

Changes in intra-city employment patterns: a spatial analysis

Don Webber

*Department of Accounting, Economics and Finance,
University of the West of England, Bristol, UK, and*

Gail Pacheco

*Department of Economics, Auckland University of Technology,
Auckland, New Zealand*

Changes in
intra-city
employment
patterns

263

Received 4 February 2014
Revised 13 June 2014
10 September 2014
Accepted 19 December 2014

Abstract

Purpose – The purpose of this paper is to investigate area-level labour market dynamics from a spatial perspective. This analysis is aimed at better understanding what socio-economic actors are associated with shifts in unemployment rates across a major metropolitan city.

Design/methodology/approach – Based on two waves of New Zealand census data, this paper combines a seemingly unrelated regression approach (allowing for relaxation of the assumption that residuals from models of different employment states are unrelated) with a spatial lag model.

Findings – The key socio-economic drivers associated with intra-city employment dynamics were vehicle access, dependency rates and educational attainment. Importantly, the identification of spatial autocorrelation with respect to employment status patterns within this major New Zealand city motivates a case for heterogeneous employment policies across the city.

Originality/value – This research improves the understanding of changes in labour market status rates within a city region. This is done by inclusion of two important considerations: a spatial perspective to labour market dynamics at an intra-city level; and formally modelling the interdependence across the four potential labour market outcomes (being full-time, part-time, unemployed or out of the labour force). Overall, there was clear empirical support for the need to include spatial considerations when using targeted policy to help lift areas out of unemployment.

Keywords Unemployment, Intra-city analysis, Labour market status

Paper type Research paper

1. Introduction

The propensities to be employed, unemployed or inactive in the labour force are important foci of research in many OECD economies and there is a growing recognition that creating more and better jobs should be resurrected as a major objective for local government authorities or remain so. However, funds are limited and governments face difficult choices on how best to respond to the different demands of heterogeneous segments of the labour market. There is a strong likelihood that improved employment growth will induce higher participation among low-income and disadvantaged labour market groups (Bartik, 1991). Therefore, improving our understanding of changes in aggregate labour market status rates within a city is key, and as both disadvantaged



The authors are grateful to Statistics NZ for the provision of the data used in this study, which were given under conditions designed to give effect to the security and confidentiality provisions of the Statistics Act 1975. The analysis in the paper reflects the authors' views and not those of Statistics New Zealand.

and advantaged labour market groups tend to be geographically clustered within a city, it is paramount to approach this analysis from a spatial perspective.

This research commences with the realisation that, for the vast majority of individuals, being full-time, part-time, unemployed or out of the labour force are four mutually substitutable labour market states, i.e. being in one labour market state means that an individual is not in any of the other states. The majority of past research[1] has focused on analysing outcomes independently, without consideration for the substitutability between these labour force states. Thus the empirical analysis in this research is driven by the need for the four labour market outcomes to be analysed collectively and exhaustively, with an explicit appreciation that, for the vast majority, they are substitutes[2]. Second to this, we approach this analysis from a spatial perspective. There is an increasing evidence base pointing to the importance of spatial patterns, but few studies have analysed the spatial linkages with respect to labour market outcomes (see for instance Patacchini and Zenou, 2007 who illustrate spatial autocorrelation in unemployment rates). We therefore adopt a seemingly unrelated regression (SUR) with spatial lag model in our study to combat the conceptual gaps in the literature, with regard to treating the four labour market states as substitutable and explicitly controlling for spatial linkages.

The main purpose of this paper is to investigate why some areas experience faster increases in employment than other areas. After applying techniques that reveal levels of, and changes in, the four labour market states are spatially autocorrelated, the analysis proceeds to investigate processes behind these changes. Our empirical analysis focuses on the Auckland region of New Zealand between 1996 and 2006, which, like many world cities, has a vision of achieving high levels of employment (Auckland City, 2009).

The remainder of this paper is organised as follows. Section 2 provides a review of the two strands of literature that are paramount to this study: first, the determinants of labour market states and how these are correlated with geography, and second an overview of the links between socio-economic spatial analyses and spatial autocorrelation. Section 3 outlines the methodology employed and Section 4 describes the area-level census data. Section 5 interprets the key results and Section 6 provides conclusions.

2. Literature review

The restated OECD jobs strategy is aimed at promoting labour market participation and employment, with extra weight given to take into account the concerns of low-income groups (OECD, 2006). Most countries have amplified their efforts and resources towards two separate policies: social policies that support the rapidly growing number of unemployed and labour market policies that help transition these individuals back towards employment.

Drivers of labour force status

There is a wide range of factors that influence an individual's propensity to be unemployed. These include, but are not limited to, the individual's education, age, psychological impact of past unemployment (Clarke *et al.*, 2001), duration of being unemployed (Pissarides, 1992), existence and number of dependents in the household, geographic immobility, level of social security benefits (Mortensen, 1986), the stigma attached to being unemployed (Vishwanath, 1989) and relative prices (such as the

median wage level, and the minimum wage). It is well known that individuals have constraints on their labour market choices; for instance, individuals in one-parent families may be more affected by childcare issues than those in two-parent families. It is also known that people with certain characteristics (such as one-parent family status, age, income and ethnicity) are more likely to congregate in certain areas within cities. This research seeks to identify factors that influence changes in area-level labour market states over time and whether their importance varies across a city.

Economists categorise unemployment status according to the perceived cause: cyclical, frictional or structural (Ehrenberg and Smith, 2012). We can discount cyclical causes of unemployment owing to the time period of focus in this study. Our data correspond to the Auckland city between 1996 and 2006, during which period there was a prolonged recovery from the 1997 recession. There was no major industrial change over this period, so we can also rule out substantial structural unemployment, especially from the demand side, as all industrial sectors experienced either stable or increasing rates of growth during the majority of this time[3]. For example, there was particularly strong growth in construction and dairy (St John and Fargher, 2004, p. 30).

The final category of unemployment, frictional, exists because of a mismatch between heterogeneous jobs and heterogeneous workers. The amount of frictional unemployment is dependent on the amount of workers who move between jobs and is typically a result of imperfect information in the labour market. This mismatch has been shown to be a function of a very wide range of issues, including skills/education, preferences for or constraints on working hours, which are often associated with (though not constrained to) family responsibilities, preferences for or constraints in location due to travel options, which are themselves related to disposable incomes, preferences and tastes. Unfortunately, many of these attributes, especially the all-important preferences and tastes for work and its leisure trade-off, are unobservable and widely heterogeneous at the individual level and can therefore bias individual-level analyses. National governments often attempt to reduce labour market frictions by providing education, advice, training and assistance (such as the subsidisation of childcare) in efforts to reduce mismatch that can be particularly prevalent for first-time entrants to the labour market (migrants or graduating students) and for those re-entering the labour market (mothers returning to work, people changing their careers for lifestyle or job satisfaction reasons, while incorporating a period of time out of the labour market). When mismatch is spatially heterogeneous, there may be the need for local policies and targeted responses to enhance stimulators or to reduce inhibitors of changes to preferred labour market states. At the area level within a city, this can include altering the routes, quality and quantity of public transportation, extending job centre opening hours and improving the services that they provide, targeting advice on compiling CVs and job applications and promoting the wider benefits of active labour market participation.

Spatial considerations

The significance of the spatial dimension in understanding economic activities such as unemployment rates and other labour market dynamics was recognised by Jensen, who presents a useful debate around the trade-off between spatial efficiency and equity considerations. While the degree of interdependence between spatially defined labour markets can be very high (at both the inter and intra-regional level), only a few studies have specifically analysed the spatial linkages (with respect to labour market outcomes) between neighbouring areas (see Molho, 1995; Burda and Profit, 1996;

Burgess and Profit, 2001; Overman and Puga, 2002). The findings from this sparse literature tend to emphasise the existence of a spatial dependence in unemployment rates, and it should therefore not be a surprise that intra-city area-level labour market status variables are spatially correlated. Nevertheless, the mechanisms that cause such spatial patterns at the intra-city level have not been clearly identified. In an effort to shed light on this issue, albeit at a more aggregated (regional) scale, Patacchini and Zenou (2007) analyse UK travel-to-work area data and provide evidence that suggests that spatial autocorrelation in unemployment rates (i.e. those out of work) is influenced by workers' commuting patterns (i.e. those in work). Their evidence suggests that labour mobility drives spatial interactions between geographical units, although this spatial spillover effect has a limited geographical coverage. In spite of also identifying the importance of human capital and local population structure in driving local unemployment rates, it is not clear whether these patterns occur at a smaller spatial scale. Indeed, it is probable that the distance-decay function will vary across individuals with different levels of human capital, and also across individuals who possess factors that are advantageous (such as having access to a motor vehicle) and disadvantageous (such a lack of educational credentials or, potentially, being part of an ethnic minority) in local labour markets. When intra-city areas have asymmetries in labour market status rates and have local governments that are judged on their ability to improve labour market participation rates, it is necessary for policy makers to identify which policies might aid in the achievement of these goals for their local communities.

Baum and Mitchell (2010) advocate that, while individual characteristics are important in understanding unemployment in metropolitan areas, it is equally important to consider the strength of spatially distinct labour markets. This leads them to state that "while contemporary labour market policies tend to focus on individual characteristics, there is a need to widen the policy understanding of labour market outcomes so that other broader contexts, including the impact of space and place, are also seen as being influential" (p. 13). It is important to note that in many cases, local planning authorities do not have individual-level data, but rather rely on aggregated area level data to inform policy decisions. Additionally, Baum and Mitchell's findings also suggest that analysing small-scale aggregate data can permit a useful and relevant analysis that can lead to appropriate policy formation.

Spatial analyses are important if there are reasons to believe that geographic entities, especially those juxtaposing each other, are not independent. There are a number of reasons why a spatial pattern of labour market statuses may exist. First, spatial patterns in labour market states are expected a priori, as it is well known that higher parental incomes permit the clustering of high-income (and typically parental-education-rich) individuals around already established higher-quality schools, which consequently increases the observed educational outcomes of the schools' students that may be supported by a critical mass of positive education values and positive peer-group effects. Conversely, parents with lower levels of educational attainment, who are therefore less likely to perform well in the labour market and hence have lower incomes, are forced out of high-rental value areas that surround high-performing schools and into areas whose schools have on average a lower recorded quality of student output. Such circumstances tend to be intergenerational in nature, whereby low-income families have children who are taught in observably poorer performing schools, which then adversely influences the child's job opportunities as an adult.

A second reason for the existence of spatial patterns in labour market states is that low-skilled workers typically reside in areas that have fewer jobs and are spatially

disconnected from main employment centres. Korsu and Wenglenski (2010) provide a detailed review of the literature, which emphasises that mean distances between low-skilled workers' homes and low-skilled job opportunities are relatively high (especially in US cities). Part of the reason for the clustering of low-skilled workers into areas that are relatively further from job opportunities could be because the relatively wealthier populations are selecting and able to pay to reside in areas that are relatively closer to job opportunities; a lack of purchasing power by the less-skilled therefore congregates such workers into areas that are less attractive, often more dispersed and less-gentrified, and also have poorer transport links.

A third reason to consider is that access to jobs can be a fundamental constraint on labour market status. Recent research by Korsu and Wenglenski (2010) highlights that distances to jobs are no longer small and have been increasing in recent years. New Zealand's transport investment has been directed at improving the movement of private vehicles (New Zealand Transport Agency, 2010). Private vehicle access then may become vitally important as a potential constraint for a worker's job availability. Areas with poor links to centres of employment may be adversely affected by transport facilities if private vehicle access is low. As suburbia to non-CBD public transport connections are necessarily limited, access to private transport becomes increasingly important in determining the number of accessible job opportunities. Good access to job opportunities also increases the number of job opportunities (Cervero *et al.*, 1999) and may consequently shorten the job search period (Korsu and Wenglenski, 2010) or allow greater movements between jobs without resorting to being unemployed; the reverse argument states that poor accessibility to job-rich locations will constrain job opportunities and extend the job search period (Korsu and Wenglenski, 2010) and hence reduce the likelihood that individuals in particular areas will move into the active labour market.

There are ways in which individuals can overcome these spatial-accessibility restrictions: two such means emphasised by Korsu and Wenglenski (2010) are that the workers could accept longer commutes, although this would typically incur greater financial and time costs, or choose to change their residential location, which would impact on their wider social lives, social and family networks. Either way, both options remain implausible for most low-skilled, income-constrained individuals (Morrison and Monk, 2006).

Fourth, exposure to spatially concentrated poverty is known to limit opportunities and residing in high-poverty neighbourhoods reduces a person's opportunities for successful integration into the labour market (Dietz, 2002). This may be particularly salient for early labour market entrants, who have social networks and peer groups that do not actively encourage behaviour that is valued in the labour market (Jencks and Mayer, 1990) and greater reaction to social influences may be due to a lack of an adult role model that is active and successful in the labour market or deviant teenager peer groups, where the emphasis is far from human capital accumulation at secondary school level or beyond. A negative feedback loop may exist, whereby regular contact with other unemployed people who are unable to find a job may make it difficult to believe in one's own ability and chances of also finding a job, which may result in a negative and self-fulfilling prophecy of unemployment.

Spatial considerations are also required not necessarily because job opportunities happen in the same area level as individuals live, but rather because the characteristics of the area level in which they live will influence the probability of finding employment *per se*. For instance, Massey and Denton (1992) contend that job seekers in areas of high poverty and high unemployment are more likely not to move into employment.

On the flip side of this, it is likely that once an area begins to experience a sizable drop in unemployment, this may instil greater belief and job search efforts into those that are unemployed and living in the area. After all, many job seekers may find work or learn about opportunities with the help of their friends, family members, acquaintances within their spatial area unit, and therefore likelihood of finding a job will depend on whether the members of a person's social network are employed (Lai *et al.*, 1998). The implication is that areas with higher initial unemployment rates could experience faster reductions in unemployment rates.

Finally, it is worth noting that prejudice towards residents of certain neighbourhoods may adversely affect their employment opportunities. Images associated with violence, criminality, alcohol and drug addition, as well as employers' perceptions that residents of a poor neighbourhood are unwilling to work or to work hard, can lead employers to stigmatise residents from these areas, which may lead to fewer job opportunities (Korsu and Wenglenski, 2010). Many of these issues are related to education, household structure, ethnicity and home ownership.

The five reasons stated above all indicate that the rate of change in the four labour market states across areas within a city will possess a spatial dimension. Such a perspective is particularly important if the aggregate labour market dynamics of area i are not independent of the dynamics of its neighbours. That may occur if the propensity of individuals within area i to behave in a certain way varies with the prevalence of that behaviour in their reference group. In the following analysis, we will explicitly account for these spatial influences by assuming that the reference group of the individual is not only the average behaviour of the area in which they live but also the average employment behaviour of surrounding areas.

Manski (1993) suggests that it is not possible to infer whether the average behaviour of a reference group impacts on an individual in that group unless there is prior information specifying the composition of the group. He also indicated that inference on how average behaviour of a reference group impacts on an individual's behaviour is more plausible if the attributes that define the reference group and the factors impacting on the outcome are moderately related. Given that the outcome in which we are interested is the employment state, the same variables influencing employment propensity are also the variables available (via census data) for the reference groups at the area level, i.e. information on education, household structure, ethnicity and home ownership.

Spatial autocorrelation in a regression may indicate that the model is under-specified or that clustering is serendipitous. Although such non-independence of observations may be random, it is also possible that employment rates in area i are influenced by spatial contagion effects from area i 's neighbouring areas. Thus spatial autocorrelation may exist because there is a "spatial process" (usually diffusion or spread) moving across areas. If area i is not independent of its neighbours, in terms of analysing the determinants of area-level employment trends, then the underlying standard regression assumptions are violated and normal regression estimates could be inefficient and potentially biased. For example, although analysis by Vipond (1984) recognised the importance of spatial factors when investigating unemployment differentials within Australia's largest city of Sydney, she employed standard multiple regression analysis of census data to explore the influence and significance of location on these differentials. Consequently, her econometric estimates of the effect of explanatory variables would most likely have been inefficient owing to spatial autocorrelation. One of the clearest expositions of the reasons behind spatial

autocorrelation has been provided by Voss *et al.* (2006), and based on the work by Wrigley *et al.* (1996), who emphasise the importance of, amongst other things, feedback, grouping forces and grouping responses.

Voss *et al.* (2006) stated the potential for feedback forces to influence individuals' and households' preferences and activities. *Ceteris paribus*, the smaller the spatial scale of analysis and therefore the higher the density of areas, then the greater the potential feedback because of the higher likelihood and frequency of contact between people. For reasons related to the adoption/diffusion theory (Rodgers, 1962) and to the agent interaction theory (Irwin and Bockstael, 2004), we should generally expect there to be the potential for spillovers of employment behaviour with a positive correlation in employment rates between contiguous areas.

Geographically proximate areas with similar aggregate employment status profiles might be influenced by grouping forces. Clusters of high employment rates might be due to a number of reasons including the spatial grouping of similarly work-oriented and work-successful people around appropriate schools, amenities that are status symbols and/or associated with activities that are of interest to similarly defined individuals, such as being close to the riverfront, yacht club or a prestigious golf course. One issue here is whether people with similar employment status profiles group together as a result of their income and purchasing power or whether being resident in an area where employment rates and incomes are high also results in one's own employment profile (and thence income) being relatively high; social capital issues may well be relevant here.

Entry into employment can result in the outmigration of workers from relatively deprived areas to more affluent areas. Such grouping responses may be positive or negative and can result in some areas being employment black-spots with the least well-off being forced out of affluent areas because of the inability to pay high rents and other housing costs.

The relevance of spatial influences on unemployment was shown by Patacchini and Zenou (2007), whose results indicate a significant spatial dependence that has been growing over time. Despite this finding, most empirical research to date on explaining unemployment disparities has typically ignored the spatial correlation between regional unemployment rates, and the importance of spatial factors when investigating changes into and out of unemployment within a region. Evidence of diffusion or spread in employment rates has been largely anecdotal, and this has been primarily due to the lack of appropriate data at small spatial scales. As a consequence, few studies have employed econometric techniques to take account of the possible spillover effects of employment rates at the small spatial scale[4].

One study that has made use of spatial econometric models when investigating patterns of unemployment within a city (Chicago) was Conley and Topa (2002). They focused on the time period 1980-1990 and, by acknowledging the relevance of spatial influences and employing a methodology that explicitly accounted for it, they were able to identify the characteristics that contributed the most to explaining the strong clustering in the unemployment data for this city: racial and ethnic composition variables.

Given the lack of research on this front, one of the main contributions of this paper is to investigate the importance of a number of socio-economic factors that are associated with changes in the employment rates within a major metropolitan city (specifically, Auckland[5]), by explicitly taking into account spatial effects in the modelling process.

3. Method

When an individual exits a state of unemployment, he or she enters one of three possible alternatives: full-time employment, part-time employment or out of the workforce. In this respect, employment states are mutually exclusive and should be seen as substitutes.

Application of ordinary least squares (OLS) regression to area-level changes in employment states would be inappropriate for two main reasons. First, we would implicitly need to assume zero correlation between the residuals of separate employment state models associated with the observation for area i . Correlations of residuals across regression models illustrate that there is additional explanatory information in the data that has not been exploited through an OLS model. However, residuals from models of different employment states are expected to be strongly positively correlated because in areas where the rate of full employment is higher than predicted, at least one of the other employment states must be lower than predicted, leading to large residual variances in both equations. An OLS approach would ignore the correlation in the residuals across equations and would produce inefficient estimates, even though they would be unbiased and consistent. Therefore, we adopt the SUR approach (Zellner, 1962).

Second, standard OLS regression techniques are applied on the assumption that the units of analysis are independent and identically distributed. This assumption is unlikely to hold across small areas within a city when there are observable spatial correlations in employment states, commuting patterns, purchasing behaviour, leisure pursuits and extended families. Therefore, we combine the SUR and spatial lag approaches and estimate a two-step procedure (see Cochrane and Poot, 2008, for an overview of the method). In our case, the first step involves the initial estimation of an individual spatial lag model for each employment state and we retrieve the spatial lag parameter for each separate equation. We then multiply the estimated spatial lag parameters by the spatially weighted[6] average of each corresponding employment state in order to predict the spatial spillover effect. The second step is to add this spillover effect to the other regressors and calculate the resulting spatial lag SUR (SL-SUR) model.

The model that is estimated using the SL-SUR is, therefore:

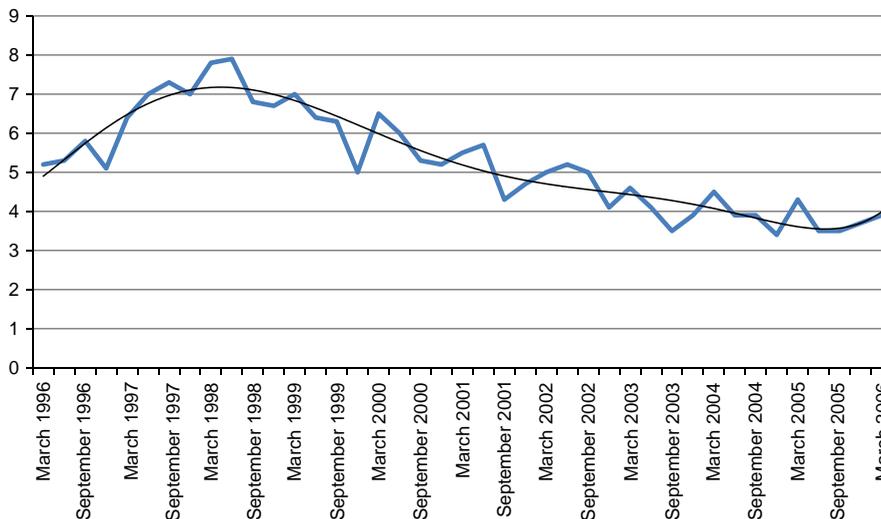
$$\begin{aligned}\Delta FT_i &= \alpha_1 + \beta_2 (W \times FT_i^{1996}) + \beta_3 \gamma_i + \beta_4 ASL_i + \beta_5 X_i^{1996} + \varepsilon_{i6} \\ \Delta PT_i &= \alpha_7 + \beta_8 (W \times PT_i^{1996}) + \beta_9 \gamma_i + \beta_{10} ASL_i + \beta_{11} X_i^{1996} + \varepsilon_{i12} \\ \Delta Out_i &= \alpha_{13} + \beta_{14} (W \times Out_i^{1996}) + \beta_{15} \gamma_i + \beta_{16} ASL_i + \beta_{17} X_i^{1996} + \varepsilon_{i18} \\ \Delta U_i &= \alpha_{19} + \beta_{20} (W \times U_i^{1996}) + \beta_{21} \gamma_i + \beta_{22} ASL_i + \beta_{23} X_i^{1996} + \varepsilon_{i24}\end{aligned}$$

where Δ is the change between 1996 and 2006, subscript i signifies area i , W is the queen contiguity spatial weights matrix, superscript 1996 signifies the year of observations for the parameter, γ is the SUR lag coefficient, ASL is the adjusted spatial lag, α and β are intercept and slope parameters to be estimated and subscripts 1-24 signify that there are separate intercept, slope and error estimates for each regression within the SUR.

4. Data

Data used in this paper are area-specific census data for the Auckland region, sourced from Statistics New Zealand. Auckland is the most densely populated city in New Zealand, and according to Maré (2008) accounts for a third of the national employment, and 40 per cent of the value added in this economy. The census normally occurs every five years in New Zealand, although the next census has been postponed from 2011 until 2013 owing to the Christchurch earthquake of 2010. This data set provides information on the percentage of an area's working age population (16-64) that is classified as being in any of the possible four labour market states (unemployment, full-time or part-time employment or out of the labour force)[7]. Our empirical analysis focuses on the changes between two census data sweeps, which fairly closely coincides with the end of the recession and the end of the boom, thereby covering a period of sustained unemployment rate reductions in New Zealand: 1996 and 2006. This also coincides with no changes in the area boundaries across the Auckland region. As an illustration of the population sizes within each area, the mean value in 1996 was 2,899 (SD=1,410). Figure 1 shows the trend in the aggregate unemployment rate across Auckland over this period.

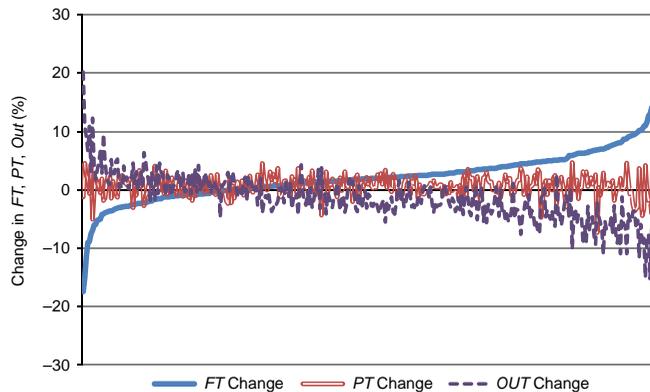
While Auckland enjoyed a decline in its unemployment rate from 5.2 per cent in March 1996 to 3.9 per cent in March 2006, this fall was not uniform across all 369 areas within the city. Some areas (such as Penrose and Ferguson) had a decline in their unemployment rates as large as 6-7 percentage points, while some areas (such as Matheson Bay and Dannemora) faced a rise in their unemployment rates of approximately 3.5 percentage points across that decade. Figure 2 displays area-level data for changes in full-time employment, part-time employment and out of the labour force when ranked by the change in full-time employment. Visual inspection leads to two main observations. First, areas with large increases (decreases) in full-time employment rates also experienced relatively large decreases (increases) in the percentage of their working age population that were out of the labour force. Second,



Source: HLFQ.S2F3QB series from PCInfos

Figure 1.
Auckland
unemployment
rate March 1996-
March 2006

Figure 2.
Areas ranked by
change in full-time
employment



variations in changes in part-time employment rates do not appear to be related to changes in these other two employment categories. Descriptions of the variables included in the econometric analyses are presented in Table I.

5. Results

Exploratory spatial data analysis

One way of examining the geography of area-level labour market states in Auckland is to exploit the spatial nature of the data set. This has two elements: maps that provide a visual indication of the importance of contiguity and spatial patterns, and Moran's I values[8].

Figure 3 presents the exploratory spatial data analysis, illustrating ΔFT_i between 1996 and 2006 in map form. The corresponding Moran's I estimates reject the null hypothesis of no spatial clustering, with values of 0.278, and is statistically significant at the 1 per cent level. LISA maps are presented in Figures 4-6 for changes in the other labour market statuses (ΔPT_i , ΔU_i and ΔOUT_i)[9]. In all cases dark blue signifies low-lows, light blue signifies low-highs, pink signifies high-lows and red signifies high-highs.

Areas which experienced high rates of increase in full-time employment are contiguous to areas with high rates of increase in full-time employment; however, the same clear pattern is not observable for changes in part-time employment. Areas which experienced high rates of increase in unemployment also had contiguous areas with high rates of increase in unemployment. Interestingly, the areas that were high-highs (low-lows) for changes in full-time employment rates were often areas that were low-lows (high-highs) for changes in unemployment rates. The north east of the Auckland region experienced low rates of increase in full-time employment; these are areas containing lifestyle blocks and farming communities where many individuals are self-employed and they experience very low levels of unemployment.

There are clusters of areas where the movement out of the labour force is very low, perhaps because of the preferred transition into the unemployment queue instead. The darkest areas are in South Auckland (particularly Mangere and Manukau), which correspond to areas with a relatively young population and higher proportions of Maoris and Pacific Islanders (for instance, both areas had more than 42 per cent Maori in 2006). Towards the north east of the Auckland city (such as the North Shore) there are areas where there was high movement out of the labour force; in the case of the North Shore this may be due to the presence of an aged population entering retirement.

| Variable | Definition | Mean | SD |
|-----------------------------|--|---------|--------|
| ΔFT_i | Percentage change in full-time employment (1996-2006) | 2.123 | 4.104 |
| ΔPT_i | Percentage change in part-time employment (1996-2006) | 0.690 | 1.777 |
| ΔU_i | Percentage change in unemployment (1996-2006) | -1.232 | 1.560 |
| ΔOut_i | Percentage change in propensity to be out of the labour force (1996-2006) | -1.576 | 4.291 |
| Rental value | Median rent in 1996 (\$ per week) | 248.862 | 50.447 |
| Home ownership | Home privately owned (%) | 68.333 | 15.254 |
| Vehicle access | Number of motor vehicles to which the household has access to | 0.897 | 0.068 |
| Sex ratio | 100 times the number of males divided by the number of females | 97.630 | 10.648 |
| Dependency ratio | Youth dependency ratio + old age dependency ratio (%) Youth (old age) ratio = number of people aged 0-14 (65+) divided by the number of people aged 15-64 | 49.621 | 12.885 |
| One-parent families | Percentage of families that are 1-parent households | 17.976 | 8.383 |
| Two-parent families | Percentage of families that are 2-parent households | 47.096 | 8.836 |
| Post graduate qualification | Have a post graduate qualification (%) | 2.834 | 2.254 |
| Bachelors degree | Have a bachelors qualification (%) | 6.371 | 4.458 |
| Post-school qualification | Have a post-school qualification (%) | 14.148 | 4.503 |
| School qualifications | Have a school qualification (%) | 48.180 | 4.073 |
| Overseas residence | Per cent of people aged 5+ living overseas 5 years ago (%) | 11.503 | 6.302 |
| Pacific | Per cent of population with Pacific ethnicity (%) | 12.425 | 16.213 |
| Maori | Per cent of population with Maori ethnicity (%) | 12.387 | 8.854 |
| Asian | Per cent of population with Asian ethnicity (%) | 9.507 | 7.336 |

Notes: Reference groups include “other families”, households not classed as one or two-parent families; “no school qualifications”, having no school qualification as their highest level of educational attainment; “European”, per cent of population with European ethnicity. The school qualifications category also encompasses any “not elsewhere included” responses

Table I.
Area-level
descriptive statistics

SUR results

This section reports the results of the SL-SUR model, which has been employed predominantly to identify associations between area-level labour market status variables[10]. There are four dependent variables in our SL-SURs: 1996-2006 changes in ΔFT_i , ΔPT_i , ΔU_i and ΔOut_i . The explanatory variables are not identical sets across individual regressions: each individual regression has its own adjusted spatial lag, SUR lag coefficient parameters and different initial (1996) values of the respective dependent variables, along with its queen-weighted spatial lag.

The regression results are presented in Table II. There is evidence to suggest that the spatial aspect of the model is highly important. The estimated spatial lag parameter (a partial correlation coefficient) varies between 0.054 for the ΔU_i regression and 0.205 for the ΔFT_i regression. These significant spatial correlations indicate that there remains significant spatial clustering in changes in area-level employment states, which signify the presence of unmeasured geographically specific features over this time period in Auckland, as they are present even after all the other intra-region-specific explanatory variables have been controlled for.

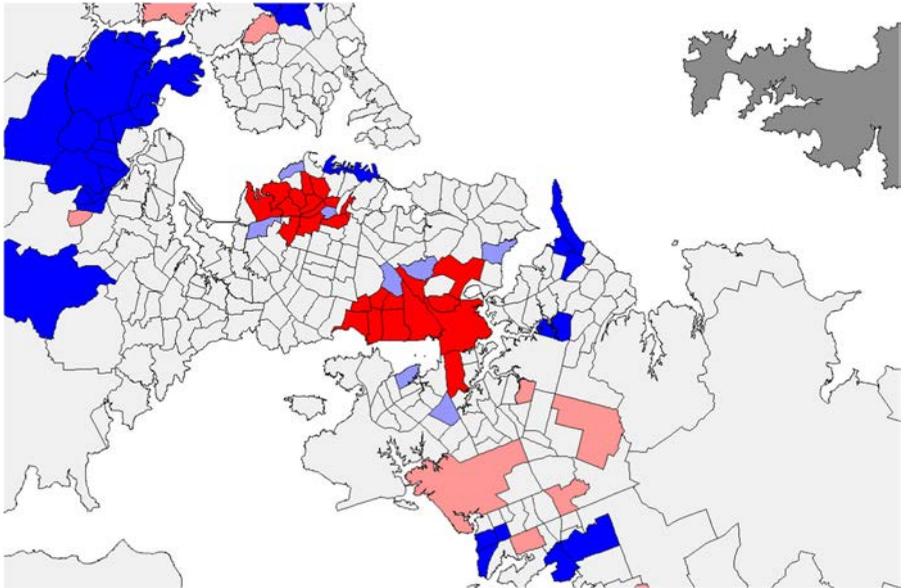


Figure 3.
Local indicator of
spatial association
map of ΔFT_i

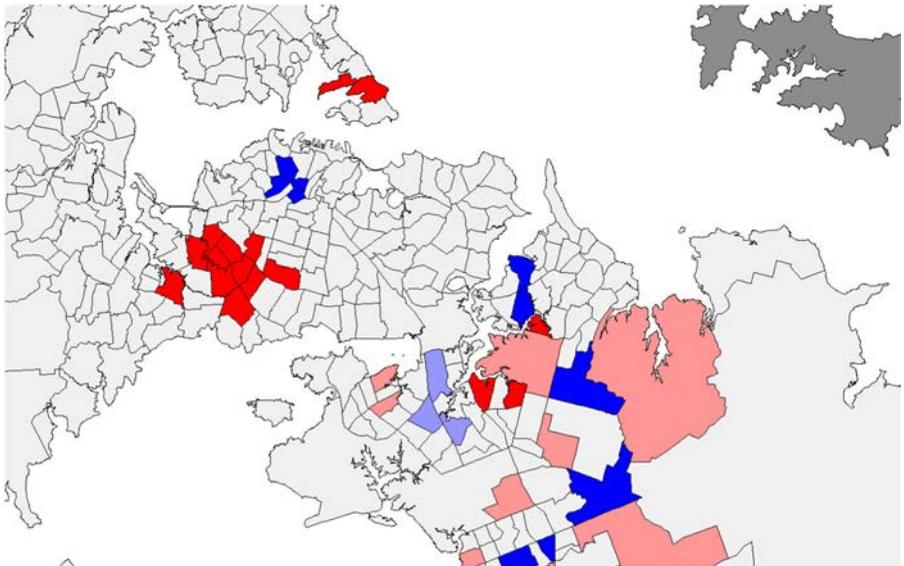


Figure 4.
Local indicator of
spatial association
map of ΔPT_i

The SUR lag is a rescaling parameter that adjusts the SUR model in such a way that it gives the influence of spatial clustering a more prominent role because movements out of unemployment and into the three other labour markets states are likely to be spatially autocorrelated. The upscaling in all regressions (shown by the positive and significant SUR lag coefficient) emphasises that changes in these labour market states are likely to be even more spatially dependent than would be otherwise apparent.

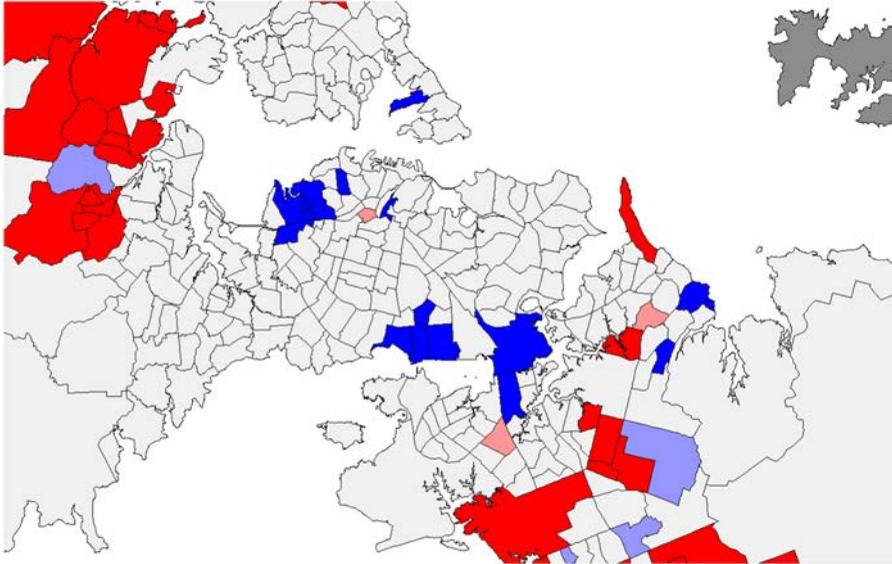


Figure 5.
Local indicator of
spatial association
map of ΔU_i

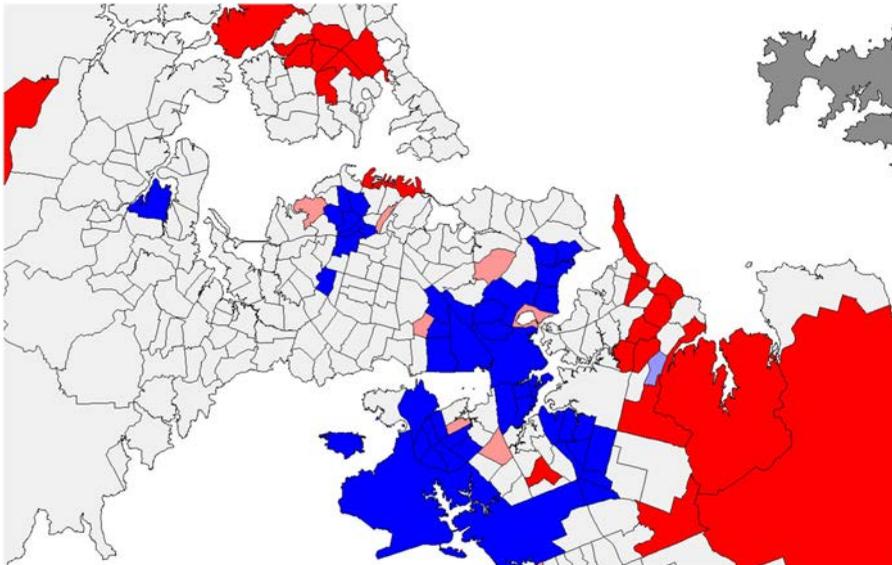


Figure 6.
Local indicator of
spatial association
map of ΔOut_i

Table II illustrates several interesting findings[11]. As expected, the initial values of the dependent variables are negative indicating that the lower the starting point then the greater the change towards that state. For instance, the lower the level of full-time employment in an area in 1996, the greater the likelihood of movement into full-time employment (and perhaps out of unemployment) by 2006. The insignificant coefficients for the initial value in the change in part-time and unemployment state regressions

| | ΔFT_i | | ΔPT_i | | ΔU_i | | ΔOut_i | |
|-------------------------------------|---------------|-----------------|------------------|-----------------|--------------|-----------------|----------------|-----------------|
| | Coeff. | <i>p</i> -value | Coeff. | <i>p</i> -value | Coeff. | <i>p</i> -value | Coeff. | <i>p</i> -value |
| Spatial lag | 0.205 | 0.000*** | 0.081 | 0.252 | 0.054 | 0.451 | 0.196 | 0.000*** |
| SUR lag coefficient | 0.447 | 0.000*** | 0.708 | 0.000*** | 0.790 | 0.000** | 0.366 | 0.012** |
| Adjusted spatial lag | -0.012 | 0.194 | 0.073 | 0.065 * | -0.010 | 0.639 | 0.007 | 0.418 |
| Initial value | -0.370 | 0.000*** | -0.103 | 0.357 | -0.036 | 0.768 | -0.383 | 0.000*** |
| Rental value | -0.001 | 0.847 | -0.007 | 0.000*** | 0.002 | 0.067* | 0.005 | 0.235 |
| Home ownership | -0.031 | 0.220 | 0.003 | 0.728 | 0.005 | 0.405 | 0.028 | 0.264 |
| Vehicle access | 0.926 | 0.091* | 0.968 | 0.647 | 0.141 | 0.919 | -1.135 | 0.034** |
| Sex ratio (males/females) | -0.016 | 0.472 | 0.000 | 0.991 | 0.006 | 0.285 | 0.006 | 0.777 |
| Dependency ratio | -0.898 | 0.000*** | 0.469 | 0.625 | 0.021 | 0.709 | 0.734 | 0.003*** |
| One-parent families | -0.026 | 0.625 | 0.028 | 0.252 | 0.014 | 0.342 | 0.007 | 0.889 |
| Two-parent families | 0.006 | 0.859 | 0.014 | 0.313 | 0.002 | 0.842 | -0.020 | 0.538 |
| Other families | | | Control variable | | | | | |
| Post graduate qualification | -0.301 | 0.177 | 0.032 | 0.755 | 0.050 | 0.393 | 0.093 | 0.669 |
| Bachelors degree | 0.271 | 0.035** | 0.000 | 0.997 | -0.029 | 0.387 | -0.186 | 0.135 |
| Post-school qualification | 0.160 | 0.081* | 0.059 | 0.190 | -0.018 | 0.464 | -0.221 | 0.025** |
| School qualifications | -0.052 | 0.374 | -0.004 | 0.867 | -0.007 | 0.648 | 0.056 | 0.345 |
| No school qualifications | | | Control variable | | | | | |
| Overseas residence | -0.084 | 0.173 | 0.062 | 0.016** | -0.003 | 0.898 | -0.004 | 0.953 |
| Pacific | 0.012 | 0.621 | -0.004 | 0.700 | -0.008 | 0.312 | -0.007 | 0.784 |
| Maori | 0.031 | 0.447 | -0.008 | 0.632 | -0.009 | 0.467 | -0.023 | 0.570 |
| Asian | -0.045 | 0.292 | -0.023 | 0.188 | 0.002 | 0.845 | 0.080 | 0.064* |
| European | | | Control variable | | | | | |
| Intercept | 18.354 | 0.006*** | -0.469 | 0.852 | -1.384 | 0.423 | -17.480 | 0.007*** |
| RMSE | 3.248 | | 1.231 | | 0.820 | | 3.118 | |
| Moran's <i>I</i> residuals | 0.200*** | | 0.067** | | 0.056** | | 0.126*** | |
| χ^2 | 520.47*** | | 475.29*** | | 994.68*** | | 567.27*** | |
| R^2 | 0.372 | | 0.519 | | 0.723 | | 0.470 | |
| Breusch-Pagen test for independence | | | | | 315.144** | | | |

Table II.
SUR-SL results

Notes: $n = 369$. *, **, ***Statistical significant at the 10, 5 and 1 per cent levels, respectively; queen contiguity weight matrices employed. Estimation is by maximum likelihood

indicate that an area's change towards a greater proportion of residents entering part-time or unemployment may not be path dependent.

Areas with higher rental values have smaller changes part-time employment and larger changes in unemployment. This may be because rental values are higher in areas where employment rates (and therefore wages and rental purchasing power) are already high. Conversely, areas with relatively low rental values experience greater movement, with people leaving unemployment and entering either full-time or part-time employment. This may be because originally low rental values permitted either relatively low employment rates (for instance, with only one breadwinner in the house) or offered people less incentive to obtain a job; the same effect is not identified for home ownership.

There is a literature that discusses the link between home ownership and unemployment propensity (see, e.g. Blanchard and Katz, 1992; Henley, 1998), some of which attempt to test the external validity of Green and Hendershott's (2001) result that home ownership leads to higher unemployment. Oswald (1996) contends that home ownership may limit the efficient matching of jobs within the labour market. However, such a hypothesis may be more speculative in a global city such as Auckland.

Indeed, García and Hernandez (2004) suggest, for the case of Spain, that the direction of causation may actually be that higher unemployment discourages home ownership. Our empirical results do not support either hypothesis. However, we are unable to control for inter-area migration patterns, and it is possible that the results may be biased by this omission. Nevertheless, Jeanty *et al.* (2010, p. 343) suggest that neighbourhoods are likely to experience an increase in their housing values if they gain population[12]. It is possible, therefore, that rental values could be capturing the migration effect on labour market dynamics.

Access to jobs can be a fundamental constraint in terms of achieving a positive employment state (Korsu and Wenglenski, 2010), as areas with poor public transport links to centres of employment may be adversely affected by transport facilities if private vehicle access is low. Our results, although relatively weak in significance level, corroborate this perspective as areas with greater vehicle access are associated with greater increases in full-time and part-time employment over this period. There is statistical evidence which suggests that areas with low vehicle access are also likely to leave the labour force. Korsu and Wenglenski (2010) also suggest that individuals can overcome this issue by locating closer to work hubs and therefore have a reduced need for a vehicle; sometimes, however, residing in such locations may incur higher rental costs, which may only be possible through high-wage, high-education jobs; this may account for our generally weak evidence on this front.

Table II illustrates that, for Auckland, areas with greater dependency rates are associated with much lower rates of increase in full-time employment and higher rates of leaving the labour force. Additional parental and caring responsibilities may be a barrier to greater employment hours or being in work *per se*. However, it is worth noting that dependency rates are found to be positively (albeit statistically insignificantly) related to an aggregate change into part-time employment (for instance, working while children are at school). After accounting for the family-dependency effects, areas with greater proportions of two- or one-parent families are seen to have no significant impact on changes in any of the four employment states. Overall, these findings have strong policy implications because if dependency is a major inhibitor to greater employment rates and employment hours then policy makers seeking to enhance these, and potentially productivity values as well, may wish to examine the potential effect of subsidising day-care and home-help facilities[13].

Post-school qualifications appear to play an important role in enhancing full-time employment; a further full-time enhancing effect can be seen for the bachelors' degree. Areas with greater proportions of residents with post-school qualifications are more likely to experience fewer exits from the labour force. These results may be reflecting a variety of factors, such as local skill-mismatch (Zenou, 2009, Chapters 7-8) or skill-bias technical changes (Acemoglu, 2003).

Areas with greater proportions of overseas residents were seen to experience greater flows into part-time employment and areas with greater proportions of Asians were more likely to leave the labour force; relative to the control group of Europeans. Although not significant at traditional levels of statistical confidence, it is pleasing from the perspective of social mixing and discrimination to find that there appears to be a slightly greater shift of Maori and Pacific backgrounds into full-time employment relative to those of a European background. However, these positive coefficients may reflect low levels of full-time employment of Maori and Pacifica backgrounds in 1996 and low rates of increase in already high rates of full-time employment European backgrounds.

6. Conclusions

This paper has presented an extension to the literature on area-level unemployment changes based on the following two propositions:

- P1.* Labour market states need to be treated as mutually substitutable.
- P2.* Spatially evolving phenomena have the potential to influence – either directly or indirectly – expectations, motivations, values and aspirations and therefore the impetus to change workers' employment propensity.

Empirical support for the latter claim was provided through the use of exploratory spatial data analysis and the regressions.

It is well known that individuals have constraints on their labour market choices. It is also known that people with certain characteristics are more likely to congregate in certain areas within cities, either because they choose to (high-wage workers who have been successful in the labour market) or because they have little choice (often low-wage workers who have done poorly in the labour market). Accordingly, this research has sought to identify the factors that contribute to improving employment rates over time and whether their importance varies across a city. As people with certain attributes cluster together, then so too may effective and targeted policy-making have a spatial dimension to alleviate any labour market problems.

Using census data for area-level employment rate changes across 369 areas of Auckland between 1996 and 2006 and application of SL-SURs, our results suggest that several demographic characteristics, such as vehicle access, dependency rates and education are important issues associated with changes in employment across areas. These findings suggest that local governing authorities that strive to reduce their local unemployment rates could identify where there is mismatch between the educational needs of prospective employers and the educational background of the local inhabitants, and then target funding to education suppliers to improve this.

The evidence presented in this paper also suggests that local governing authorities cannot assume each area is totally independent from each other and that spatial considerations should be taken into account when using targeted policy to help lift areas out of unemployment. If similarly performing and contiguous areas are identified as suffering from similar labour market problems, as is illustrated under our spatial modelling, then this implies that programmes aimed at business attraction and retention in spatially clustered areas with high unemployment could co-ordinate their policies to have a wider and collective policy. The identification of the presence of spatial autocorrelation of employment status patterns within Auckland motivates a case for heterogeneous employment policies across the city, as different issues seem to be relevant for local communities with populations that have specific types of characteristics. This is an important area of study, as intra-regional imbalances in non-employment are a concern for local government authorities owing not only to the economic cost of increased unemployment, but also to the social costs[14]. These involve costs to individuals, their families and their communities. For individuals, these could include feelings of being deprived, frustrated, reduced life expectancy (Safaei, 2008), increased suicide (Chuang and Huang, 1997; Ruhm, 2000; Gerdtam and Johannesson, 2003; Andres, 2005; Neumayer, 2004; Yang and Lester, 1995) and drug abuse rates. Families often face increased breakups and domestic violence rates. As for the impact on the community, areas of high unemployment experience a decline in average incomes and consequently spending levels, and often face rising relative poverty and income inequality (Saunders, 2002).

Additionally, because younger workers tend to be more mobile, these areas with high unemployment over a prolonged period of time can be left with an ageing workforce, which makes them unattractive for businesses to invest and locate in (Barnes *et al.*, 2009). Given the private and social costs of unemployment, especially intra-regional disparities, determining the factors that influence rising levels of non-employment remains an imperative research issue, and reducing unemployment rates in the short term may reduce future costs that are directed at rectifying other long-run socio-economic problems.

Finally, future research could replicate this analysis at the individual level. This would require micro data in a longitudinal framework to investigate the determinants of transitions between labour states at the individual level.

Notes

1. For instance Bassanini and Duval (2006) focus on determinants of unemployment across the OECD. While such research has significant merit, the empirical method utilised does not explicitly model the standard textbook description of a labour market (see Ehrenberg and Smith, 2012) – that is of a stockflow model, with simultaneous flows between employment, unemployment and out of the labour force.
2. At the aggregate level this means that if, for instance, greater proportions of an area's inhabitants move into full-time work, then there must also be at least one other labour market status that is shrinking. There are relatively small numbers of workers who have more than one job, and this proportion varies across economies. This added complication to this model is acknowledged but remains an area for future research.
3. This is determined using productivity/performance data from the NZ Time Series for all industry classifications, between 1996 and 2006.
4. Livanos (2009) finds that the area of residence is a factor that affects the odds of being unemployed and, in common with other studies, appears to use dummy variables to capture the region of residence without theoretical justification for their inclusion.
5. Unfortunately we do not have access to area-level information external to Auckland, but do acknowledge that it would be worthwhile in future analysis to include extra-regional information in our spatial modelling process. Nevertheless, it is worthwhile to note that in analysis by Morrison and Berezovsky of inter-regional labour market risk across NZ, the authors contend that the Auckland metropolitan region has a sufficient degree of disaggregation from other surrounding regions.
6. Throughout this paper, we employ a queen contiguity spatial weights matrix to capture the spatial effect, that is any area that shares a common boundary with area i .
7. Statistics New Zealand defines full-time work as 30 or more hours each week, and the percentage of each labour market state is drawn from the usually resident population count aged 15 years and over.
8. To undertake these tasks we employed the GeoDa open source software. This is free software and was developed at the Spatial Analysis Lab at the University of Illinois. It can be downloaded from: <http://geodacenter.asu.edu/software>
9. We estimated statistical significance for Moran's I values based on the randomisation approach with 999 permutations. Corresponding values for ΔPT_i , ΔU_i and ΔOut_i were 0.083, 0.360 and 0.241, respectively, and all were statistically significant different from 0.
10. Technically, our results can be referred to as partial correlations, which are measures of the degree of association between the dependent and an independent variable once the effects of other variables in the model have been controlled for.

11. Note that the specifications illustrated in Table II were also conducted using OLS, and while not provided here for the sake of brevity, the model fit criteria was much improved for the SUR-SL results. OLS results can also be obtained from the authors upon request.
12. Zenou and Boccoard (2000) have also argued that the stigmatisation of deprived neighbourhoods may cause employers to discriminate against workers who live in or close to these neighbourhoods, based on their residence location.
13. For instance, White (2001) demonstrates the importance of adequate childcare services with regard to increasing female labour force participation, within the Canadian context.
14. For further discussion on social costs of unemployment see Ramazzotti and Rangone (2004), Kuhn *et al.* (2007) and Morris (2002).

References

- Acemoglu, D. (2003), "Cross-country inequality trends", *Economic Journal*, Vol. 113 No. 485, pp. F121-F149.
- Andres, A.R. (2005), "Income inequality, unemployment, and suicide: a panel data analysis of 15 European countries", *Applied Economics*, Vol. 37 No. 4, pp. 439-451.
- Auckland City (2009), available at: www.aucklandcity.govt.nz/council/documents/edstrategy/docs/visionandrole.pdf (accessed 5 March 2009).
- Barnes, H., Smeaton, D. and Taylor, R. (2009), "An ageing workforce: the employer's perspective", Report No. 468, Institute for Employment Studies, Brighton.
- Bartik, T.J. (1991), "Boon or boondoggle? The debate over state and local economic development policies", in Bartik, T.J. (Ed.), *Who Benefits from State and Local Economic Development Policies?* W.E. Upjohn Institute for employment Research, Kalamazoo, MI, pp. 1-16.
- Bassanini, A. and Duval, R. (2006), "The determinants of unemployment across OECD countries: reassessing the role of policies and institutions", *OECD Economic Studies*, Vol. 42, p. 1, available at: www.oecd.org/eco/labour/38697056.pdf
- Baum, S. and Mitchell, W.F. (2010), "People, space and place: a multidimensional analysis of unemployment in metropolitan labour markets", *Geographical Research*, Vol. 48 No. 1, pp. 13-23.
- Blanchard, O.J. and Katz, L. (1992), "Regional evolutions", *Brookings Papers on Economic Activity*, Vol. 1, pp. 1-75.
- Burda, M.C. and Profit, S. (1996), "Matching across space: evidence on mobility in the Czech Republic", *Labour Economics*, Vol. 3 No. 3, pp. 233-254.
- Burgess, S.M. and Profit, S. (2001), "Externalities in the matching of workers and firms in Britain", *Labour Economics*, Vol. 8 No. 3, pp. 313-333.
- Cervero, R., Rood, T. and Appleyard, B. (1999), "Tracking accessibility: employment and housing opportunities in the San Francisco Bay area", *Environment and Planning A*, Vol. 31 No. 7, pp. 1259-1278.
- Chuang, H.-L. and Huang, W.-C. (1997), "Economic and social correlates of regional suicide rates: a pooled cross-section and time-series analysis", *Journal of Socio-Economics*, Vol. 26 No. 3, pp. 277-289.
- Clarke, A.E., Georgellis, Y. and Sanfey, P. (2001), "Scarring: the psychological impact of past unemployment", *Economica*, Vol. 68 No. 270, pp. 221-241.
- Cochrane, W. and Poot, J. (2008), "Regional labour market adjustment and social security benefit uptake", in Morrison, P. (Ed.), *Labour Employment and Work in New Zealand*, Victoria University of Wellington, Wellington, pp. 343-355.

-
- Conley, T.G. and Topa, G. (2002), "Socio-economic distance and spatial patterns in unemployment", *Journal of Applied Econometrics*, Vol. 17 No. 4, pp. 303-327.
- Dietz, R. (2002), "Estimation of neighbourhood effects in the social sciences: an interdisciplinary approach", *Social Science Research*, Vol. 31 No. 4, pp. 539-575.
- Ehrenberg, R. and Smith, R. (2012), *Modern Labor Economics*, 11th ed., Pearson Education, Harlow.
- García, J.A.B. and Hernández, J.E.R. (2004), "User cost changes, unemployment and homeownership: evidence from Spain", *Urban Studies*, Vol. 41 No. 3, pp. 563-578.
- Gerdtham, U.G. and Johannesson, M. (2003), "A note on the effect of unemployment on mortality", *Journal of Health Economics*, Vol. 22 No. 3, pp. 505-518.
- Green, R.K. and Hendershott, P.H. (2001), "Homeownership and unemployment in the US", *Urban Studies*, Vol. 38 No. 9, pp. 1509-1520.
- Henley, A. (1998), "Residential mobility, housing equity and the labour market", *Economic Journal*, Vol. 108 No. 447, pp. 414-427.
- Irwin, E. and Bockstael, N. (2004), "Endogenous spatial externalities: empirical evidence and implications for the evolution of exurban residential land use patterns", in Anselin, L., Florax, R. and Rey, S.J. (Eds), *Advances in Spatial Econometrics: Methodology, Tools and Applications*, Springer, Berlin, pp. 359-380.
- Jeanty, P.W., Partridge, M. and Irwin, E. (2010), "Estimation of spatial simultaneous equation model of population migration and housing price dynamics", *Regional Science and Urban Economics*, Vol. 40 No. 5, pp. 343-352.
- Jencks, C. and Mayer, S.E. (1990), "The social consequences of growing up in a poor neighborhood", in Lynn, L.E. Jr and McGahey, M.G.H. (Eds), *Inner City Poverty in the United States*, National Academy Press, Washington, DC, pp. 111-186.
- Korsu, E. and Wenglenski, S. (2010), "Job accessibility, residential segregation and risk of long-term unemployment in the Paris region", *Urban Studies*, Vol. 47 No. 11, pp. 2279-2324.
- Kuhn, A., Lalive, R. and Zweimüller, J. (2007), "The public health costs of job loss", IZA Discussion Paper No. 4355.
- Lai, G., Lin, N. and Leung, S.-Y. (1998), "Network resources, contact resources and status attainment", *Social Networks*, Vol. 20 No. 2, pp. 159-178.
- Livanos, I. (2009), "Modelling the incidence of unemployment: the case of Greece", *Applied Economics Letters*, Vol. 16 No. 16, pp. 1607-1611.
- Manski, C.F. (1993), "Identification of endogenous social effects: the reflection problem", *Review of Economic Studies*, Vol. 60 No. 3, pp. 531-542.
- Maré, D. (2008), "Labour productivity in Auckland firms", MOTU Working Paper No. 08-12, MOTU Economic and Public Policy Research, Wellington.
- Massey, D. and Denton, N. (1992), *American Apartheid*, Harvard University Press, Cambridge, MA.
- Molho, I. (1995), "Spatial autocorrelation in British unemployment", *Journal of Regional Science*, Vol. 35 No. 4, pp. 641-658.
- Morris, A. (2002), "The social costs of unemployment", *Economic and Labour Relations Review*, Vol. 13 No. 2, pp. 207-225.
- Morrison, N. and Monk, S. (2006), "Job-housing mismatch: affordability crisis in Surrey, south east England", *Environment and Planning A*, Vol. 38 No. 6, pp. 1115-1130.
- Mortensen, D.T. (1986), "Job search and labour market analysis," in Ashenfelter, O. and Layard, R. (Eds), *Handbook of Labour Economics 2*, Elsevier, Amsterdam, pp. 849-919.
- Neumayer, E. (2004), "Recessions lower (some) mortality rates: evidence from Germany", *Social Science and Medicine*, Vol. 58 No. 6, pp. 1037-1047.

- New Zealand Transport Agency (2010), *National Land Transport Programme*, The New Zealand Transport Agency, Wellington.
- OECD (2006), *OECD Employment Outlook 2006*, Paris, available at: www.oecd.org/document/38/0,3746,en_2649_33927_36261286_1_1_1_1,00.html
- Oswald, A. (1996), "A conjecture on the explanation for high unemployment in the industrialized nations: part I", Warwick Economics Research Paper No. 475, University of Warwick.
- Overman, H. and Puga, D. (2002), "Unemployment clusters across European regions and countries", *Economic Policy*, Vol. 17 No. 34, pp. 115-147.
- Patacchini, E. and Zenou, Y. (2007), "Spatial dependence in local unemployment rates", *Journal of Economic Geography*, Vol. 7 No. 2, pp. 169-191.
- Pissarides, C.A. (1992), "Loss of skill during unemployment and the persistence of employment shocks", *Quarterly Journal of Economics*, Vol. 107 No. 4, pp. 1371-1391.
- Ramazotti, P. and Rangone, M. (2004), "Unemployment as a social cost", Working Paper No. 20-2004, Department of Finance and Economic Sciences, Macerata University.
- Rodgers, E.M. (1962), *Diffusion of Innovation*, Free Press, New York, NY.
- Ruhm, C.J. (2000), "Are recessions good for your health?", *Quarterly Journal of Economics*, Vol. 115 No. 2, pp. 617-650.
- Safaei, J. (2008), "Long-term employment and health inequalities in Canadian communities", *Canadian Journal of Public Health*, Vol. 99 No. 3, pp. 195-200.
- Saunders, P. (2002), "The direct and indirect effects of unemployment on poverty and inequality", SPRC Discussion Paper No. 118, University of New South Wales.
- St John, S. and Fargher, S. (2004), *Macroeconomics and the Contemporary New Zealand Economy*, 3rd ed., Pearson, Auckland.
- Vipond, J. (1984), "The intra-urban unemployment gradient: the influence of location on unemployment", *Urban Studies*, Vol. 21 No. 4, pp. 377-388.
- Vishwanath, T. (1989), "Job search, stigma effect and escape rate from unemployment", *Journal of Labour Economics*, Vol. 7 No. 4, pp. 487-502.
- Voss, P.R., Long, D.D., Hammer, R.B. and Friedman, S. (2006), "County child poverty rates in the US: a spatial regression approach", *Population Research Policy Review*, Vol. 25 No. 4, pp. 369-391.
- White, L. (2001), "Child care, women's labour market participation and labour market policy effectiveness in Canada", *Canadian Public Policy/Analyse de Politiques*, Vol. 27 No. 4, pp. 385-405.
- Wrigley, N., Holt, T., Steel, D. and Tranmer, M. (1996), "Analysing, modelling and resolving the ecological fallacy", in Longley, P. and Batty, M. (Eds), *Spatial Analysis: Modelling in a GIS Environment*, GeoInformation International, Cambridge, pp. 23-40.
- Yang, B. and Lester, D. (1995), "Suicide, homicide, and unemployment", *Applied Economics Letters*, Vol. 2 No. 8, pp. 278-279.
- Zellner, A. (1962), "An efficient method for estimating seemingly unrelated regressions and tests for aggregation bias", *Journal of the American Statistical Association*, Vol. 57 No. 298, pp. 348-368.
- Zenou, Y. (2009), *Urban Labor Economics*, Cambridge University Press, New York, NY.
- Zenou, Y. and Boccoard, N. (2000), "Racial discrimination and redlining in cities", *Journal of Urban Economics*, Vol. 48 No. 2, pp. 260-285.

Further reading

- Berezovsky, O. and Morrison, P.S. (2003), "Labour market risk and the regions: evidence from gross labour flows", in Martin, R. and Morrison, P.S. (Eds), *Geographies of Labor Market Inequality*, Chapter 2, Taylor and Francis Books, London, pp. 23-54.
- Granovetter, M. (1973), "The strength of weak ties", *American Journal of Sociology*, Vol. 78 No. 6, pp. 1360-1380.
- Jensen, R. (1997), "Social issues in spatial economics", *International Journal of Social Economics*, Vol. 23 Nos 4/5/6, pp. 297-309.

Corresponding author

Gail Pacheco can be contacted at: gail.pacheco@aut.ac.nz