SPATIAL EFFECTS OF 'MILL' CLOSURES: DOES DISTANCE MATTER?

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ABSTRACT: When small towns experience a major shock, such as a 'mill' closure, the effects can be devastating. We analyse the effects of two major meat works closures in New Zealand, Patea (1982) and Whakatu (1986). These examples provide an interesting comparison: Whakatu is located close to a city, while Patea is relatively isolated. We describe the impacts of these shocks on population, employment and housing in each town, and contrast adjustment dynamics resulting from their differing locations. Both towns experience negative population and employment impacts; however, consistent with benefits of a near-city location, the effects on Whakatu are mainly temporary, whereas the effects on Patea are more permanent. Population age-groups respond differently to the shocks, consistent with homeownership being a factor stifling migration responsiveness. The results have implications for regional development policy and programmes designed to stimulate homeownership.

KEYWORDS: Mill closures; rural infrastructure; homeownership

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1. INTRODUCTION

Any small town with employment heavily concentrated at one employer (the 'mill') has the threat of mill closure as an ever-present concern. We examine the impacts of two large mill closures in New Zealand that occurred in the early-mid 1980s in towns with some contrasting features. Using a difference-in-difference approach, we examine how the dynamic adjustments differed across the two towns and relate these contrasting adjustments to features of the towns and their populations.

Our purpose in this analysis is twofold. First, understanding factors that affect adjustments to negative employment shocks is important in its own right, especially where policymakers aim to facilitate improved economic and social responses in the wake of such a shock. Second, the impact of a major exogenous closure can tell us a considerable amount about the benefits of a similar mill opening. Where the closure is unanticipated (as in our examples), we can treat the observed impacts as akin to the outcomes of a natural experiment, whereas this is more difficult in the case of an opening where many other (positive) factors may be operating in tandem with the mill opening.

Drawing on a range of prior research, we derive a set of hypotheses concerning adjustment dynamics of employment and population, and confront these hypotheses with data from the two meat works plant closures at Patea and Whakatu. We analyse the effects of each closure on population, housing and employment within each town. In each case, we express the town data relative to (two sets of) comparator data, detrend the resulting ratio, and then examine the temporal differences in the responses of the detrended ratios. This difference-in-differences approach enables us to isolate the adjustment components due to the respective mill closure. The results assist in understanding the role of major investments in rural areas, and provide insights for regional development policy makers who may be considering the location of such investments.

We provide a brief survey of related studies, together with descriptions of the two closures and hypotheses, in the next section. Section 3 outlines our data and methodology. Results are presented in section 4, with conclusions following.

2. BACKGROUND INFORMATION AND HYPOTHESES

In New Zealand and internationally, regional development programmes have often attempted to promote the construction of large processing facilities (mills) in areas away from major urban areas. The rationale for their establishment in non-urban areas relates to the net economic and social benefits these developments may bring to rural towns. These benefits include employment, higher revenues, urban growth, and better education and health services. In effect, the mill is a form of infrastructure, often servicing multiple suppliers (as in the case of meat works or dairy factories) and providing the commercial substance to attract other service providers to the locality. In this latter respect, they are similar to a transport link that attracts new firms and population to an area. However, the effects associated with the closure of these facilities on the towns in which they are located can be devastating. Given the immobility of houses and commercial properties, these structures are not likely to disappear as quickly as they emerged; many may fall into disrepair and cheap rents may encourage those without employment to move in.

Prior Literature

Our analysis of adjustment dynamics following mill closures is conceptually related to analyses of the impacts of regional employment shocks. Blanchard and Katz (BK, 1992) analysed regional adjustments to employment shocks using United States state-level data. They found that the dominant adjustment mechanism following an employment shock is labour mobility. Their study established that US employment shocks have a permanent component to them. In the case of a negative employment shock, the employment response after 5-7 years is almost entirely reflected in net outward migration from the region, leaving the unemployment rate and participation rate relatively unaffected.

European studies find some similarities and some differences relative to BK. Frederiksson (1999) finds even stronger migration responses using Swedish data than do BK, while Decressin and Fatás (1995) find labour force participation rate changes to be a major adjustment mechanism over a three year window across Europe. Mauro and Spilimbergo (1998) find different adjustment responses according to skill level, with out-migration observed

for higher skilled workers and labour force participation or unemployment responses more prevalent amongst lower skilled workers.

Another relevant factor is the prevalence of homeownership in affected localities. Oswald (1996, 1999) conjectured that homeownership establishes a barrier to migration for the homeowner if that person (or a family member) loses a job. The costs of selling the house (possibly in a depressed market compared with time of house purchase) and then purchasing or renting elsewhere are added to other economic and social costs of relocation. These extra costs may tip the decision towards staying in the affected locality rather than seeking new employment elsewhere. Additional studies in the United Kingdom and the United States confirm this finding, and additionally indicate that the impact of this factor falls disproportionately on more disadvantaged groups (South and Crowder, 1998a and 1998b; Green and Hendershott, 2001; Partridge and Rickman, 1997; Pehkonen, 1999).

Glaeser and Gyourko (2005) examine housing and population dynamics across cities, including the 'rust-belt' cities of the United States, finding that a positive employment shock causes a positive change to population and a positive, but small, change to house prices; a negative employment shock results in a small migration away and a relatively large fall in house prices. These patterns arise as a result of the adjustment dynamics of the housing stock; the stock of dwellings increases (through new building) in the face of a positive employment shock, but remains broadly static following a negative shock. A downward employment (and population) shock requires a steep fall in house prices in order to equate existing supply to the new lower level of demand.

One feature that may further condition adjustment dynamics following a shock is the location of the affected area in relation to urban agglomerations. Advantages of agglomeration include greater risk-sharing and improved matching between firms and their suppliers (including labour) and between firms and their customers (Maré and Timmins, 2006; Maré, 2008; de Groot et al., 2009). Glaeser and Maré (2001) note that denser areas facilitate matching. Better matching within a larger urban area results not only in higher productivity, and hence higher wages, but also reduces the chance of a worker (or firm) not finding any suitable match, thus inducing an inward shift in the Beveridge Curve (i.e. the equilibrium locus of unemployment and vacancies). The Beveridge Curve is a graphical representation of the relationship between unemployment and job vacancies. It is downward-

sloping and hyperbolic, indicating increasing rates of unemployment occur as the number of job vacancies declines (Dow and Dicks-Mireaux, 1958).

A number of New Zealand studies have examined adjustment dynamics following employment shocks in the spirit of the BK analysis. Building on previous work by Maré and Timmins (2000) and Choy et al. (2002), Maré et al. (2009) examine regional adjustments across New Zealand following an employment shock. They estimate a structural vector autoregression model containing variables relating to employment, migration and housing prices. Their results indicate positive responses in the employment rate, participation rate and the working age population (and hence in net inward migration) following an upward regional employment shock. Population and employment rise to permanently higher levels following such a shock. However, the response of house prices, both in the short and long terms, is negligible. This negligible response of regional house prices is a surprising result, especially since at a national level they find a significant positive response of house prices to a similar employment shock. They offer some possible explanations for this paradox. First, the housing market may be a national market rather than regional. Second, house price effects may be further localized than the regional definition used. The third explanation is put down to high sampling error.

A related study, by Velamuri et al. (2008), looked at the effects of structural reforms on local communities, focussing on employment, population and house price effects in the medium- and long-term. Like Maré et al. (2009), they find no relationship between employment shocks and house prices. Furthermore, employment, population and house price shocks have no relationship with any future outcomes of employment rates, population levels or house prices, other than on their own respective future outcomes. In other work, Stillman and Maré (2008) studied the relationship between house prices and migration within New Zealand. They find, at both national and regional level, a significant positive correlation between population change and house prices; specifically, a net inflow from migration leads to house price inflation. (They caution, however, about the temporal stability of the relationship.) Grimes and Aitken (2010), using a cointegration approach, find a strong regional relationship between population and house prices over time within New Zealand.

These conflicting results leave unanswered questions relating to the effects of a regional employment shock on local house prices. It is possible that

nationwide studies are unable to capture the diversity of reactions that arise from different shocks given the differing spatial characteristics of the regions included in each study. In particular, the Glaeser and Gyourko analysis and agglomeration theories suggest that adjustment dynamics may differ materially depending on whether the shock is positive or negative, and on whether the affected locality is rural or is close to a larger urban area. Case study analyses may shed light on these issues in ways that nation-wide regional panel studies cannot, owing to the need for the latter studies to assume similarity of response across regions.

Case studies also enable us to delve more deeply into the role of differing population characteristics in determining adjustment dynamics. The cited international and New Zealand studies focus on the effects of shocks on the whole population (or on the working age population). However, differing age groups may respond in materially different ways from one another. This observation follows, in part, from the work of Oswald (1996) on the effects of homeownership on mobility. In New Zealand and elsewhere, older adults tend to have higher rates of homeownership than do young adults. Carne (2004) showed that homeownership rates were much higher for older aged-groups. Those aged 45 to 59 years and those aged 60 years or more had very similar homeownership rates of around 80 to 90%, for the eight cities considered. The younger age-group of those aged 25 to 44 years had homeownership rates that were 10 to 15 percentage points lower than the two older age-groups and homeownership rates for those aged 15 to 24 years were even lower still. Morrison (2008) also finds that the probability of homeownership increases with age. If Oswald's findings extend to New Zealand, we would expect to see young adults (predominantly non-homeowners) being more mobile than are older adults (predominantly homeowners) when a locality suffers a negative employment shock. Our study decomposes population movements into age bands, focusing on population ages grouped by: 0-14 years (children), 15-24 years (youths), 25-44 years (young adults), 45-64 years (older adults), 65+ years (mainly retired).

Another distinction that we make, following the agglomeration literature, is to contrast adjustment dynamics across two separate localities that exhibit material differences in their respective proximity to a city. This comparison enables us to observe whether the better risk-sharing and matching characteristics of a city location leads to differing adjustment dynamics

relative to those observed for a locality in a rural environment. We hypothesise that Whakatu, being closer to a city, will adjust more quickly to the employment shock than does Patea.

If true, this hypothesis has implications for policy development. Regional development policies have been used as tools to assist regions recover from unfavourable shocks or, more generally, to promote growth in local economies. They may be designed to attract major processing plants servicing local suppliers (e.g. forestry mills and meat works) or a social services institution (e.g. hospital or polytechnic), plus people with skills and ideas into areas which need assistance. However, caution must be taken with regard to how the benefits of major plant investments are distributed. If the majority of the benefit accrues to migrants into the area, any improvements may fail to raise the standard of living for the original residents (Maré and Timmins, 2000). In addition, attention must be paid to the sustainability of the new plant; if population and other services gravitate to the locality serviced by the new investment, major costs could subsequently be experienced if it were later closed. This potential reversibility of major investments makes their location in relation to other activities of crucial importance.

Meat Works Closures

The meat industry in New Zealand was once the country's leading export industry. External economic developments progressively reduced profitability (Evans et al, 1996) and its structure was inflexible in the face of heavy regulation and licensing. In the early 1980s, the New Zealand Government's decision to de-license and deregulate the industry, coupled with over-capacity of meat processing plants, especially in the lower North Island, caused major rationalization of the industry. Two major closures in the mid North Island occurred at Patea (1982) and Whakatu (1986) respectively. There were major job losses in both cases, with Patea's closure resulting in the direct loss of 800 jobs and Whakatu's closure leading to over 1600 direct job losses. The two meat works were the chief employers in their respective towns, and the closures had serious impacts on each town.

Patea[1]

Patea is a small isolated town located in the South Taranaki District of the North Island of New Zealand, between Wanganui and New Plymouth (Figure 1). The population of Patea in 1981 was 1,983. Its nearest city (Wanganui, with a 1981 population of 39,595) is 60.8 kilometres (kms) distant (with an estimated travel time of 48 minutes). New Plymouth (population of 44,095 in 1981) and Palmerston North (population of 66,691 in 1981) are 98.3 kms (90 minutes) and 152 kms (112 minutes) distant, respectively.

Figure 1. Geographical Locations of Patea, Whakatu and Nearest Cities.
Source: Google Maps

In 1910, The Patea Freezing Company was established to operate the local meat-processing plant. After a reformation in 1933, it provided work for approximately one thousand workers during the peak season (Dare, 1999). In May 1982, it was announced that the Patea Freezing Works would close in three months time (Puke Ariki, 2003). Its closure left 800 employees of the works without jobs, amounting to an estimated loss of around $10 million per

[1] Background information on Patea and Whakatu from the cited sources is supplemented by information from Google Maps and Wikipedia.

annum in wages (The Dominion, 1982a). There were a number of factors precipitating the plant's closure. One major proximate determinant was the Government's decision to de-license the meat industry in the early 1980s (The Evening Post, 1982b), coupled with over-capacity of meat processing plants, especially in the lower North Island (Taranaki Daily News, 1982a). In addition, the Patea Freezing Company had a reputation of low productivity and a high number of work stoppages (The Dominion, 1982b). Another determinant was heightened hygiene standards and other requirements for upgrades demanded by foreign parties (Taranaki Daily News, 1982a).

The plant officially closed in September 1982. Negotiations between the firm and the meat-workers union over redundancy payments were lengthy (The Evening Post, 1982a). Workers considered that they were in need of a good settlement as there were no real alternative jobs nearby. In addition, it was reported that many redundant workers owned homes in the area and were not able to move easily, as transport or selling of houses was not possible (The Evening Post, 1982c). Approximately 65% of the workers in the meat works lived in Patea (The New Zealand Herald, 1982), and it was considered unlikely that the unemployed would be absorbed by other firms in the area (The Evening Post, 1982d). This was especially the case given that those already unemployed in the area were not able to find work (Taranaki Daily News, 1982b). The company arranged transfers for many senior and middle management staff; other offers were also made, but the majority were turned down because many owned houses in the single-industry town (The Dominion, 1982c). Many surrounding businesses, reliant on the meat workers for business, were also forced to close.

Following the announcement but prior to the actual closure, Melser (1982) assessed its likely social and economic impacts. He expected that Patea's population would decline, with highly skilled workers plus younger and unattached workers being the largest groups of migrants. Patea had always had an issue retaining its younger population, with approximately 50% migrating from the town in the 20 years leading up to the closure. It was believed that others had been retained through job security which the meat works offered. With the works closure, Patea could expect an even higher proportion of its younger population to leave. A large number of redundant workers were in the older generation. Many of these workers owned houses; therefore the cost of relocation was high and migration may not have been a viable option for this group. Melser predicted that physical infrastructure and

property within Patea would suffer a major impact from the closure of the meat works. With the decline in population, the local council faced a diminishing financial base. This meant that residential rates bills for those who remained could rise sharply and the town could be faced with the possibility that many of its streets would contain empty dwellings.

Whakatu

Whakatu is located in the Hastings District of the Hawke's Bay region in New Zealand's North Island. Its population in 1981 was 936. In contrast to Patea, Whakatu lies close to twin cities, Hastings and Napier. Hastings (population 52,563 in 1981) lies 6.8 kms (10 minutes) away while Napier (population 51,330 in 1981) is 14.3 kms (14 minutes) distant.

The Whakatu meat works, established in 1912 (Hawke's Bay Today, 2006), became one of the largest meat works in the country. In October 1986, the plant was officially closed, leaving around 1,600 of 1,900 employees (during the peak periods) redundant (The New Zealand Herald, 1986). The closure came as a shock to almost all employees, even some top management staff (The New Zealand Herald, 1986). Although the slaughtering operations were closed, the fellmongery, freezing chambers and casing operations continued. The cold-stores were converted, in part, to store apples and other commodities, and there was hope that other processing facilities would also be developed (The New Zealand Herald, 1986).

The reasons for closure again included the deregulation of the industry and existing over-capacity, coupled with a complex series of industry mergers and takeovers (Keefe-Ormsby, 2001; The New Zealand Herald, 1986). After months of bargaining, redundancy packages were paid to ex-workers and a special worker support group was established to assist redundant staff find new employment (The New Zealand Herald, 1986). However, with the high level of pre-existing unemployment in the region, very few of the redundant workers were able to find work. As was the case in Patea, many local businesses in Whakatu were affected by the closure and were forced to close (Hawke's Bay Herald Tribune, 1986a). However, unlike Patea, only 4% of Whakatu's meat workers lived in Whakatu. The residence of the remaining 96% of Whakatu's meat workers comprised: 42% living in Hastings, 36% living in Napier, 10% in Havelock North, 4% in Clive and the remaining in outlying areas (Hawke's Bay Herald Tribune, 1986b).

Hypotheses

The prior studies and information about the two closures lead to a number of hypotheses that we subject to examination. First, previous employment adjustment literature suggests that the closures will induce long term employment and population loss with net outward migration from each town. Therefore, we hypothesise that a negative employment shock will induce outward net migration, at least for the working age population; unemployment will rise initially before converging back to a lower value while falls in the levels of employment and population will exhibit permanent effects.

Second, homeownership characteristics may affect the adjustment dynamics since homeowners may incur greater costs in shifting towns than do non-homeowners. We hypothesise that these effects will be more marked for younger (non-homeowning) adults than for older adult (homeowning) age groups.

Third, the adjustment dynamics are expected to vary according to the proximity of the affected localities to larger urban areas. Patea is a relatively isolated rural town, while Whakatu is located close to the major urban areas of Hastings and Napier. Location close to a major urban area may improve risk-sharing and labour market matching for Whakatu relative to Patea meaning that the effects of the closure on Whakatu may be relatively short-lived and of a different nature to those experienced in Patea. Given that Whakatu is located near a major urban area, we hypothesise that its adjustment to the employment shock will be faster than that of Patea.

Fourth, following Glaeser and Gyourko, we hypothesise that house prices will fall sharply following the shocks, with a greater effect in (isolated) Patea than in Whakatu, while the number of dwellings will remain broadly static following the shocks.

3. DATA AND METHODOLOGY

Census Data

We use census data for population, employment and dwellings from 1981, 1986, 1991, 1996, 2001 and 2006. All census data are coded to a census meshblock (the lowest geographical area used by Statistics New Zealand),

before being aggregated to area units (AUs), territorial local authorities (TAs) and higher levels. We focus on AU and TA data. The geographical boundaries are sensitive to which census years they refer to. We re-map all census data to 2001 geographical boundaries so that there is a consistent set of boundaries used for all towns in our study. For population, the total usually resident population count is used, as well as counts of the total population broken down into the following population age-bands: 14 years and younger, 15 to 24 years, 25 to 44 years, 45 to 64 years, and 65 years and older. Employment census data classifies each individual according to their employment status on census night. Total employment comprises those who are either full-time employed or part-time employed; unemployment refers to those who are currently without a job and are actively seeking one; not in the labour force refers to those who are currently without a job and are not actively seeking one. The dwellings census data count private and non-private dwellings which are occupied as at midnight on census night. Data for non-occupied dwellings and total number of dwellings had incomplete coverage (earlier data are not available) and hence were not used.

Housing Data

The housing data are collected by Quotable Value New Zealand (QVNZ), a state-owned entity. This paper uses QVNZ sales data to obtain observations of median sales prices and median land values for the years 1981 through to 2006. The data are collected for each year ended 30 June and are based on properties that have been sold. Land value is the value that QVNZ attributes to the unimproved land parcel on which the residence is located; it is used by some local authorities as the legal rating base and reflects a best estimate of market values. Median values are used as these are less likely than mean data to be affected by extreme outliers. There are multiple categories for types of property. We use the residential dwelling (RD) category. As with the census data, the QVNZ data are coded to meshblock level before being aggregated further. All QVNZ data have been mapped to 2001 geographical boundaries. Definitions of variables used in the paper are given in Table 1.

Table 1. Variables. Source: Census and QVNZ.

Variable	Description
pop	Total population measured as the total of the usually resident population on each census night (also decomposed into 'age bands')
emp	Total employment measured by the number of the usually resident population aged 15 years and older, who are in either full-time or part-time employment
unemp	Total unemployment measured by the number of the usually resident population aged 15 years and older, who are without employment and are actively seeking employment
nlf	Number not in the labour force measured by the number of the usually resident population aged 15 years and older, who are not employed and are not actively seeking employment
occupied	Total number of occupied dwellings measured as the sum of private occupied dwellings (houses, flats, apartments, etc) and non-private occupied dwellings (hotels, hospitals, etc).
averagehh	Average household size of each occupied dwelling, measured by dividing *pop* by *occupied*.
spmedian	Median sales price measured by the median sales price of residential dwellings sold. This variable is measured annually from 1981 through to 2006.
lvmedian	Median land values measured by the median land value of residential dwellings sold. These data are measured tri-annually from 1981 through to 2005.

Methodology

To analyse the impacts of each meat works closure on its town, we adopt a difference-in-differences (DID) approach. Under DID, a treatment (meat works closure) is given to a treated group (the closure town) and the difference, pre- and post-treatment, is measured on various outcomes (impacts of the closure). These simple differences may not represent the true impacts of the treatment on the treatment group, as there may be other factors influencing the outcomes that confound the impact of the treatment. To account for these confounding factors, a control group, that does not receive the treatment, is selected with similar characteristics to the treated group. The control group difference is calculated, and the difference between the

treatment group difference and the control group difference (DID) is formed. The DID measure provides a more accurate prediction of impact of the treatment. Angrist and Pischke (2009) note that the DID approach was first used in 1855 by physician, John Snow, to study the causes of cholera epidemics in London.

We analyse the DID impacts of each closure by comparing developments in each closure town to two different sets of comparators (control groups): (a) a group of similar control towns, determined by a set of characteristics, and (b) each closure town's respective TA.

Initially, we compare both Patea and Whakatu to a group of control towns, dubbed 'like localities' (LLs). These like localities are selected AUs that have similar characteristics to those of Patea and Whakatu respectively. The purpose of adopting these LL controls is to filter out influences on each of the variables under consideration that are due to generalized economic developments impacting on similar localities that are not specific to the closure. The characteristics used to select the LLs are: distance from nearest major urban area, industry structure (operating meat-processing plant), and size of the town (population). Given that Patea is relatively isolated, its LLs were chosen on the basis of isolation from a major urban area together with the existence of an operating meat-processing plant from 1981 through to at least 2006. Considering these criteria, we found three like localities: Wairoa, Takapau and Mataura[2]. Using the same selection process for Whakatu, a town close to the major urban area of Hastings, we chose LLs based on their proximity to a major urban area and the existence of an operating meat-processing plant from 1981 to 2006. Again we found three like localities for Whakatu: Horotiu, Pareora and Makarewa. Table 2 details information on each of the LLs across relevant characteristics.

[2] Mataura contained another 'mill' type infrastructure in the form of a paper mill. This mill was mothballed in 2000. Our analysis focuses on the impacts during the first 15 years following the closures, so there are no effects from this mothballing on our analysis.

Table 2. Like Locality Characteristics. Source: Census; Google Maps.

Town	1981 Population	Name of nearest city	Distance to nearest city (kms)	Meat works operating dates during sample
Patea	1,983	Wanganui	60.8	1981-1982
Wairoa	5,448	Gisborne	99.8	1981-2006
Takapau	474	Hastings	69.4	1981-2006
Mataura	2,376	Invercargill	51.7	1981-2006
Whakatu	936	Hastings	6.8	1981-1986
Horotiu	711	Hamilton	13.6	1981-2006
Pareora	546	Timaru	12.1	1981-2006
Makarewa	1,134	Invercargill	10.1	1981-2006

To compare Patea with its LLs, we average observations from the LLs to obtain an LL average and then form the ratio of Patea to LL average for each variable over time. All data were normalized (using a base year of 1996=1) to give each like locality an equal weight. The same process was adopted for Whakatu. (We checked that no abnormal behaviour is observed for any of the variables across the LL towns that could affect the LL ratios. For instance, with regard to population, each LL average remains close to unity across the sample period.)

As an alternative approach to controlling for external influences, we compared both Patea and Whakatu to their respective TAs, South Taranaki District and Hastings District. (Pre-closure, Patea's population accounted for 6% of the South Taranaki District population and Whakatu's population comprised 1.4% of the Hastings District population; therefore, neither closure town exerts much influence on the TA levels). This comparison accounts for region-specific effects that may have affected trends in each closure town. The ratios of Patea and Whakatu to their respective TAs were formed, and the ratios again normalized to one in 1996.

All analysis is conducted using each set of controls to determine whether our results are sensitive to the particular controls chosen. Once the ratios for all variables were obtained for each town, with respect to their LL average and their TA, they were plotted over time to present a perspective of the long-run trends in each town. We then compare the two towns' adjustment processes following each closure. These were computed by taking the ratio of

actual observations to their linear trend values (where the latter, calculated over the period 1981 to 2006, accounts for any longer term divergent tendencies that may be present between the affected towns and their controls). We focus on the adjustment processes for the first 15 years following the closure. The Patea (Whakatu) plant was closed shortly after the 1981 (1986) census, so these are our base years respectively for the two towns when comparing the adjustment processes. We re-centre all detrended ratios to 1.0 for the respective base years by dividing each series by its base year value. By comparing the time paths of the (detrended) data after accounting for each town's control locations, we are adopting a difference-in-differences approach in analyzing the adjustment data.

4. RESULTS

First we examine population variables to test whether out-migration occurred following the closures, and to test whether the migration patterns vary by age-band, potentially reflecting influences of homeownership and other factors on propensity to migrate. Second, we examine labour market data to test whether the initial job losses had prolonged employment, participation rate and/or unemployment effects. Third, we examine impacts of the closures on the housing market. Table 3 presents descriptive statistics of pre-closure levels for key variables considered, and Table 4 presents the percentage changes over the 15 years following each closure (i.e. the difference pre- and post-closure in each town/comparator), and the difference-in-difference (DID) measures between the closure town and its comparator.

Table 3. Descriptive Statistics of Pre-Closure Levels. Source: the Authors.

	Patea	LL	TA (South Taranaki)	Whakatu	LL	TA (Hastings)
Population (pop)	1,983	2,766	32,955	903	832	65,835
Employment (emp)	792	1,120	13,875	456	398	30,288
Unemployment (unemp)	42	53	495	39	22	2250
Not in the Labour Force (nlf)	495	729	7,923	162	220	15,942
Total Occupied Dwellings (occupied)	570	816	9,699	252	242	20,781
Average Household Size (averagehh)	3.48	3.32	3.40	3.58	3.45	3.17
Median Sales Price (spmedian)	$12,000	$27,067	$23,250	$39,000	$43,250	$57,500
Median Land Values (lvmedian)	$2,300	$3,567	$5,500	$10,500	$6,083	$14,100

Table 4. Difference in Differences Values. Source: the Authors.

Like-Locality (LL) Difference-in-Difference (DID)						
Impact (15 year % change)	**Patea**	**LL**	**DID**	**Whakatu**	**LL**	**DID**
Population (pop)	-29.2%	-9.2%	**-20.0%**	-8.0%	-3.1%	**-4.9%**
Employment (emp)	-49.6%	-12.7%	**-36.9%**	-13.2%	+3.8%	**-17.0%**
Unemployment (unemp)	+93.0%	+98.1%	**-5.1%**	-15.4%	+27.3%	**-42.7%**
Unemployment Rate'	+135.4%	+105.8%	**+29.6%**	-2.0%	+22.3%	**-24.3%**
Not in the Labour Force (nlf)	+6.7%	-7.5%	**+14.2%**	-1.9%	-22.3%	**+20.4%**
Total Occupied Dwellings (occupied)	-2.6%	+5.4%	**-8.0%**	+8.3%	+15.3%	**-7.0%**
Average Household Size (averagehh)	-27.3%	-13.6%	**-13.7%**	-15.1%	-16.8%	**+1.7%**
Median Sales Price (spmedian)	+137.5%	+71.8%	**+65.7%**	+125.0%	+79.2%	**+45.8%**
Median Land Values (lvmedian)	-63.0%	+36.0%	**-99.0%**	+147.6%	+200.8%	**-53.2%**

Table 4. Continued.

Territorial Authority (TA) Difference-in-Difference (DID)						
Impact (15 year % change)	**Patea**	**South Taranaki**	**DID**	**Whakatu**	**Hastings**	**DID**
Population (pop)	-29.2%	-11.7%	**-17.5%**	-8.0%	+2.4%	**-10.4%**
Employment (emp)	-49.6%	-5.4%	**-44.2%**	-13.2%	-1.5%	**-11.7%**
Unemployment (unemp)	+93.0%	+85.0%	**+8.0%**	-15.4%	+9.6%	**-25.0%**
Unemployment Rate*	+135.4%	+87.3%	**+48.1%**	-2.0%	+10.3%	**-12.3%**
Not in the Labour Force (nlf)	+6.7%	-13.9%	**+20.6%**	-1.9%	+2.1%	**-4.0%**
Total Occupied Dwellings (occupied)	-2.6%	+7.3%	**-9.9%**	+8.3%	+16.5%	**-8.2%**
Average Household Size (averagehh)	-27.3%	-17.6%	**-9.7%**	-15.1%	-12.0%	**-3.1%**
Median Sales Price (spmedian)	+137.5%	+188.2%	**-50.7%**	+125.0%	+130.0%	**-5.0%**
Median Land Values (lvmedian)	-63.0%	+145.5%	**-208.5%**	+147.6%	+201.4%	**-53.8%**

* Unemployment Rate = % change in Unemployment minus % change in Labour Force; where % change in Labour Force = weighted % change in Employment + weighted % change in Unemployment, and weights are determined by the pre-closure levels found in Table 3.

Population

Figure 2 compares the two closure towns' population ratios relative to their respective LL average and TA. The population ratios trend downwards over time for both towns in relation to both comparators. Each closure town experiences a large population decline over the first five years following closure: Patea's population ratios fall by 28% (LL) and 28% (TA), while the falls for Whakatu are 13% and 19% respectively. Along with the initial magnitudes of each drop being slightly smaller for Whakatu, there is also a marked difference in the behaviour of the ratios after the initial falls. Whakatu shows relatively rapid signs of recovery and is back above trend in 15 years on both measures. In contrast, Patea experiences a further fall in its population ratio over the second five year period (using the LL controls, with little pick-up using the TA control) and is still well below (a declining) trend after 15 years. Supporting evidence is found from Table 4, with Patea's population DID impact being more negative than those experienced in

Whakatu; with a 20.0% (17.5%) decline 15 years post-closure for Patea when compared to LL (TA), versus a 4.9% (10.4%) decline in Whakatu.

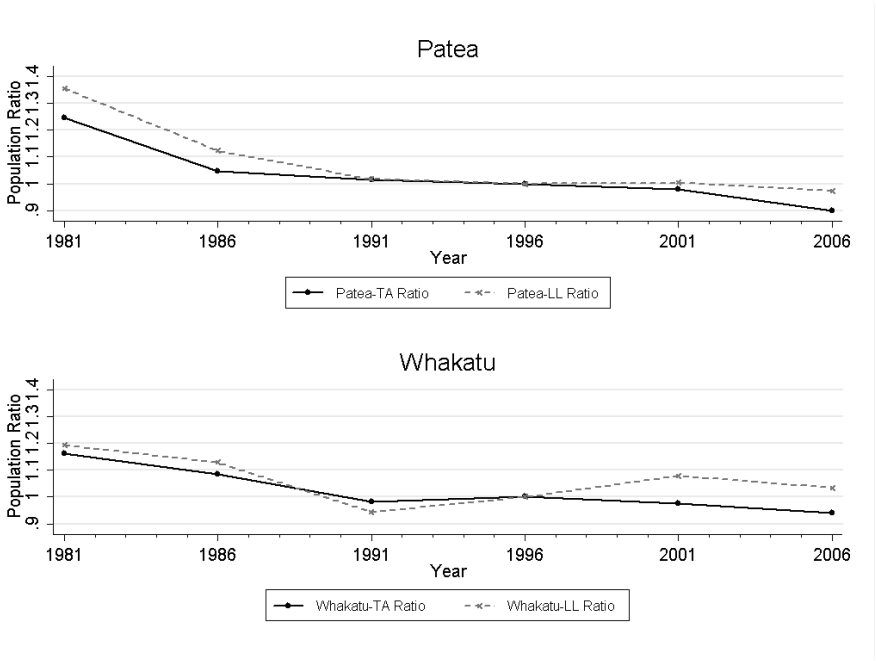

Figure 2. Population Ratios Relative to Comparison Areas. Source: the Authors. Trend lines have been omitted from for clarity.

Adjustment dynamics (relative to trend) are plotted in Figure 3 for the first 15 years after closure. The figure demonstrates the much faster adjustment of population following the shock in Whakatu relative to Patea. The relative losses in population in both towns are consistent with out-migration following the closures, mirroring the results of other studies of negative employment shocks. Figure 3 also demonstrates that Whakatu suffers a temporary shock, while Patea endures a permanent shock to its population. This difference in population dynamics is consistent with our hypothesis regarding the risk-sharing and job matching benefits of larger agglomerations. Even though Whakatu experiences an initial net population

outflow following the closure, because it is in the vicinity of an urban area it is able to draw back or gain new residents attached to the neighbouring cities (and labour markets) of Hastings and Napier.

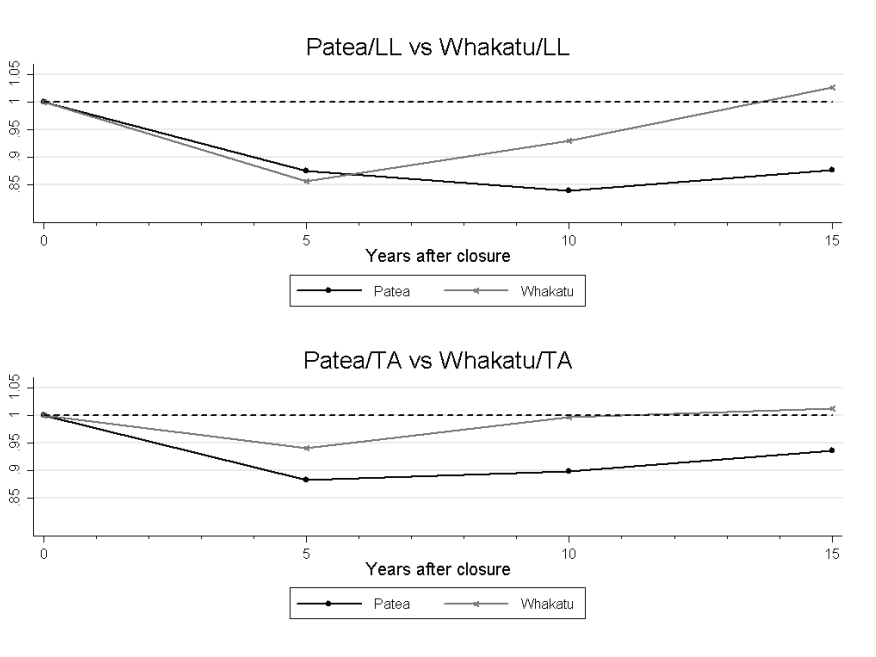

Figure 3. Population Adjustment Dynamics

Splitting the population into age-bands, we are able to assess population movements of different age groups resulting from the closures. Table 5 provides a summary of the percentage changes for each age-band for each town, both absolutely and relative to their respective LLs and TA comparators. We concentrate on the first 15 years following each town's closure.

Table 5. Age-Band Percentage Changes for Each Closure. Source: the Authors.

Age-Band	Percentage Change (1981-1996)			Percentage Change (1986-2001)		
	Patea	Patea-LL Ratio	Patea-TA Ratio	Whakatu	Whakatu-LL Ratio	Whakatu-TA Ratio
0-14 Years	-45.5%	-35.5%	-28.2%	-23.2%	-13.7%	-22.7%
15-24 Years	-52.1%	-38.1%	-28.9%	-31.0%	8.0%	-9.9%
24-44 Years	-28.4%	-37.8%	-29.6%	-13.7%	-15.3%	-18.1%
45-64 Years	-11.3%	-14.5%	-15.3%	-33.3%	19.3%	17.3%
65+ Years	+42.3%	14.4%	18.1%	61.5%	55.4%	25.5%
Total	-29.2%	-26.2%	-19.8%	-8.0%	-4.4%	-10.1%

Note: Each period covers the first 15 years following each closure. "Patea" and "Whakatu" refer to percentage changes of actual counts within each town. The ratio percentage changes refer to the percentage changes in the normalised ratios of each age-band for each town with respect to each set of comparators.

For each town, the absolute number of people in each age band other than 65+ fell over the first 15 years after closure. By contrast, the number of people aged 65+ rose sharply in each of Patea and Whakatu (by 42% and 62% respectively). Furthermore, in terms of the LL and TA ratios, Whakatu experienced a rise in the 45-64 age band, while Patea's decline for this age band was less than its overall population decline. For the younger age bands, Patea suffered a major loss of population, both in absolue terms and relative to its comparators. The loss was less marked for Whakatu, especially in relation to its LL ratio (according to the latter measure, its 15-24 year age band increased slightly).

These findings highlight two important dimensions concerning age-specific population adjustment to the closures. First, both towns experienced a sizeable shift (absolutely and relatively) towards hosting a much older population (those over 45 years, and especially those aged 65+). This result is consistent with homeownership (and, potentially, other age-related factors) providing a disincentive to out-migration following a localised negative shock. In contrast, younger households (that are less likely to have been homeowners initially) have a much higher propensity to migrate to other areas in search of work. Second, the effect of the closures on the younger population was much less marked in Whakatu than in Patea. This result is consistent with our hypothesis concerning the effects of isolation (Patea) versus benefits of agglomeration (Whakatu). Workers in the latter case are

still able to access work opportunities in neighbouring cities without necessarily having to migrate. Alternatively, employees already residing and working in those cities may choose to relocate to take advantage of newly vacated (and possibly cheaper) houses in Whakatu.

Labour Market

Table 4 shows that the severity of the employment decline in Patea, 15 years after closure, was much greater than that in Whakatu. The DID impacts for Patea were at least double the decline in employment of Whakatu when compared to their respective LLs, and around four times the decline when both are compared to their respective TAs. The employment ratio adjustment plots (Figure 4) indicate that these differing outcomes were only partly attributable to the initial employment shock; Patea's employment ratios each decline by approximately 20% over the initial period following closure while Whakatu's fell by 10-15%.

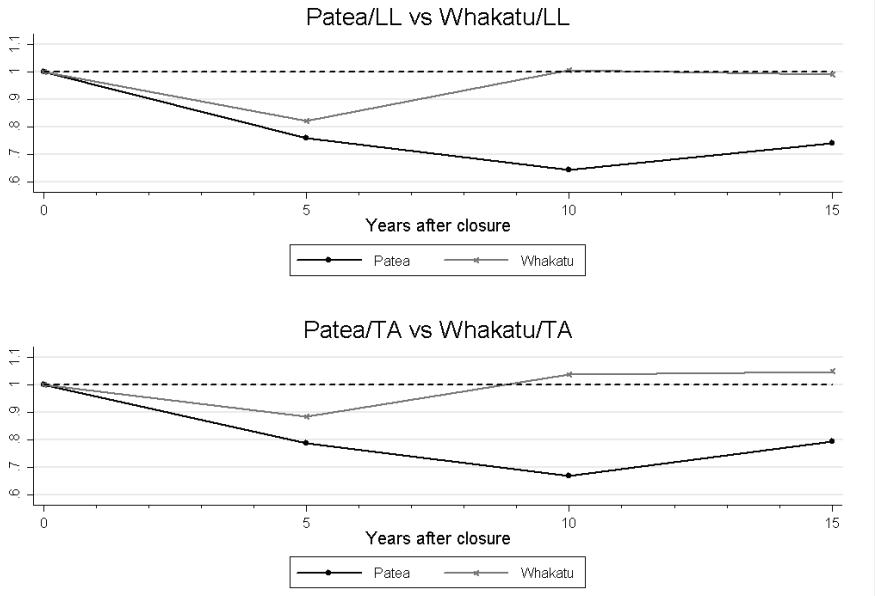

Figure 4. Employment Adjustment Dynamics. Source: the Authors.

More important was the subsequent adjustment process. The adjustment plots indicate that after the immediate falls, Whakatu recovered relatively quickly to be back on trend, while Patea endured a long period below trend. These observations provide evidence of a temporary effect of the employment shock in Whakatu versus a permanent effect in Patea, consistent with labour market benefits of urban agglomeration. Those who became unemployed from the closure in Whakatu, or who chose to relocate to Whakatu to live in newly vacated houses, found it easier to match their skills to other jobs available in the urban area. Patea residents, not possessing an urban area within a reasonable distance, found it hard to source work locally and emigrated in greater numbers, leaving employment within Patea at a lower level.

The adjustment dynamics of unemployment for each of Patea and Whakatu are shown in Figure 5. Perhaps surprisingly, both adjustment processes for Whakatu experience sizeable falls immediately, with unemployment remaining below trend even after 15 years. Patea has a delayed effect, with both ratios taking one period to show sizeable downward movement. One explanation for relative unemployment falling rather than rising (five years) after the closures is that, consistent with the observed out-migration from the two towns, those who were previously unemployed may too have migrated. Seeing the closure, those already unemployed considered their chances of finding employment were even lower than before and consequently migration may have become their best option. The DID impacts presented in Table 4 indicate that the level of unemployment 15 years post-closure is less in Whakatu than in Patea (i.e. there are much larger negative DID impacts). More interesting are the DID of the unemployment rate.[3] For both sets of comparators, Patea's DID unemployment rate increased, while Whakatu experienced a DID decrease in its unemployment rate.

[3] The observations of Unemployment Rate are calculated as the percentage change in unemployment less the percentage change in the Labour Force; where the percentage change in the Labour Force is the weighted sum of the percentage changes to employment and unemployment, and the weights are determined by the pre-closure levels provided in Table 3.

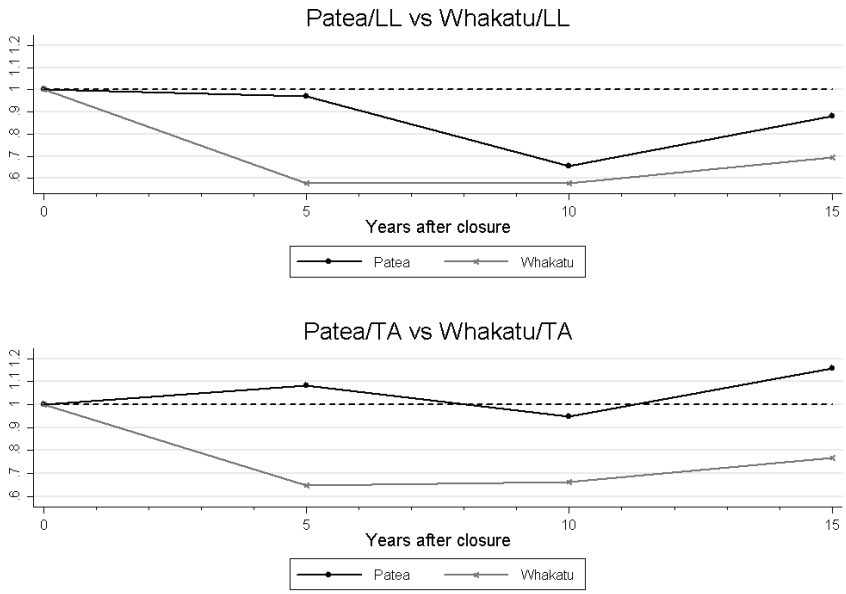

Figure 5. Unemployment Adjustment Dynamics. Source: the Authors.

Others who remained may have given up job search completely and chosen not to be part of the labour force. This possibility is consistent with Figure 6 which shows the adjustment dynamics for those not in the labour force. The adjustment plots provide evidence of increasing proportions for people not in the labour force for both towns following the closure. This rising proportion of the population opting to stay out of the labour force indicates that some of those who were already unemployed or had been made redundant gave up job search following the closure (i.e. a discouraged worker effect). In addition, the population age-band results suggest that part of the increase in this category is due to an increasing proportion of people aged at least 65 years who typically choose to stay outside the labour force.

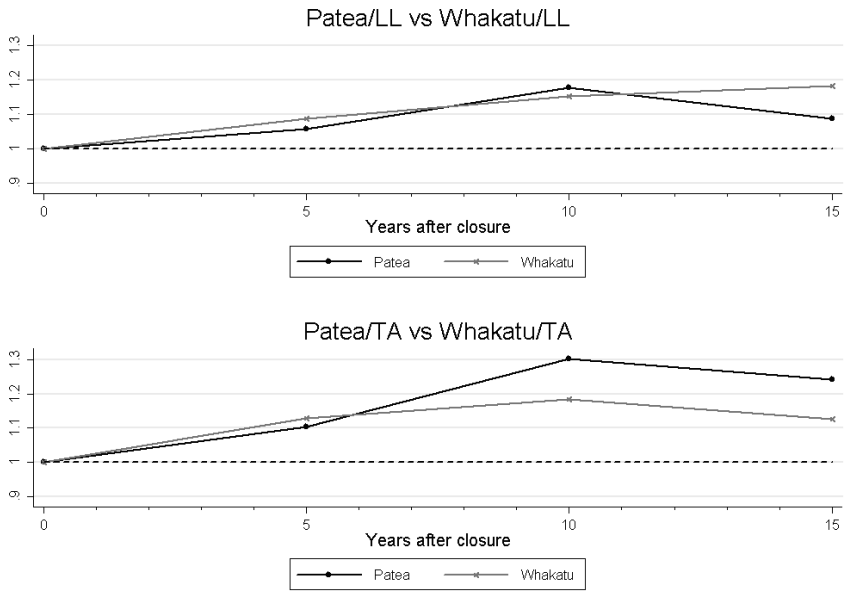

Figure 6. Not in the Labour Force Adjustment Dynamics. Source: the Authors.

Dwellings and Property Values

Table 4 indicates that despite the sizeable population decline in Patea, the number of occupied dwellings in the town declined only marginally (2.6%) in the 15 years following the works closure, while in Whakatu, the number of occupied dwellings increased (by 8.3%). The overall DID of total occupied dwellings was broadly similar for both towns; Patea declined by 8.0% (9.9%) when compared to its LL (TA), and Whakatu by 7.0% (8.2%). Major changes are observed in the average household size ratios, defined as population/occupied dwellings (see Table 4). Whakatu experienced a lesser DID impact on average household size; increasing by 1.7% (LL) and decreasing 3.1% (TA), while Patea fell by 13.7% and 9.7% respectively. The reduction in household size is consistent with out-migration of families with children (Tables 4 and 5) and an increased proportion of older adults and

retirees. The DID methodology accounts for the effects of any generalised changes in household size across the wider community.

We expect to see a major impact of closures on the housing market. Patea experienced a small spike in house sales (of 49 compared with an average of approximately 30 in neighbouring years) in the year after closure. Other than for that year, both towns maintain broadly stable house sale numbers over time, albeit with a slightly decreasing trend in Patea and a slightly increasing trend in Whakatu. However, we observe no trends in house prices. The ratios for median sale prices of residential properties in Patea and Whakatu, while both quite variable (reflecting the small number of sales each year in each locality), reveal no clear long-run trends in relative values. Both towns' trend house prices increased relative to their respective LLs but decreased relative to their TA (Figure 7 and Table 4). There is no obvious impact on the ratios from either town's plant closure. The adjustment graphs (Figure 8) exhibit quite volatile behaviours, regardless of which comparator is used. While the lack of clear impacts of the negative employment shocks on house prices contrasts with some studies' findings (including Glaeser and Gyourko), they are consistent with those of Maré et al. (2009) who found that local employment shocks had negligible impacts on local house prices across New Zealand.

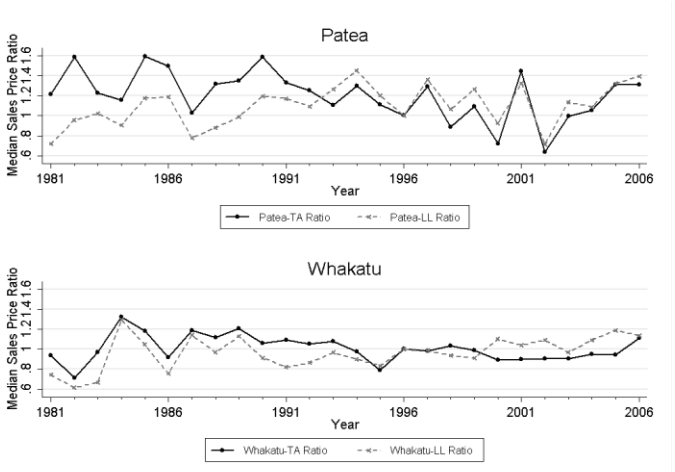

Figure 7. Median House Sale Price Ratios Relative to Comparison Areas. Source: the Authors.

Figure 8. Median house sale price adjustment dynamics. Source: the Authors.

Figures 9 and 10, which show the behaviour of median residential land values, indicate that one element of the Glaeser and Gyourko findings is observed for our towns. In the period immediately following the closure of the Patea plant, there was a steep drop in its residential land values. Whakatu, on the other hand, experienced no obvious impact from the closure of its meat works. The adjustment graphs for Whakatu fluctuate around a constant whereas there is a steep downward adjustment for Patea that remains below the trend (and initial) level for the full 15 years. Looking at Table 4, we see that the DID of land values in each town are consistent with Figures 9 and 10. When compared to LL, the DID fall in land value for Whakatu is only a little over half that in Patea; when compared to their respective TAs, both values again decreased but Whakatu's decrease was only a quarter that of Patea's. Thus land values in Patea appear to have suffered severely from the loss of the local meat works. Given the net migration out of the town, there was little to support the revival of land values in Patea. Whakatu, by contrast, experienced a relatively temporary population shock and had a nearby urban area so remaining attractive to potential residents, supporting its land values.

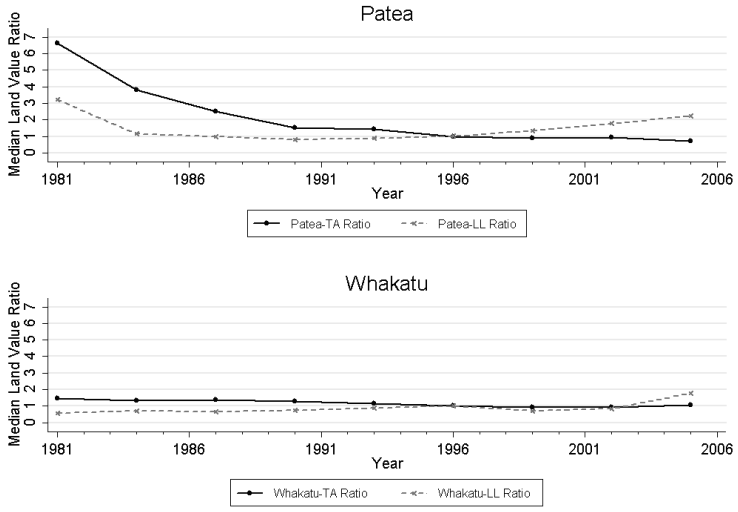

Figure 9. Median Land Value Ratios Relative to Comparison Areas. Source: the Authors.

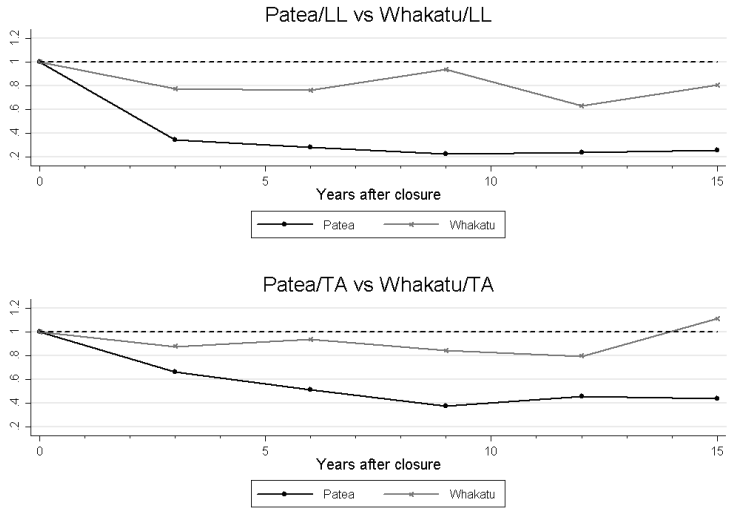

Figure 10. Median land value adjustment dynamics. Source: the Authors.

The house sales price and residential land value findings for Whakatu are consistent with one another, but the Patea findings across the two variables are inconsistent. (Initial land values in Patea represented only a small proportion of capital values, so arithmetically it is possible to have a large fall in residential land values with little effect on house sales prices.) One potential weakness of the land value data is that they rely on valuers' estimates, and so the inconsistency may conceivably be due to changing measurement practices for land values in Patea across time. However land valuations are informed by sales of vacant lots (sections) in the local area; and there is no reason to believe that there was a change in practices for Patea (as opposed to Whakatu) at this time.

Taking the data at face value, we hypothesise that vacant land within Patea was formerly valued as being capable of conversion to residential purposes in order to meet a possible increase in the town's population. Thus it will have had a positive option value attached to it, resulting in it being priced above neighbouring agricultural land. This option value will have virtually disappeared once the works closed since now there was little likelihood of demand for new housing stock. Sales prices of existing houses, by contrast, may have been supported by the ability of out-of-town retirees (and other inward migrants, potentially including working aged beneficiaries) to purchase a house or pay a rental within Patea that was still inexpensive relative to their existing place of residence. Thus while the housing stock was unlikely to expand (so removing the option value for land), a wider housing market worked to support the level of house prices in the town.

5. CONCLUSIONS

During the early to mid 1980s, the closures of meat works at Patea and Whakatu had significant impacts on these rural towns. The similarities and differences between the two towns' adjustment experiences have implications for our understanding of the impacts of major rural processing infrastructure, the role of urban versus rural labour markets and the effects of homeownership on migration patterns following local shocks. These adjustment responses provide insights that may assist in the formulation of regional development policies.

We provide evidence over a range of variables to extract the initial and longer term impacts that each closure had on the town in which it was

located. The data enable us to compare the adjustment dynamics across the two towns given their differences in location relative to urban areas. Both towns suffered net outward migration immediately following the closures. This outcome is consistent with results of other studies. One exception is the study of Glaeser and Gyourko (2005), which found that a negative shock results in a relatively small impact on population (but a large negative impact on house prices).

One feature that sets our study apart from many others is that we subdivide the population into a number of different age-bands. We find that the majority of the population movement arises from migration of the younger working age population (25-44 years), youths (15-24 years) and children. The older working population (those aged 45 to 64 years) showed fewer signs of outward movement following the closures, while both towns experienced a sizeable increase in the number of people aged 65 and older. Average household size decreased (relative to comparators) after the closures, reflecting the shift to an older population. Population movements in Whakatu were temporary, with inward migration following the initial outward flows, while population loss was permanent in Patea.

The closures of both meat-processing plants created substantial reductions in total employment for both towns. Given that Whakatu is located near the urban area of Hastings (and also Napier), some of those made redundant could find work there, so the negative employment shock for Whakatu residents had temporary effects. Patea, not being located near any larger agglomeration, suffered a permanent employment shock. An unexpected outcome was that both towns experienced falls in their unemployment figures five years after the closure. One possible explanation for these falls is that many of those who were previously unemployed left the workforce following the closures since they now considered there to be little point in searching for work within the locality. Accordingly, the number of those not in the labour force increased. Another (consistent) explanation is that a number of those already unemployed were among the population who migrated since they now had to relocate in order to give themselves a reasonable probability of finding work, whereas formerly they could hold out hope of a job at the local meat works.

Considering the changes in population and the results of Glaeser and Gyourko (2005) for the US rust-belt, one could expect housing demand to fall in the affected towns (especially Patea), and therefore to see house prices

fall (in the face of unchanging house supply). However, consistent with the findings of Maré et al (2009), we find no material impacts on the median sales price of houses in either town following the employment shocks.

The house price and land value results for Whakatu are consistent with that locality being part of a larger housing and labour market; thus arbitrage within that market would mitigate the potential for a marked downward shift in residential prices. Patea is unlikely to be part of a larger labour market due to travel distances and times to nearby urban areas. However, it is possible that it is part of a larger housing market, in a particular sense. Certain population groups that are faced with financial stringency may be open to migration to cheap housing areas with vacant houses. Such population groups may include retirees and others on social assistance benefits. While we have no evidence concerning the latter group's migration patterns, we do find evidence of a marked increase in (absolute numbers of) those aged over 65 years in Patea for each of the five yearly observations following the closure. While not placing pressure for additions to the dwelling stock, the actual and incipient inflow of this group may have supported house prices in the town. Nevertheless, the option value for developing vacant lots into new housing would have fallen sharply following the works closure, so land values dropped at the same time as house prices remained broadly stable (relative to comparators). The land value result is consistent with the Glaeser and Gyourko findings while the house price results more closely mirror those of Maré et al (2009).

Our results have implications for the formulation of regional development policies in relation to major investments. The paper has analysed the impacts of *closure* of two major plants in order to avoid the methodological problems that would occur with new plant openings where a new plant is located in an already expanding area. Both closures studied here came as surprises to the local community and, at least in part, were an end product of exogenous changes in central government licensing rules. Thus we can reasonably treat their effects as being the outcome of a natural experiment. While the timing of impacts may differ between an opening and closing of such an asset, it is reasonable to consider that many of the longer term effects, especially in terms of employment and working aged population, will be similar. Our findings lead us to conclude that policy makers involved in deciding where to locate major rural processing infrastructure should consider locating such facilities in towns which are close to cities or other urban areas. This avoids

the potentially dislocative impacts and greater long-run investment risks, which could occur to the local community if the plant were subsequently to be closed.

Given the findings of our study relative to some other studies with regard to the relationship between migration and house prices, further research into this relationship is warranted. Our findings indicate that it will be important in future work to examine age differences and homeownership influences when considering responses to shocks. The analysis here indicates that certain age-groups are more mobile than others and that homeowners may be less mobile in response to local employment downturns. This latter feature, in particular, mirrors similar findings in the UK and US and is a factor that needs to be incorporated into policy considerations when programmes to promote homeownership, especially in rural regions, are being assessed.

REFERENCES

Angrist, J. and Pischke, J-S. (2009). *Mostly Harmless Econometrics: An Empiricist's Companion*, Princeton University Press, Princeton NJ.

Blanchard, O. J. and Katz, L. F. (1992) Regional evolutions. *Brookings Papers on Economic Activity*, 1, pp. 1-75.

Carne, S. (2004). *Home Ownership: Tenure of Choice.* MPP Thesis. Victoria University of Wellington, Wellington.

Choy, W., Maré, D. C. and Mawson, P. (2002). Modelling regional labour market adjustment in New Zealand. Treasury Working Paper 02/01, The Treasury, Wellington.

Dare, R. (1999). *Food Power and Community: Essays in the History of Food and Drink*, Wakefield Press, South Australia.

de Groot, H. L. F., Poot, J. and Smit M. J. (2009). Agglomeration externalities, innovation and regional growth: theoretical perspectives and meta-analysis. In R. Capello and P. Nijkamp (Eds) *Handbook of Regional Growth and Development Theories*, Edward Elgar. Cheltenham.

Decressin J. and Fatás, A. (1995). Regional labour market dynamics in Europe. *European Economic Review*, 39, pp. 1627-55.

Dow, J. C. R. and Dicks-Mireaux, L. A. (1958). The excess supply of labour, A study of conditions in Great Britain, 1946-56. *Oxford Economic Papers*, 10, pp. 1-33.

Evans, L., Grimes, A., Wilkinson, B. and Teece, D. (1996). Economic reform in New Zealand 1984-95: The pursuit of efficiency. *Journal of Economic Literature*, 34, pp. 1856-902.

Fredriksson, P. (1999). The dynamics of regional labor markets and active labor market policy: Swedish evidence. *Oxford Economic Papers*, 51, pp. 623-48.

Glaeser, E. and Maré, D.C. (2001). Cities and skills. *Journal of Labour Economics*, 19, pp. 316-42.

Glaeser, E. and Gyourko, J. (2005). Urban decline and durable housing. *Journal of Political Economy*, 113, pp. 345-375.

Green, R. and Hendershott, P. (2001). Homeownership and unemployment in the USA. *Urban Studies*, 38, pp. 1509–1520.

Grimes, A. and Aitken, A. (2010). Housing supply, land costs and price adjustment. *Real Estate Economics*, 38, pp. 325-53.

Hawke's Bay Herald Tribune. (1986a). Anger mounts at closure. *Hawke's Bay Herald Tribune*, 11 Oct.

Hawke's Bay Herald Tribune. (1986b). 42pc from Hastings. *Hawke's Bay Herald Tribune*, 11 Oct.

Hawke's Bay Today. (2006). The day grown men cried. Online version accessed 24 March 2009, http://www.hbtoday.co.nz/storyprint.cfm?storyID=3682341.

Keefe-Ormsby, V. (2001). Mauri Mahi: Does being made unemployed affect health? The closures of Whakatu and Tomoana. Ngati Kahungunu Iwi Incorp and Te Ropu Rangahau Hauora a Eru Pomare, Wellington.

Maré, D. C. (2008). Labour productivity in Auckland firms. Motu Working Paper 08-12, Motu Economic and Public Policy Research, Wellington.

Maré, D. C., Grimes, A. and Morten, M. (2009). Adjustment in local labour and housing markets. *Australasian Journal of Regional Studies*, 15, pp. 229-248.

Maré, D. C. and Timmins, J. (2000). Internal migration and regional adjustment: Some preliminary issues. In P. Morrison (Ed) *Labour Employment and Work in New Zealand: 2000*, Victoria University of Wellington, Wellington.

Maré, D. C. and Timmins, J. (2006). Geographic concentration and firm productivity. Motu Working Paper 06-08, Motu Economic and Public Policy Research, Wellington.

Mauro, P. and Spilimbergo, A. (1998). How do the skilled and the unskilled respond to regional shocks? The case of Spain. IMF Working Paper WP/98/77, International Monetary Fund, Washington DC.

Melser, P. (1982). Patea after the freezing works: an assessment of the social and economic impact of the closure of the Patea Freezing Company. Technical report No. 12, Town and Country Planning Division, Ministry of Works and Development, Wellington.

Morrison, P. (2008). On the falling rate of home ownership in New Zealand. Centre for Housing Research, Aotearoa New Zealand.

Oswald, A. (1996). A conjecture on the explanation for high unemployment in the industrialized nations: Part I. Working Paper 475, Department of Economics, Warwick University.

Oswald, A. (1999) The housing market and Europe's unemployment: a non-technical paper. Working Paper, Department of Economics, Warwick University.

Partridge, M. and Rickman, D. (1997). The dispersion of US state unemployment rates: The role of market and non-market equilibrium factors. *Regional Studies,* 31, pp. 593–606.

Pehkonen, J. (1999). Unemployment and home-ownership. *Applied Economics Letters,* 6, pp. 263-5.

Puke Ariki. (2003) Taranaki Trivia – May. Online version accessed 23 March 2009 http://www.pukeariki.com/en/resources/TaranakiTrivia/trivia05.htm.

South, S. J. and Crowder, K. D. (1998a). Avenues and barriers to residential mobility among single mothers. *Journal of Marriage and the Family,* 60, pp. 866-877.

South, S. J. and Crowder, K. D. (1998b). Residential mobility between cities and suburbs: Race, suburbanization and back-to-the-city moves. *Demography,* 34, pp. 525-538.

Stillman, S. and Maré, D. C. (2008). Housing markets and migration: Evidence from New Zealand. Motu Working Paper 08-06, Motu Economic and Public Policy Research, Wellington.

Taranaki Daily News. (1982a). Works closure news stuns Patea. *Taranaki Daily News*, 22 May.

Taranaki Daily News. (1982b). Union might not accept company's decision. *Taranaki Daily News*, 22 May.

The Dominion. (1982a). Patea mayor vows to fight closure. *The Dominion*, 22 May.

The Dominion. (1982b). Blame laid for Patea's fate. *The Dominion*, 6 Sep.

The Dominion. (1982c). Patea negotiations stall. *The Dominion*, 4 Sep.

The Evening Post. (1982a). MP learns from Patea. *The Evening Post*, 3 Sep.

The Evening Post. (1982b). Patea 350 finish tomorrow; many more by week's end. *The Evening Post* , 31 Aug.

The Evening Post. (1982c). Regulations penalise meatworks: Gerbic. *The Evening Post*, 12 Aug.

The Evening Post. (1982d). Maori pin faith in land to replace Patea. *The Evening Post*, 3 Sep.

The New Zealand Herald. (1982). Town shocked as 800 told jobs are to go. *The New Zealand Herald*, 22 May.

The New Zealand Herald. (1986). 1500 jobs to go with closure of Whakatu. *The New Zealand Herald*, 11 Oct.

Velamuri, M., Stillman, S. and Aitken, A. (2008). The long-run impact of New Zealand's structural reform on local communities. Motu Working Paper 08-11, Motu Economic and Public Policy Research, Wellington.