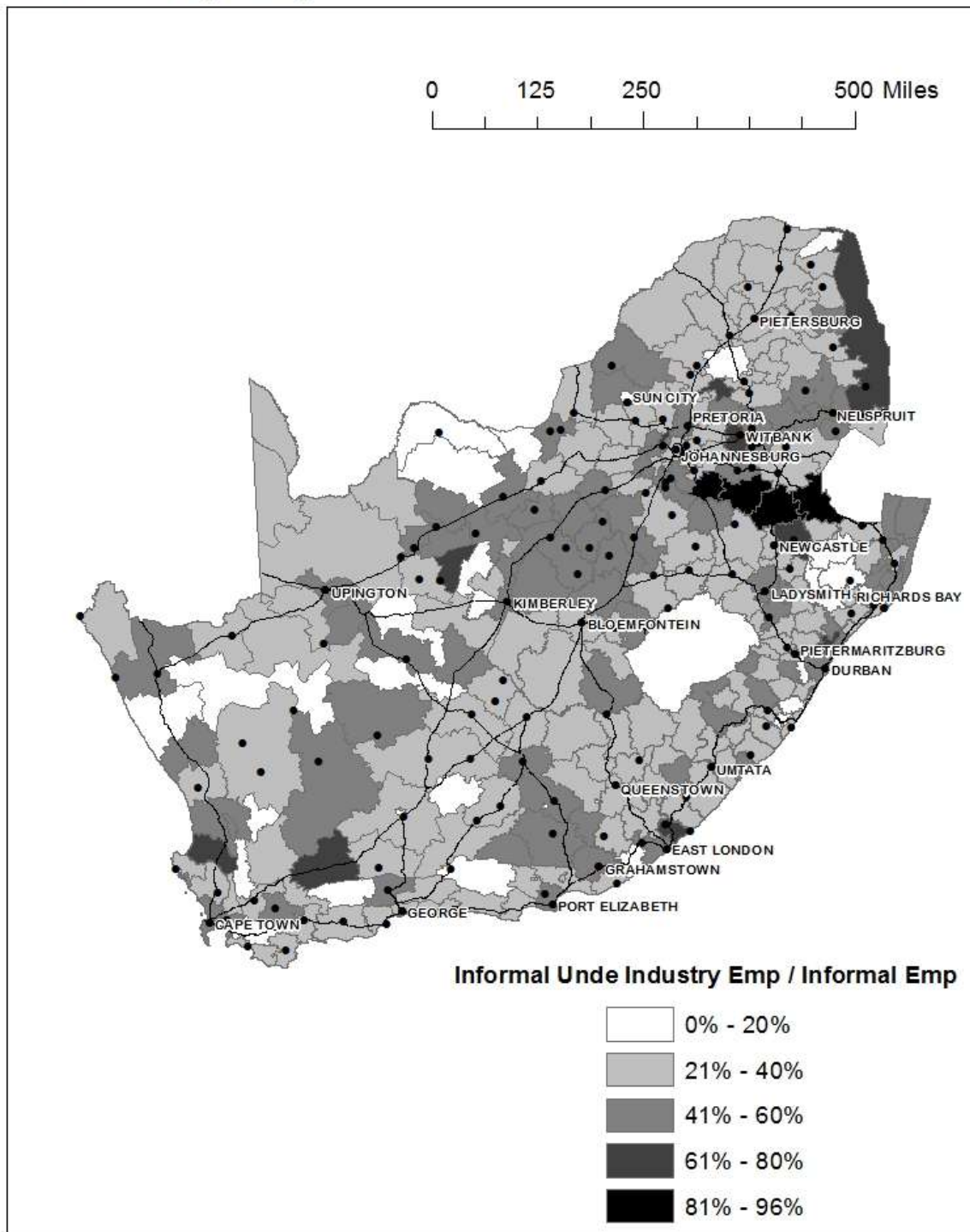
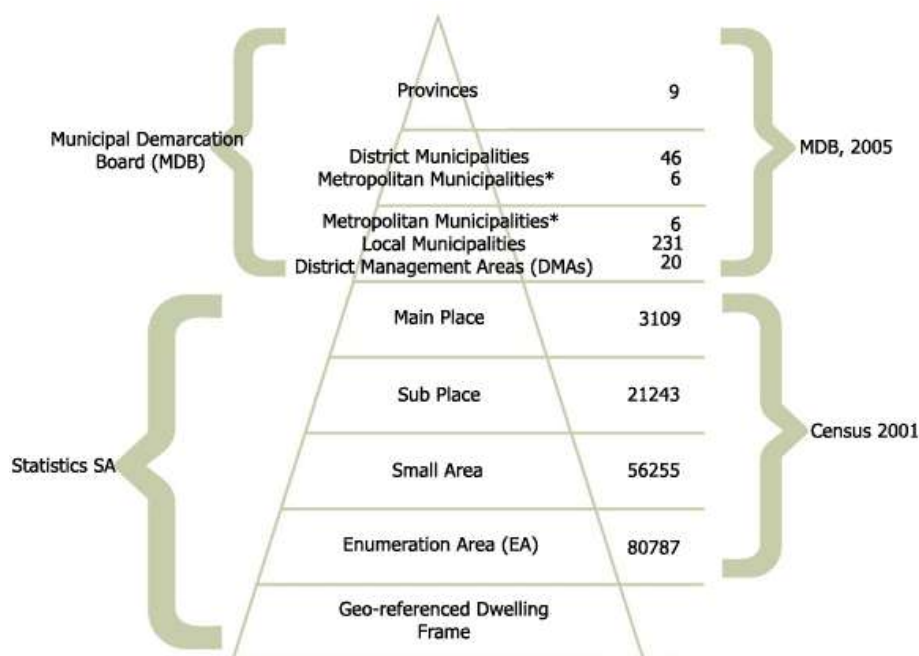


Figure 17: Hierarchy of Political/Administrative Boundaries

2001 Census and 2007 Community Survey – South Africa Statistics



* Metropolitan Municipalities are both District and Local Municipalities.

Figure 18: Differences in the Informal Employment Questionnaire

2001 Census and 2007 Community Survey Metadata – South Africa Statistics

2007 Community Survey

BUSINESS TYPE

Is the organisation / company / business / enterprise/branch where (the person) works, in the formal or informal sector?

Formal sector employment is where the employer (institution, business) is registered (i.e. has a tax number) and informal is when it is not registered.

- 1 In the formal sector
- 2 In the informal sector (including domestic work)
- 3 Do not know

Mark appropriate box with an X.

2001 Census

ANY WORK IN THE 7 DAYS BEFORE 10 OCTOBER (P-18)

In the SEVEN DAYS before 10 October did (the person) do any work for PAY (in cash or in kind) PROFIT or FAMILY GAIN, for one hour or more?

- 1 = Yes: formal registered (non-farming)
- 2 = Yes: informal unregistered (non-farming)
- 3 = Yes: farming
- 4 = Yes: has work but was temporarily absent
- 5 = No: did not have work

If YES go to P-19

Table 13: Estimation results for lagged modelLabor demand model with lagged RHS variables ($R^2 = 0.87$ | Observations = 262)

Informal07	Coefficient	Robust SE	t-stat	P-value	95% Confidence Interval	
lninformal01	0.1371	0.1074	1.28	0.203	-0.7442	0.3486
lnincome01	0.0073	0.1422	0.05	0.959	-0.2727	0.2874
lnEduAttain01	0.9961	0.1434	6.94	0.000	0.7137	1.2786
lnperHHbirths01	0.0013	0.2555	0.00	0.996	-0.5018	0.5044
lnPop01	-0.1792	0.2418	-0.74	0.459	-0.6553	0.2970
Constant	0.9531	0.5391	1.77	0.078	-0.1085	2.0148

Source: Author's calculations based on data from the 2001 Census and 2007 Community Survey

Table 14: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Base Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
lnincome07	102.16	0.0000	0.8077
lnEduAttain07	259.91	0.0000	0.8998
lnperHHbirths07	66.53	0.0000	0.5353
lnPop07	695.18	0.0000	0.9500
lninformal07	1346.21	0.0000	0.9171

Table 15: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Race Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
lnincome07	67.77	0.0000	0.8161
lnEduAttain07	231.31	0.0000	0.9110
lnperHHbirths07	52.52	0.0000	0.5401
lnPop07	624.17	0.0000	0.9503
lnblack07	605.82	0.0000	0.9127
lnicolour07	141.44	0.0000	0.7060
lniindian07	17.56	0.0000	0.3555
lniwhite07	225.06	0.0000	0.6387

Table 16: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Homeland Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
Inincome07	82.34	0.0000	0.8144
InEduAttain07	230.57	0.0000	0.9038
InperHHbirths07	61.81	0.0000	0.5405
InPop07	690.11	0.0000	0.9501
Inihomelands07	6754.16	0.0000	0.9937
Ininohmlands07	3591.35	0.0000	0.9818

Table 17: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Worker Status Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
Inincome07	105.78	0.0000	0.8118
InEduAttain07	231.22	0.0000	0.9020
InperHHbirths07	59.23	0.0000	0.5395
InPop07	653.35	0.0000	0.9517
Inidworkerstatus07	782.40	0.0000	0.9084
Inisworkerstatus07	691.66	0.0000	0.8828

Table 18: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Sector Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
Inincome07	98.25	0.0000	0.8093
InEduAttain07	235.05	0.0000	0.9075
InperHHbirths07	56.74	0.0000	0.5419
InPop07	693.75	0.0000	0.9526
Inidsector07	648.12	0.0000	0.8618
Inisector07	938.12	0.0000	0.8867
Iniusector07	640.94	0.0000	0.8525

Table 19: Endogenous variable & instrument correlations

Statistics from First-Stage Regressions - Income Model

Instrumented Variable	F-Statistic	P-Value	R-Squared
Inincome07	101.19	0.0000	0.8081
InEduAttain07	249.58	0.0000	0.9083
InperHHbirths07	58.69	0.0000	0.5432
InPop07	633.36	0.0000	0.9523
Inidincome07	863.96	0.0000	0.8993
Inisincome07	2024.63	0.0000	0.9095

Table 20: Exclusion criteria for instrument coefficients

H0: instrument coefficients collectively not different from zero

Model Specification*	Wald Test	P-value
Base Model	7.70	0.0000
Race	10.80	0.0000
Homelands	9.24	0.0000
Worker Status	5.64	0.0001
Economic Sector	5.84	0.0000
Income	4.06	0.0015

*DV = Formal Employment 2007

Table 21: Variable Correlation

Homelands Model - Instrumental Variables (Obs = 262)

Variables	Inincome _{iv}	InEduAttain _{iv}	InperHHbirths _{iv}	InPop _{iv}	InHLinfemp _{iv}	InnoHLinfemp _{iv}	HL _{dummy}
Inincome _{iv}	1						
InEduAttain _{iv}	0.9613	1					
InperHHbirths _{iv}	0.4629	0.4268	1				
InPop _{iv}	0.9735	0.9802	0.5453	1			
InHLinfemp _{iv}	0.2821	0.3475	0.7573	0.4533	1		
InnoHLinfemp _{iv}	0.1906	0.1267	-0.5607	0.0126	-0.8845	1	
HL _{dummy}	0.2618	0.3178	0.7620	0.4307	0.9911	-0.8880	1