STRONGER, TOGETHER

An independent state-wide macroeconomic assessment of fast regional commuter rail network impacts on Victorian settlement patterns, economic growth, fairness and opportunity

A report for the
STRONGER, TOGETHER REGIONAL VICTORIAN FAST COMMUTER RAIL ALLIANCE

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Preface

From 1998 to 2019 NIEIR prepared an annual State of the Regions report for presentation at the Regional Cooperation and Development Forum of the Australian Local Government Association. In these reports Australia was divided into regions – in recent years 67 of them. The format of the reports developed over the decades, but included:

- tables of data for each region, covering demography and an array of economic development indicators;
- insights into the process of economic and social development arising from analysis of the indicators;
- commentary on recent trends; and
- detailed analysis of particular aspects of development.

The most recent report, for 2019-20, addressed the question: are there over-populated Australian regions? Several regions were identified where the population was larger than could be fully employed, due to lack of accessible jobs. These regions were mainly outer suburban and the analysis was supported by a chapter on patterns of commuting.

In 2020, thanks to COVID-19, the ALGA could not organise a Regional Cooperation and Development Forum. Nevertheless, the work continues and it is planned by NIEIR to issue the State of the Regions report for 2020-21 in November 2020.

An important theme in the State of the Regions reports has concerned the importance of knowledge in the creation of real wealth. Knowledge in this sense includes, but goes far beyond, technical skills and scientific research to cover all forms of human and social capital, many of which are deeply personal and can only contribute to the general good if exercised in concert with other people. The knowledge economy is hence linked to the economies of agglomeration – the increases in productivity (output per hour worked) when large populations are able to interact.

Though interaction via telecommunications can be effective, a major source of economic prosperity remains the establishment of trust relationships between disparate yet complementary people. Such relationships, along with economies of scale, underlie the economies of agglomeration. The centres of large metropolitan areas are hothouses for fostering these economies.

Despite its undoubted convenience for dispersed travel, the motor vehicle has threatened to strangle the centres of large metropolitan areas. Its land requirements are too large. A city of car parks is no city at all.

For several decades now, urban planners have sought to create suburban rivals to the central business districts of Australian cities. The argument is that dispersion of city-centre activities into three or four major centres within a metropolitan area the size of Sydney or Melbourne can allow the harvesting of economies of agglomeration without the same stress on the transport system. This requires the creation of centres of high public transport accessibility.

Though it is easy to identify such centres on planning maps, it has proved very difficult to bring them into being. A complementary strategy is to build up the already-existing major regional cities by bringing them within commuting range of the metropolitan cities, so that they can contribute to metropolitan agglomeration economies and also, importantly, draw from them.

An opportunity to evaluate this strategy for Melbourne and Victoria arose when the Stronger Together Victorian Regional Commuter Rail Alliance offered to contribute to a study of the agglomeration benefits likely to accrue from investment in faster rail services on the five main rail lines which radiate from Melbourne. Given the strong links between this study and the State of the Regions reports, it is appropriate that they be made available on the NIEIR website as a State of the Regions Occasional Paper.

Executive summary

Melbourne and its hinterland

With a population approaching five million, the Melbourne metropolitan area accommodates around three-quarters of the population of Victoria. Five railway lines, which are paralleled by major highways, radiate from Melbourne to the rest of Victoria. Patterns of settlement along these lines include different mixtures of major provincial cities, towns, ex-urban areas and farmland.

In the first half-decade of the current century the government of Victoria upgraded the country portions of four of the five rail lines to clear one track for 160 kmph running, redeveloped Southern Cross terminal in Melbourne and began purchasing V/Locity diesel railcars. Follow-up investment segregated country from suburban traffic on the three lines which traverse the metropolitan area via Sunshine and addressed capacity constraints on the Ballarat line.

The fast rail project

Public response to faster and more frequent rail services along the five lines connecting Melbourne with centres up to 165 km away has been encouraging. The current project proposal follows on and includes electrification of the five lines, a modest increase in maximum speed from 130/160 kmph to 200 kmph and further increases in frequency of service.

The present study is confined to addressing the effects of the Project on the productivity of the Victorian economy and its constituent regions via its influence on producers' choices as to where to locate economic activity and citizens' choices as to where to live. It accordingly assumes that the Project is viable in terms of patronage (and hence modal split), costs (including health and safety benefits) and environmental benefits including greenhouse gas emission abatement.

Analysing the changes to locational patterns resulting from passenger rail investments

By their nature, benefits from changes to locational patterns are slow to arise, since they involve investment – investment in the creation of new workplaces and investment in the construction of new dwellings and communities. Though some investment decisions will anticipate project completion, most will follow as people realise that geographic patterns of opportunity are changing. The process can easily last for decades.

These slow dynamics mean that the established method of project evaluation is useless for the assessment of the locational changes which result from transport investments. The established method defines an affected area and compares constructed snapshots of the economy of the area with and without the Project. The problem with this approach is that the economy does not settle down from the disturbance caused by a major transport project till decades after project completion. NIEIR circumvents this problem by constructing a dynamic comparison which plays out over the several decades of a realistic planning horizon.

The Base case projection takes into account the factors which are moderating Australian population and economic growth now and for the medium-term future. The COVID-19 pandemic has brought forward problems which were impending in any case, such as high household indebtedness, climate change and uncertainties in international trade compounded by rising strategic tensions. In the Project case Victoria is constrained to the same population growth as in the Base case, and to the same general background, but the Project is implemented as planned. The projections gradually diverge. Comparisons can be provided for each year of the projections, but the results outlined in this report are for four decades hence, in 2060. These are not forecasts – the future is too uncertain for that – but serve to outline the potential benefits of the Project even in a time of constrained economic growth.

Rail corridors and regions

The economy of interest is the State of Victoria as subdivided by the ABS into 462 SA2s, each of which comprises its own little sub-economy of residents and productive activities. The 462 SA2s are interconnected by trade flows of goods and services, by various financial flows including government transfers and, most important when assessing transport investments, by commuter flows. Commuter flows can be daily journeys to work but may also be more occasional, but regular, journeys for work, educational or indeed social purposes.

Commuting relationships define the catchment of each SA2, which comprises the SA2 itself plus SA2s within commuting range, defined by time-distance. Time-distance patterns differ between motor vehicle and public transport. In this report both are used, sometimes simplified into a shandy. Individuals differ in their travel tolerance, so a shaded rather than an absolute boundary is used. Similarly a 'short' boundary (set at an hour one-way) is used for regular commuting and a 'long' boundary (set at 90 minutes) to take account of less frequent but still regular interactions.

For this project assessment, the economy of a SA2 is defined in four ways.

- Production which takes place within the boundaries of the SA2.
- Production undertaken by the residents of the SA2.
- Production and resident activities within the 'short' catchment of the SA2 and
- Production and resident activities within the 'long' catchment of the SA2.

From the point of view of this assessment, the essence of the Project is that it extends the area covered by the catchments of SA2s along the rail corridors.

The economies of agglomeration

The importance of SA2 catchments lies in their relationship to the economies of agglomeration. Among the SA2s of Victoria, defined on a catchment basis, productivity (defined as Gross Regional Product per hour worked) rises as catchment size increases (as measured by GRP), particularly over the range from $100 to $200 billion. Further, the larger the catchment GRP the faster its rate of growth – again tapering off for the larger catchments.

Recent trends in the rail corridors

The proposal involves enlarging the catchments of SA2s along the five rail corridors, with particularly significant enlargements for SA2s situated along the corridors outside the metropolitan area. From 1995 to approximately 2008 – the period when rail services were first improved – GRP per hour worked (productivity) and earned incomes per hour increased along the rail corridors at approximately the same rate as in Victoria in general while hours worked per resident of working age increased from below the Victorian average towards that average. During the mining boom – a period particularly difficult for many employers in the rail corridors – productivity growth along the corridors lagged behind that in inner Melbourne. Since the end of the mining boom both rates of growth have been lacklustre. During this period rail services on several of the lines were frequently disrupted by construction works, mainly in the metropolitan area.

The upshot of these trends has been that regional inequality remains rampant, with GRP per capita in the metropolitan area, particularly the inner suburbs, drawing ahead of that in the rail corridors.

What happens when rail services are improved

The initial effect of the expansion of the catchments of SA2s along the rail corridors will be to expand the range of employment choice of residents and also expand the range of labour recruitment for employers in those SA2s. The latter can be crucial for productivity in local business, especially when it allows recruitment of employees with specialised skills such as those required by the knowledge economy.

The initial expansion of the rail corridor catchments will attract people to live in the corridors, resulting in dwelling construction and further growth in catchment population. A virtuous circle can be set in motion by which increases in catchment population increase productivity which increase the availability of good jobs which attract more residents and further increase productivity. This virtuous circle can be augmented if, for example, the recruitment of 'knowledge economy' personnel underpins the development of new products and services and supports sales into new markets.

These developments will spread out from the SA2s located near the rail service since these SA2s are included in the catchments of other SA2s situated away from the stations. The end result is that fast rail benefits a not only regular rail travellers but great many people who patronise the trains rarely if at all.

Quantitative results

For the purposes of this assessment, the population of Victoria is assumed to be the same in the Base and Project cases. In the Project case, the population gradually moves into the rail corridors, mainly from Melbourne suburbs which are currently experiencing difficulties in accessing work, though there is also some movement from the peripheries of the state.

Thanks to the economies of agglomeration, productivity along the rail corridors increases rapidly compared to Base case, with an increase after 30 years of around 15 per cent.

Initially some of this increase, compared to Base case, is offset by productivity growing less rapidly than in the Base case in parts of the rest of the state, but after a decade or so the shift in population out of regions with poor job availability improves the productivity of these regions. Given that productivity is increasing in the Base case, very few regions suffer declines in productivity as a result of the rail investment.

The upshot for productivity for Victoria as a whole is that, after three decades of adjustment, it is roughly 5 per cent over Base case.

Increased productivity in the rail corridor SA2s and their neighbours results in increased incomes per hour worked in these regions, associated with a shift in hours worked into these corridors as people move to take advantage of the increased incomes.

Since GRP is the product of productivity per hour and hours worked, the shift of hours worked into the Project Corridors magnifies the effect of their growth in productivity.

Three decades after project completion the GRP of the regional fast rail corridors is projected to have increased by 20 per cent over Base case and by 5 per cent for Victoria as a whole.

This allows substantial catch-up between the rail catchments and the rest of Victoria, particularly Melbourne. In 2019 income from work per working-age resident of the rail corridors averaged 81 per cent of that for residents of the rest of the State (dominated by Melbourne); by 2050 this is projected to increase to 85.2 per cent in the Base case and 93.6 per cent in the rail investment case.

Overall assessment

This is not a complete project assessment. Costs and other benefits, such as environmental and safety benefits, need to be taken into account. Nevertheless, a project (or set of corridor projects) which promises to yield a long-run 5 per cent increase in GSP and a 10 per cent internal rate of return on investment along with a reduction in regional inequality cannot be lightly disregarded.

The overall macroeconomic evaluation criteria for the project are included in Table E.1, including congestion cost savings for the Rest of Victoria.

Table E.1	Fast Train Project – Macro evaluation metrics, 2000-2060			
	Discount rate	**Project Corridor**	**Rest of Victoria**	**Victoria**
Excluding congestion cost savings				
Present value – GRP change ($2018 billion)	7 per cent	n.a.	n.a.	159.8
	3.5 per cent	n.a.	n.a.	361.4
Present value – GRP change per capita of working age population ($2018 ths.)	7 per cent	89.3	13.1	32.1
	3.5 per cent	178.3	25.1	63.7
Internal Rate of return – GRP or GRP per capita (per cent)				**10%**
Congestion cost savings				
Avoided congestion costs – present value – ($2018 billion)	7 per cent	n.a.	29.1	29.1
	3.5 per cent	n.a.	66.4	66.4
Avoided congestion costs – present value – per capita of working age population ($2018 ths.)	7 per cent	n.a.	5.0	3.7
	3.5 per cent	n.a.	11.0	8.1
Including congestion costs				
Present value – GRP change ($2018 billion)	7 per cent	n.a.	n.a.	188.9
	3.5 per cent	n.a.	n.a.	427.8
Present value – GRP change per capita of working age population ($2018 ths.)	7 per cent	89.3	18.1	35.8
	3.5 per cent	178.3	36.1	71.7
Internal rate of return – GRP or GRP per capita (per cent)				**11%**
Average return on infrastructure investment – GRP perspective (per cent only)				**33.2%**

Notes: To bring the GRP to headline GRP status GRP is adjusted upwards for ownership of dwellings.
n.a. denotes not applicable.

1. The Project and the evaluation framework

This study evaluates the economic impact of a fast passenger rail project that will improve connectivity between Melbourne City and nearby regional centres. The economic impact is assessed by a single criterion, namely the effect of the Project on the economic development potential of the regional centres and their surroundings. This effect is measured by:

(i) regional productivity;

(ii) real incomes from work;

(iii) industry activity; and

(iv) the population living in the Project catchment.

Table 1.1 gives the definitions of terms which are used throughout this study.

Table 1.1	Glossary of terms
Gross regional product (GRP)	Sum of industry value added at market prices excluding ownership of dwellings.
Industry value of an indicator	Value of an indicator within regional boundaries.
Local value of an economic variable	The local value of an economic variable reports the value of that variable within the geographic boundaries of the region. This accords with the conventional definition of a region's Gross Regional Product, employment, hours of work, etc. The adjective 'local' is used to distinguish these values from catchment area values as defined below.
Melbourne City	Melbourne City in this study refers to the ABS SA2 region with ID number 21122.
Productivity	Gross regional product (GRP) per hour worked.
Project catchment – short and long	Two catchment values for economic variable k are used, based on travel time: a short catchment value based on a low upper limit travel time and a long catchment value based on a higher upper limit travel time.
Project Corridor	Consists of all regions which receive a positive economic impact from the transport infrastructure project as measured by the increase in catchment gross regional product (GRP).
Project economics	For the Project to be viable, average trip cost will have to be competitive with motor vehicle travel if the Project is to attract viable patronage. This study is silent on project costs, leaving these to be determined by the proponents. This study assumes that the Project is viable in the sense that average trip costs are competitive with competing motor vehicle trips.
Project phase-in period	The Project phase-in period is 2020-2030. In terms of the economic impact, the announcement effects of the commencement of construction will start to unleash positive economic benefits since businesses will expand and households relocate in anticipation of the Project being delivered. By 2030 it is assumed that the full potential benefits of the Project are recognised even if the Project is not fully completed.
Region	The regions used in this study are the 462 SA2 regions defined by the Australian Bureau of Statistics (ABS) into which Victoria is exhaustively divided.

Table 1.1	Glossary of terms (continued)
Catchment value of an economic variable	The catchment value for an economic variable k for region j is the weighted sum of variable k from region j and its surrounding regions. The weights decline as the travel time from region j increases and become zero once an imposed upper limit of travel time is reached.
The Project or FTP	The Project is the electrification parts of the Victorian regional rail network that serve regions near the metropolitan area.
Travel times	Travel times are the estimated travel times between any two SA2s. Travel times, in minutes, are measured separately for motor vehicles and public transport. The total travel time is a weighted average of the two components. The weights are based on the latest relative usage rates.
Working age population	Population aged between 18 and 65.

1.1 The Project

The main objective of the Project is to upgrade existing regional railway lines to substantially reduce public transport travel times between the regional cities connected to Melbourne by existing lines by upgrading these lines to 200 kilometre per hour electric railways. There will be a need for a new line and tunnel connection in the Sunshine area. Figure 1.1 outlines the reach of the Project and estimated travel times that will result.

The total estimated capital cost is $70 billion in 2018 prices. In general, the reduction in public transport travel times will be between 25 and 50 per cent for regions directly connected by the Project. This is the core and, for the purposes of this paper, the only matrix on which the evaluation of this paper is based. The paper thus excludes consideration of possible project benefits in such areas as travel safety and greenhouse gas emission abatement. No other shocks are imposed outside the travel time reductions.

1.2 The traditional approach to evaluating transport investments

The traditional approach to evaluating transport projects is the cost benefit approach. This focuses on the benefits and costs of the Project where the benefits are largely defined in terms of the impact on the transport service industry. These benefit variables are as follows.

(i) **Travel time savings**. In the traditional cost benefit approach reductions in travel times either directly, via under improved services or indirectly via lower congestion costs, are the main source of benefits. Businesses and journey to work travel time savings are based on average work income while freight savings are quantified in terms of lower freight costs.

(ii) **Vehicle operating costs**. Shorter trip durations will save on vehicle operating costs and maintenance costs.

(iii) **Accident avoidance**. Some road maintenance and capital costs will fall because of if rail is substituted for car travel, and there will also be a reduction in road crashes which will save lives and reduce the cost of treating serious injuries.

The main cost component of a transport investment project will be the opportunity benefits foregone in reallocating investment expenditures from other projects to the transport infrastructure project. The net benefit will be the total benefits less the opportunity costs.

1.3 Transport infrastructure investment: The wider economic impacts

Over the last two to three decades it has increasingly been recognised that the traditional methodology for calculating the benefits of transport infrastructure projects fails to take into account many of the wider economic benefits. This is because the traditional approach assumes that, except for cost saving benefits, transport infrastructure investment will not impact on the economy outside the transport services industry.

The reality is that transport infrastructure investment can impact on a wide range of decisions which will directly influence the productivity and capacity available in industries in general, and not just the transport services industry.

The channels by which a transport infrastructure investment can influence economic activity include:

(i) Influence over the location of investment in new capacity or capacity enhancement in other industries. Investment can be reallocated into the Project catchment area at the expense of the rest of the nation or rest of the world;

(ii) The locational impact of sourcing decisions;

(iii) allowing existing enterprises to expand the geographical market for their products and services;

(iv) allowing enterprises to enhance productivity by giving them access to a wider labour market catchment and, therefore, increasing their ability to match skills with requirements;

(v) reducing transport costs between enterprises, increasing the surplus available for investment and capacity expansion driven growth;

(vi) facilitating enterprise interactions, a driver of innovation; and

(vii) influencing where people live, thereby reinforcing many of the mechanisms outlined above.

These factors are now generally recognised in the transport infrastructure evaluation literature. However, what is not fully recognised is the dynamic. There can be no clear-cut picture of the economy 'before' the investment, because some of these factors work by anticipation; similarly one cannot take a snapshot of the economy 'after' the investment, because other factors work in arrears with different lag patterns. For these reasons, the traditional approach of comparing still pictures of the economy before and after the investment can be very misleading. Such comparisons usually involve the attempt to compare equilibrium states of the economy, an initial state and a post-project state in which all interactions caused by the Project are exhausted and the economy is once again in balance. Even if the conceit that the economy is initially in equilibrium be granted, the subsequent interactions of major transport investment projects last over decades. This renders the concept of a single post-project equilibrium impractical within plausible planning horizons. However, the various channels by which the investment affects the economy are likely to generate a trend which, at any time horizon, can be compared with the trend expected without the investment. Over a time period of decades, and in the absence of other disturbances, these trends will approach an equilibrium in the conventional sense. The point is that it is too far away to be of other then conceptual use.

Figure 1.2 illustrates a major route by which a transport investment can create a virtuous cycle for a transport Project Corridor. The primary impact of a transport investment project is an increase in productivity and output. This initial increase in productivity creates new settings for all variables, including GRP, population, hours of work, etc., which raise the productivity and trigger a second trip around the virtuous cycle. And so on, generating a long-term trend. Over time it would be expected that productivity growth from each round of the circle would diminish, but the time scale is such that this may take many years if not decades.

Rather than attempt to compare blurred snapshots, it is better to compare focused videos. Dynamic modelling accordingly compares the growth paths of target variables on a regional basis.

1.4 Regional inequality and transport infrastructure projects

For purposes of exposition, it is assumed in this study that the total Victorian population is unaffected by patterns of transport investment. This being the case, there will be winners and losers from transport infrastructure projects. To the extent that a project attracts population to the Project Corridor regions, it will undermine the foundations of agglomeration economies in other regions of Victoria. From a whole of state point of view, a transport infrastructure project would satisfy the criteria to proceed to detailed consideration if it is expected to:

(i) increase the overall productivity of the Victorian economy;

(ii) reduce regional inequality by reducing any gap that may exist between the Project Corridor and the rest of Victoria as measured by key economic variables such as access to hours of work, productivity and remuneration; and

(iii) have viable and competitive project economics (taking the whole range of benefits and costs into account).

Taken together, points (i) and (ii) above indicate that there may be scope for overall increases in productivity if productivity can be increased in Project Corridor regions, even if that is partially offset by reductions in non-corridor regions. For the purposes of this study, there are two kinds of non-corridor regions: the metropolitan area and the periphery beyond the corridors. The latter areas will receive some benefit from the Projects (even if travel times between Mildura and Bendigo remain constant, travel times between Mildura and Melbourne will fall) but labour supply catchments in the peripheral areas are not expected to increase. Rather, the major effect will be a relative reduction in the labour catchment of the metropolitan area. The hypothesis to be tested is whether the increase in productivity in the Project Corridors, and the consequent relocation of population, can be expected over time to increase state-wide productivity and at the same time reduce regional inequality.

Regional inequality will continue to increase if transport infrastructure evaluations are made solely in terms of the benefits of the metropolitan core ignoring the negative impacts on other regions. Projects awarded on this basis would in general fail criterion (ii) above.

The solution to the problem is to assume balanced infrastructure development across as many regions as possible to ensure equality of regional development potential across the state.

The inference from the results of this study is that the Project Corridors are now in line for major investment.

Figure 1.1: The Project – The regional scope

Map of stronger, together fast rail network showing new travel time catchments and Melbourne Airport Rail Link, Sunshine, tunnel use

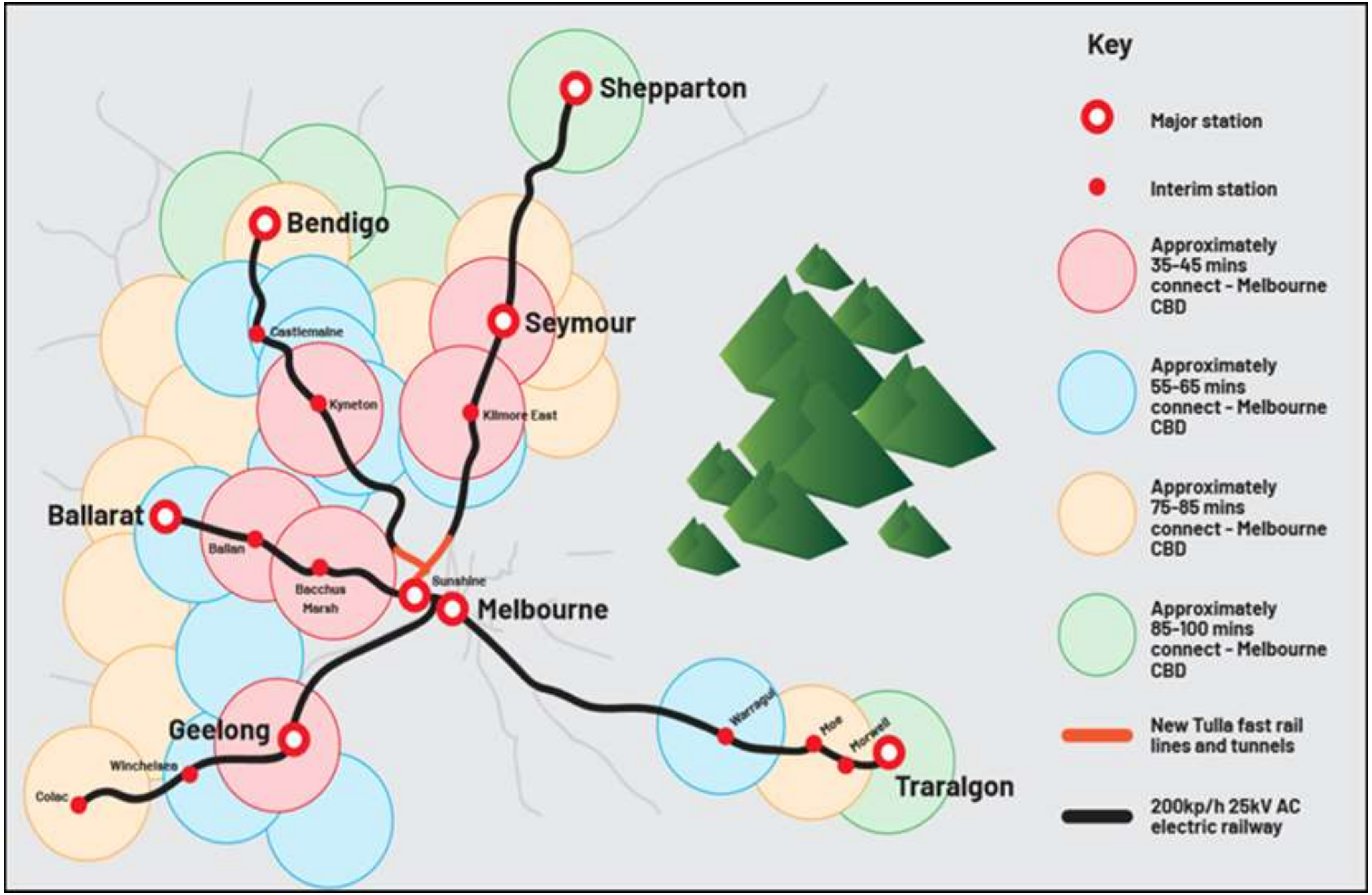
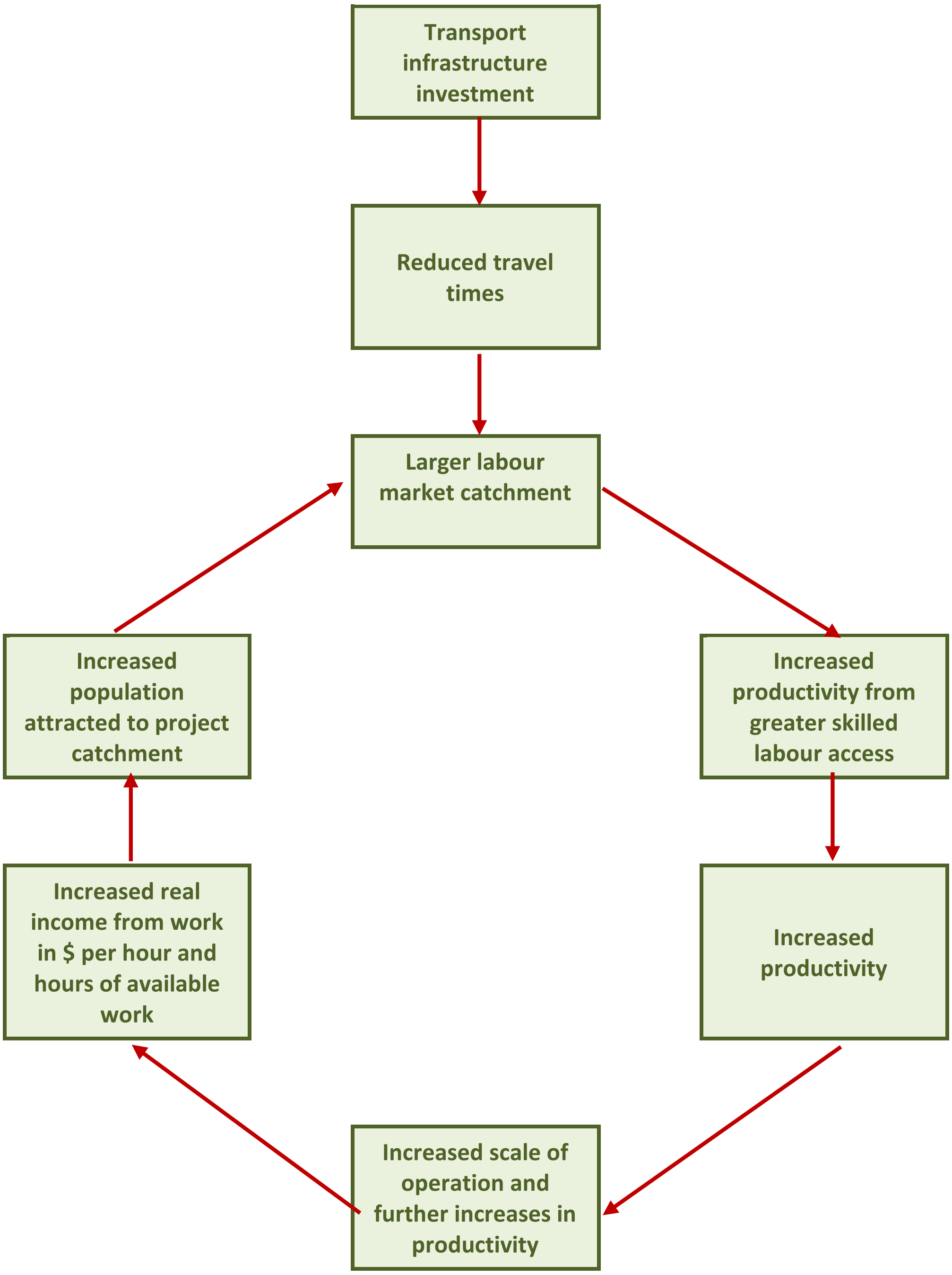


Figure 1.2: The virtuous cycle of transport infrastructure investment on a Project Corridor



1.5 The traditional versus economy-wide methodology

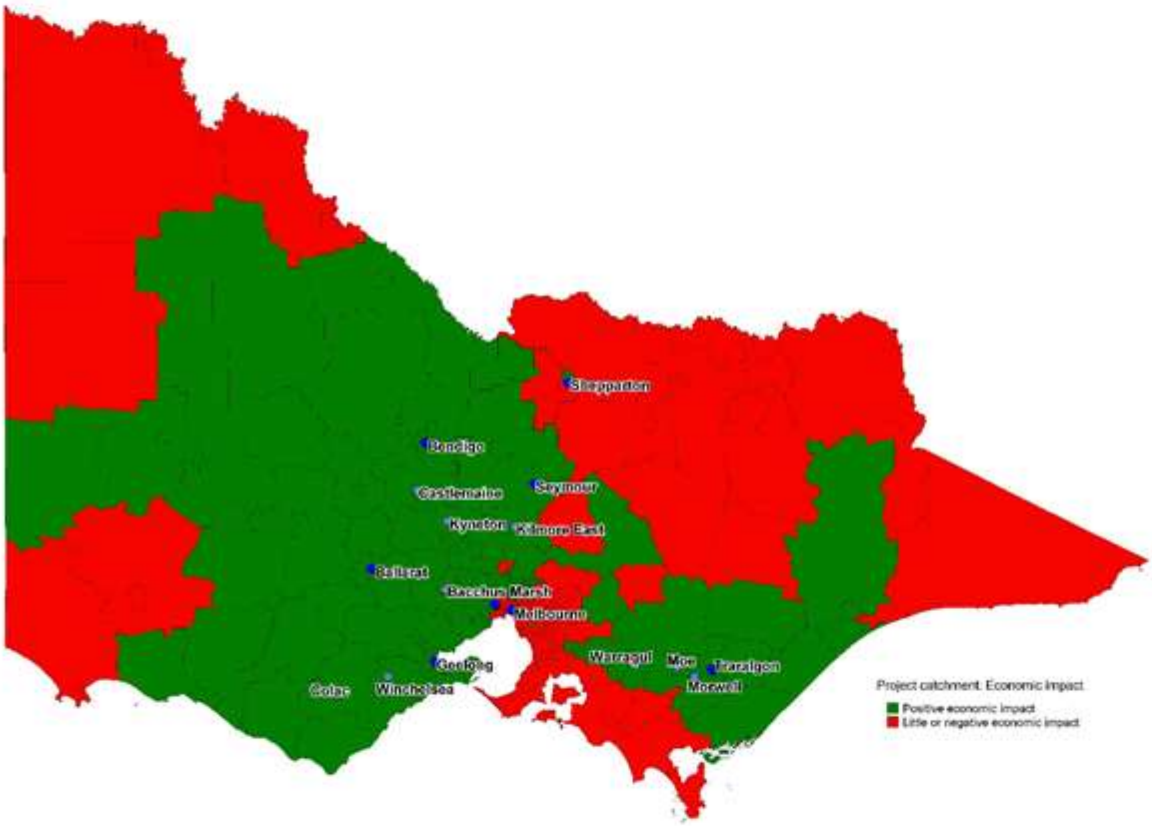
The traditional method is limited to the point of uselessness in its ability to assess the regional development potential of projects.

However, applying economy-wide dynamic methodology to project selection does not require the rejection of the factors assessed using the traditional method. This is because the evaluation of the Project economics will take into account most of the elements of the traditional method of evaluation of transport infrastructure projects. If the Project economics as dynamically assessed indicate a viable project, the Project will also satisfy the gross, if not net, criteria applied in the traditional method.

1.6 The Project Corridors

Physically, the Project comprises five corridors (Figure 1.1 above). However, in economic terms the Project Corridors comprise a wider area, as shown in Figure 1.3. This comprises the 198 SA2 regions that receive, in the long-term, economic benefit from the Project as measured by increased GRP compared to the GRP that would have prevailed in the Base scenario with no Project. These patterns of benefit were estimated from the modelling described in Chapter 4 below.

Figure 1.3: Project Corridor – Winning and losing SA2s from the Project as measured by the impact on catchment GRP relative to Base case, 2060



2. The drivers of regional economic development and Project Corridor inequality outcomes

The NIEIR/ALGA “*State of the Regions*” reports over the last 20 years have documented the drivers of regional economic development and economic outcomes. The findings are summarised in a set of “Stylised Facts” which preface each of the annual reports. A Stylised Fact is a broad generalisation that summarises data in general terms without being accurate in every detail for all regions.

2.1 The NIEIR Stylised Facts of regional economic development

The list of Stylised Facts included below of regional economic development is not exhaustive since it is restricted to those “facts” that directly relate to the issues at hand.

Stylised Fact One

High-income economies, apart from those with a unique and extensive natural resource base, now depend on sustained innovation as the core driver of long-term economic growth.

This basic fact was obscured during the mining boom. Because the mining industry is both capital and resource intensive, its value added per labour hour is high. During the boom this generated rapid economic growth in regions specialising in iron ore, coal and natural gas – less so for other minerals which did not experience the same high prices. Certainly the Stylised fact applies to Victoria.

Stylised Fact Two

The capacity to innovate depends on knowledge and networks at the regional level. Most high-income countries which have maintained sustained growth have done so because they have established successful knowledge-based regions.

Judging by patent applications, Australia’s most intensive knowledge-based regions are its metropolitan centres, though several of its independent cities are shaping up. Most regions are connected to the knowledge economy via a metropolitan city, either as suburbs or as hinterlands.

An important advantage of Victoria is that most of the state has access to a metropolitan centre through which it can be linked to the world knowledge economy.

Stylised Fact Three

Successful knowledge-based regions have a high concentration of highly skilled global knowledge workers, such as scientists, engineers and artists. These workers tend to migrate to regions with a wide variety of cultural and lifestyle choices.

The economies of agglomeration operate strongly to raise productivity and incomes in knowledge-based production located in the major metropolitan centres. The productivity benefits arise from human interaction, not only in offices and laboratories but in cafes, shops and educational and recreation venues. These interactions occur most intensively when workplaces and other venues are within walking distance of each other, and preferably also within walking distance of residential options.

Stylised Fact Four

There appears to be no limit to the economies of agglomeration, provided that metropolitan built form facilitates the mutual interaction of the whole metropolitan population.

Productivity and employment have been increasing in metropolitan centres more rapidly than in the suburbs, particularly fringe suburbs. Long commute times to jobs concentrated in the inner-metropolitan knowledge-based regions have limited the outward expansion of metropolitan areas; the resulting limited supply of residential land with good job access has joined with increasing demand, influenced by financial and tax factors, to increase metropolitan land prices, particularly towards the centres. This has made metropolitan housing less affordable, which in turn has hindered the exploitation of economies of agglomeration.

Stylised Fact Five

Regions with high-productivity jobs (or with commuter access to high-productivity jobs) have high household incomes and low unemployment rates.

Some regions have high productivity jobs due to a favourable industry mix – capital-intensive industries report high labour productivity almost by definition; industries characterised by self-employment undertaken because unemployment is the only alternative report low labour productivity. High productivity is also generated when resources are efficiently and innovatively used industry by industry, as is characteristic of knowledge-based regions.

Stylised Fact Six

Until such time as the knowledge-economy can be generalised, the young will continue to leave low-income, high-unemployment regions and migrate to high-income, low-unemployment regions.

Young people are attracted to the income-earning, educational, cultural and entertainment opportunities of the metropolitan centres and can more easily adjust to high housing costs than people with family responsibilities. The same is true of some empty-nest seniors. However, people will continue to desire greater housing space as they form families, hence the problems of appropriate investment in commuting infrastructure.

Stylised Fact Seven

Australia's difficulties in adopting the knowledge economy would be eased if knowledge-economy jobs could be decentralised.

An OECD study by Ahrend et al. (2014) suggests that a doubling in city size is associated with a productivity increase of between 2 and 5 per cent. National Economics has identified links between urban employment density and productivity and examined the empirical relationship between metropolitan-wide productivity and city size, finding productivity gains towards the high end of expectations. In face of these economies of agglomeration it has proved very difficult to spread knowledge-economy employment away from the city centres, though there has been some decentralisation to inner metropolitan suburbs (particularly when they share the walkability of the city centre) and some to regions with attractive lifestyle options. Further decentralisation is likely to be incremental – from metropolitan centres into inner suburbs and into regional capital cities which have already established themselves as outposts of the knowledge economy. It will require infrastructure support, especially investment in telecommunications and transport to build new economic opportunities and resilient intelligent communities.

Stylised Fact Eight

Infrastructure deficiencies make it difficult for low productivity/high unemployment regions to increase productivity.

Relatively low housing costs are an advantage for regions seeking to attach themselves to the knowledge economy, as are lifestyle choices; these assist in attracting knowledge workers. However, such workers must be provided with the means to be productive, by placing themselves at the interface between the local economic base (particularly export industries) and the global economy. This requires investment in telecommunications and transport. It also requires low-key local investment so that every main street becomes an outpost of the knowledge economy. Without the appropriate capital stock no long-term economic growth is possible. At the centre of economic development is the mobilisation of both the appropriate quantum and quality of investment to make growth possible.

Stylised Fact Nine

Australia could better exploit the potential of its existing knowledge-economy regions by appropriate infrastructure investments.

The affordability of metropolitan housing could be addressed directly by investment in mass transit to make additional fringe areas available for commuter housing and by investment in local transit to extend pedestrian range and so support the geographic expansion of knowledge-based centres.

It will also be important to support the diffusion of knowledge into hinterland regions, and back from the hinterland regions so that the combination of hinterland and metropolitan know-how generates innovation: telecommunications and transport are again required.

Even if all of Australia's knowledge regions are combined, they are but small compared to the mega-metropolitan regions of Asia, Europe and North America. Further economies of agglomeration could be achieved if the metropolitan areas were integrated to become a single globally-positioned knowledge economy. This will require a retreat from parochial mindsets, more interaction and more specialisation. Competition between states and regions should be re-focused on competition with the world at large. Yet again this would be facilitated by investment in improved telecommunications and transport.

Substantial transport infrastructure projects in corridors radiating from metropolitan regions are the main mechanism of achieving the diffusion objective.

Stylised Fact Ten

Low productivity regions are ageing rapidly while high productivity regions are ageing relatively slowly.

In regions where productivity is low because of high retiree populations, many households depend on transfer payments, either social security payments or returns on financial investments, supplemented by government finance of health facilities. A region with a high proportion of retirees accordingly depends on other regions for much of its income. The challenge for such regions is to leverage the liveability which originally attracted retirees into the attraction of knowledge-based businesses. Increased connectivity to metropolitan regions would assist in achieving this objective.

Stylised Fact Eleven

Income inequality within and between regions is associated with depressed economic growth.

Economic policy over the past three decades has been founded on the proposition that economies respond to market incentives and that such incentives should accordingly be sharpened. This may be true over short periods but over longer periods of a decade or more there is a cost: the working of the untrammelled market increases inequality of income.

International evidence summarised by the OECD and IMF shows that increases in inequality generate reductions in long-term economic growth rates.

Within Australia, the higher the per-capita disposable income of a region, the higher the growth rate it achieves. This will be partly due to higher per-capita resources available for investment but will also be partly the result of the unequal rewards that result from successful response to incentives.

Once these effects are taken into account, the more unequal the household disposable incomes of a region, the lower is its growth rate. As the OECD suggests, this is likely to reflect inequality of access to educational opportunity but it is also likely to reflect poor access to employment opportunities in regions with low housing costs. This poor access can be because people fail to take job opportunities into consideration when they move to a region attracted by low housing costs, or because they have difficulty in leaving because they are locked in by low housing capital.

Income inequality between regions can also influence educational attainment in terms of the basic literacy and numeracy skills.

Stylised Fact Twelve

There is increasing inequity in regional economic performance in Australian cities, with fringe urban areas being at an increasing disadvantage.

The greater the distance a suburb is from the central LGA (of the City of Melbourne or Sydney), the less its productivity compared with the city-centre peak. The historical record shows that growth in Gross Regional Product per hour worked has increased much faster in inner Sydney and Melbourne municipalities than in the fringe municipalities of those cities, and the that gap has increased with increasing distance from the centre, suggesting relatively declining access to high productivity employment and, in some cases, declining access to hours of work in outer areas. This is the key reason for increasing inequality.

Stylised Fact Thirteen

It follows from the above that there is no market-driven tendency for inequalities in economic performance between regions to fall. High-technology innovation-driven development means that regions with established competitive advantages in these activities can increase their relative performance in terms of high incomes and low unemployment rates without "technical" limits. This is because scale is important and Australia's high-technology knowledge-based regions are small by world best practice.

The only practical constraint to metropolitan growth is that high dwelling costs will choke off the supply of labour, limiting the economic potential of these regions and therefore the nation. This was the experience of the Sydney metropolitan area from 2001 to 2008. A repeat experience threatens, in which metropolitan growth will slow down due to high housing and commuting costs.

Stylised Fact Fourteen

Since market mechanisms will not reduce inequality of economic performance between regions, public policy has a key role in reducing inequality of economic performance between regions and by so doing maximising overall economic growth of the nation.

The role of policy in promoting economic growth is to maximise the quantum of infrastructure capital including investments in transport, communication, health, education, etc. and organising its distribution with multiple aims, including reducing the obstacles to growth in Australia's current high-technology regions and laying the foundations for the development of new, successful knowledge-intensive regions, all in the context of promoting environmental sustainability and governing Australia's trade and capital-flow relationships with the rest of the world so that they remain financially sustainable.

Public policy also has a key role to play, either directly and or indirectly, in infrastructure planning to influence housing affordability and facilitate the increase in population densities necessary to sustain the growth of high-technology knowledge-based regions and in reducing the inequality within regions by appropriate tax and income transfer policies.

These fourteen Stylised Facts are self-descriptive in terms of the role of the Project in enhancing regional economic development and reducing regional economic inequalities. The question remains, however, does the SA2 regional data base used in this study support the Stylised Facts?

2.2 The regional data base and the economics of agglomeration

At the heart of the wider economic benefits from transport infrastructure investment are the economies of agglomeration. One of the main indicators which captures wider economic benefits of transport infrastructure investment is productivity, or GRP per hour worked. The mechanism by which transport infrastructure investment influences productivity is via the economies of agglomeration, which in turn rely on returns to scale and network effects.

There is empirical evidence that firms cluster together in areas of relatively large labour market catchments in order to exploit:

(i) economies of scale from local industry and commercial demand;

(ii) economies of scale from expansive labour markets which provide access to highly specialised and, therefore, highly productive labour;

(iii) cheaper input costs from the economies of scale of dense local supply chain networks; and

(iv) competitive knowledge creation and innovation potential arising from dense local skills, diversity of experience and over-supply problems requiring urgent solution.

A simple test for the Stylised Facts of the importance of the operation of agglomeration economics is that catchment value productivity, or GRP per hour worked, is in general positively related to scale. This relationship for the 462 regions of the data base is shown in Figure 2.1. This is one of the two most important figures in this report.

The unit of observation in Figure 2.1 is the SA2 and values are for 2019 in 2018 prices. The size of each Victorian SA2 is measured by the GRP of its catchment, defined using a short upper travel time boundary. Productivity is measured by gross regional product per hour worked. The figure shows a clear positive relationship between catchment scale and productivity. However, the catchment scale has to be greater than $60 billion before substantial scale economics are realised and above $200 billion the potential for further scale economics appears to diminish.

In terms of the data below for the Project Corridor is to exclude SA2s more than 45 kilometres from Melbourne City. The SA2s within 45 kilometres of Melbourne City however, represent only ten percent of the Project Corridor value.

From Figure 2.2, the elasticity of productivity with respect to short catchment GRP scale is highest over the range $\$_{2018}$ 100 billion to $\$_{2018}$ 200 billion. Over this range the average elasticity is approximately 0.15. From the fast train literature survey given in Appendix A, this is consistent with the findings of overseas studies.

Figure 2.1: GRP and GRP per hour worked – Victorian regions, 2019

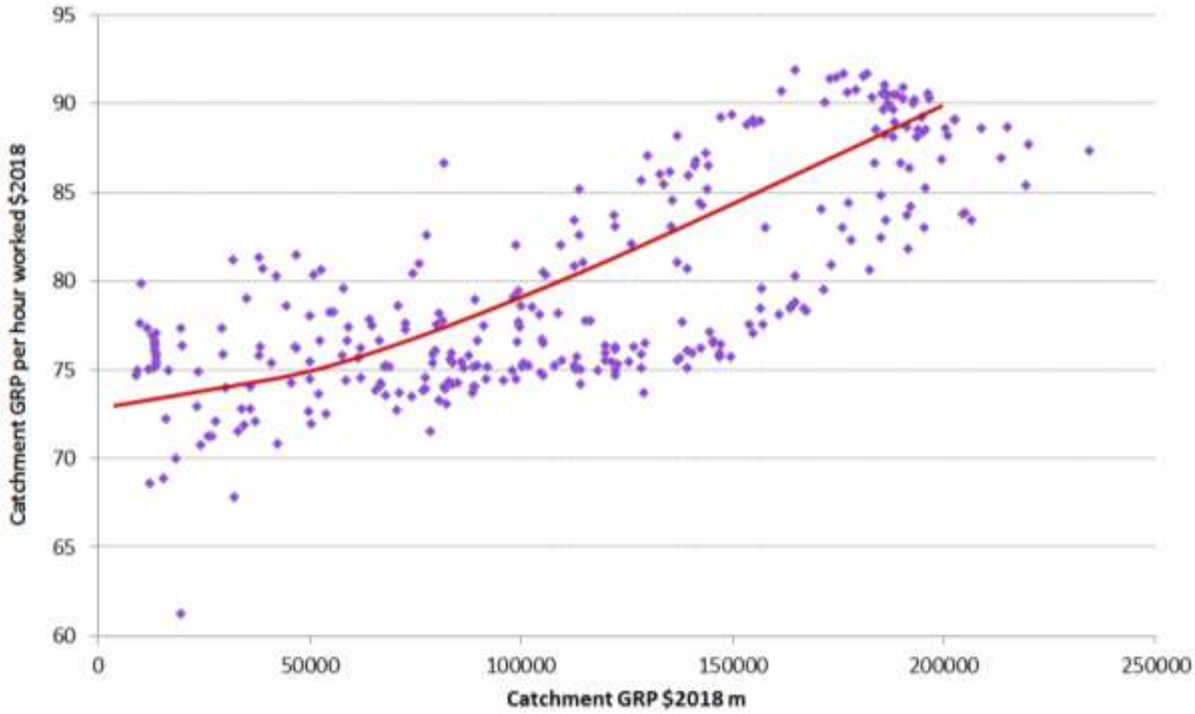
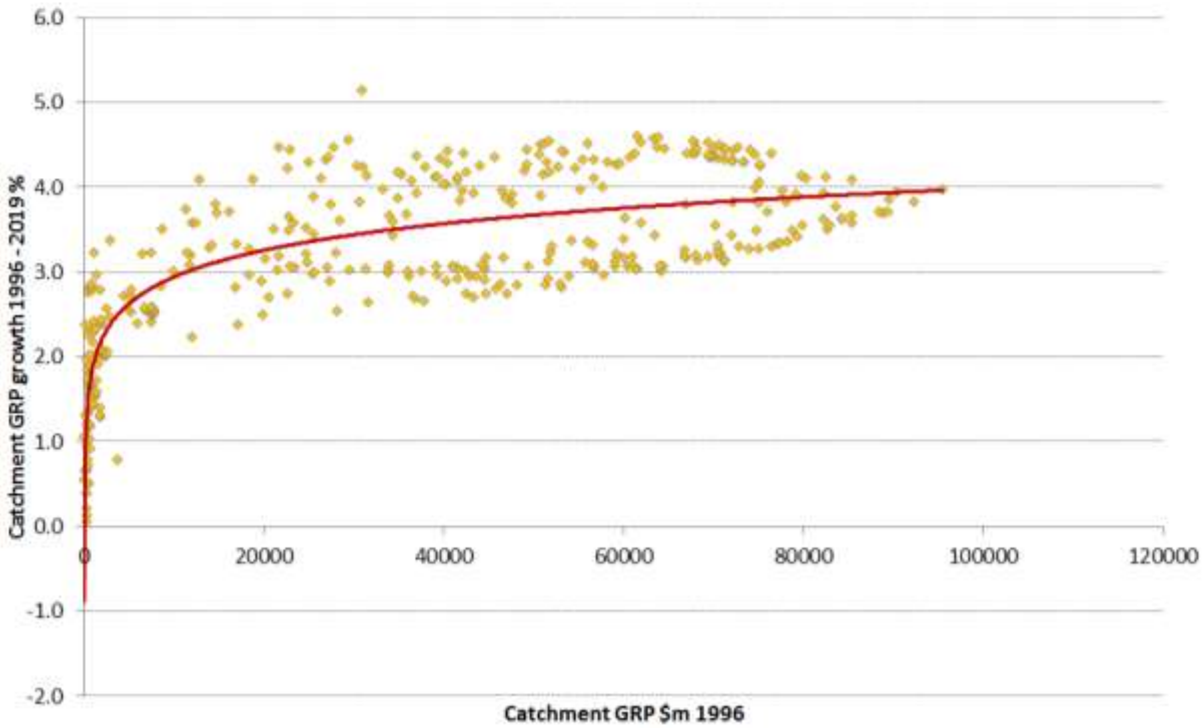


Figure 2.2: Initial catchment GRP scale versus future GRP annual growth rate – Victorian regions, 1996-2019



2.3 Initial catchment scale and economic growth

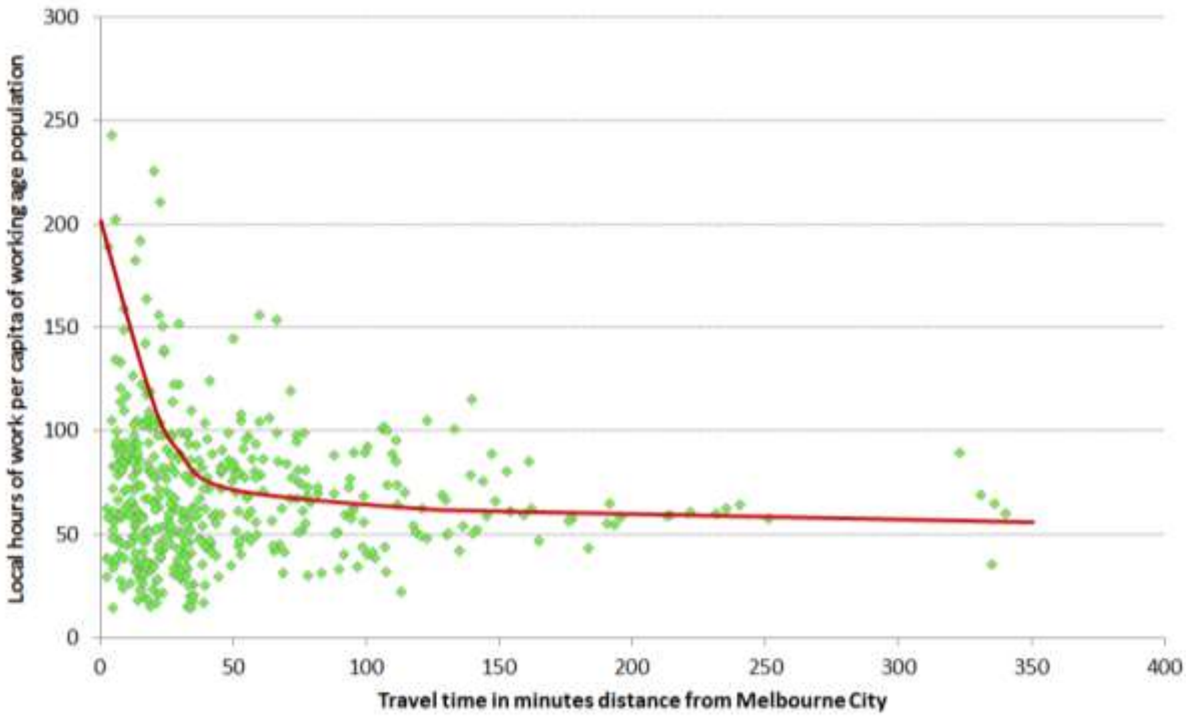
The Stylised Facts imply that the higher the initial catchment scale the higher will be the future growth in economic activity as measured by gross regional product. There will be a general underlying tendency for regional economic inequality to increase.

Figure 2.2 indicates that this is indeed so. Given the initial (short) catchment scale in 1996, the greater the economic growth rate over the next 23 years. In terms of validating the narrative of the economic impact of the Project, Figure 2.2 along with Figure 2.1 are the most important figures in the report.

2.4 Access to hours of work and income from work

Another implication of the Stylised Facts is that the greater the distance from the metropolitan centre the less will be the hours worked per capita of working age population. More simply, the effective unemployment rate will tend to increase with distance from the metropolitan centre. Figure 2.3 indicates that in general this is the case.

Figure 2.3: Local hours of work per capita working age population and travel time – Victorian regions, 2019



2.5 The wage curve: Real incomes and unemployment

A seminal study, D.G. Blanchflower and A.J. Oswald, "The Wage Curve" (MIT Press, Cambridge MA, 1994) found an inverse relationship between the wage rate and the unemployment rate. This 'wage curve' was stable across the regions and household types for 16 countries. Since then the wage curve has been found to apply in many more countries. The empirical finding for the elasticity between the unemployment rate and the wage rate has been stable at around -0.1. An increase in the real wage rate is associated with an increase in hours worked per capita, and hence with a decrease in the effective unemployment rate.

Figure 2.4 indicates that the empirical wage curve relationship is present in the Victorian data base. Across Victoria's labour catchments, higher average earnings per hour are associated with higher hours worked per capita, and hence with a lower effective unemployment rate.

Many explanations have been proposed for this phenomenon, of which the simplest is that the higher the scale of a catchment economy the higher its productivity, resulting in a buoyant labour market which combines high wages and low unemployment. Workers will be attracted to this market, but instead of competing the advantage away they add to it by adding to the scale of the market. Further, the higher the real wage the more likely that highly skilled (that is productive) workers will be attracted to the catchment, further increasing productivity and overall growth.

The more highly productive catchments tend to be close to the metropolitan centre, as is charted in Figure 2.5. The closer a region is to the metropolitan centre the lower its effective unemployment rate and the higher its real wage rate.

From Figure 2.4, the implied elasticity of real wages with respect to the unemployment rate, is -0.53. However, this estimate is likely to be reduced as other drivers, such as skill mix, are taken into account.

(NB: it is sometimes suggested that unemployment is always due to excessive real wage demands. Ceteris paribus, this would result in the unemployment rate being higher in high-wage regions. However, the economies of scale and agglomeration mean that the ceteris paribus condition is not met when comparing regional labour markets.)

Figure 2.4: The wage curve – Hours worked versus $ per hour – Victorian regions, 2019

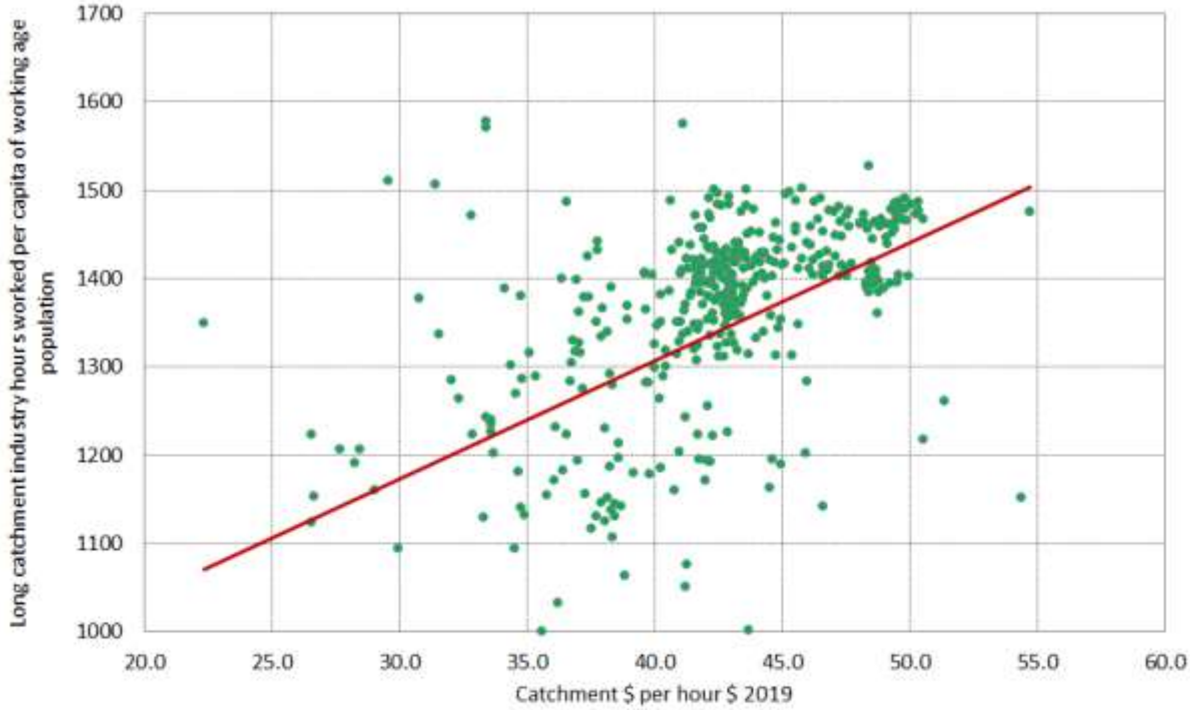
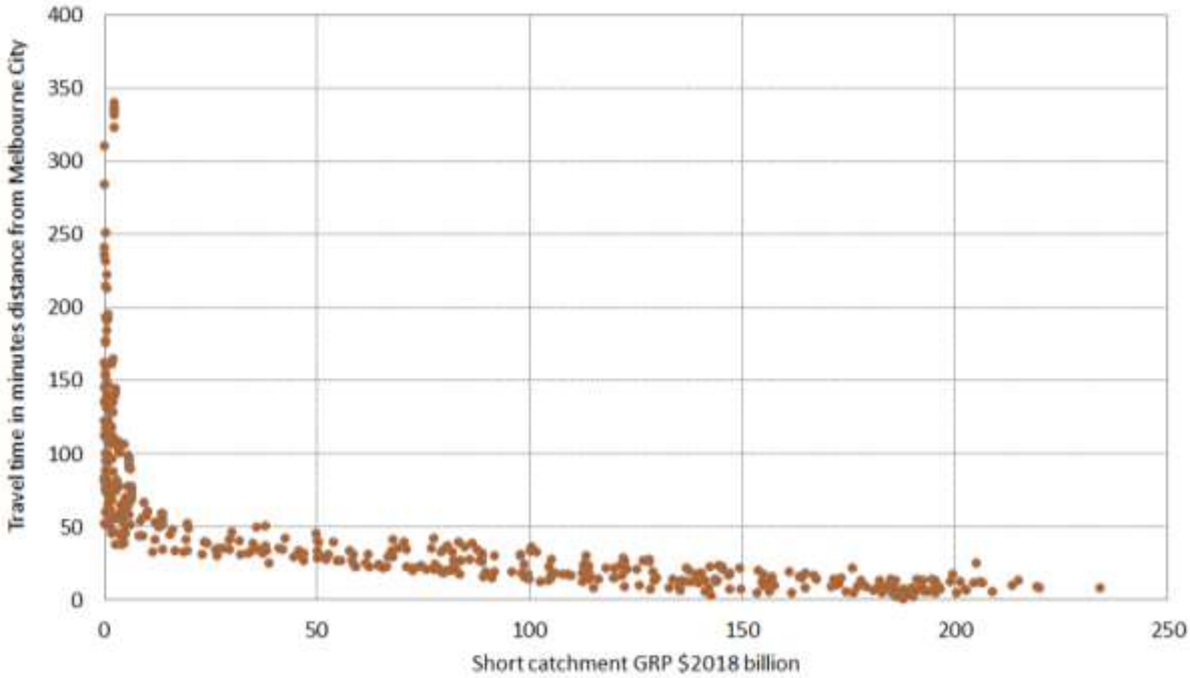


Figure 2.5: Catchment GRP scale versus Distance from metropolitan centre, 2019



2.6 The Project Corridors: Their inequality status relative to the Rest of Victoria

Figures 2.6 to 2.9 profile four indicators of inequality. Figure 2.6 profiles local productivity. In 1995 the productivity (GRP per hour worked) in the regions identified as comprising the Project Corridors (see Map 1.3) was superior to the Rest of Victoria by $\$_{2018}$ 4.00. By 2019 the Project Corridor's productivity was inferior to the Rest of Victoria by $\$_{2018}$ 9.20, or 12 per cent below the Rest of Victoria.

Figure 2.7 indicates that the productivity differential translates into a disadvantage of $\$_{2018}$ 5.70 per hour of work income for the Project Corridor relative to the Rest of Victoria. In terms of annual income from work per capita of working age population, Figure 2.8 indicates that the Project Corridors' disadvantage increased from $\$_{2018}$ 3,650 in 1995 to $\$_{2018}$ 9,285 in 2019.

Finally, in terms of access to employment, Figure 2010 indicates that in 1995 the Project Corridors had a disadvantage of 90 hours per capita per annum. In 2019 this disadvantage remained but had decreased 53 hours per annum. However this reflects the access to Melbourne by nearby regions. If the calculations are restricted to industry hours then Figure 2.11 indicates that there is a discrepancy of -440 hours of work per capita of working age population for Project Corridor vis a vis the Rest of Victoria. This is the reality for more distant SA2s. Given this it is not surprising that, from Figure 2.10, the Project Corridor has a disadvantage in 2019 of $\$_{2018}$ 45,000 in terms of GRP per capita of working age population.

Despite this reduction in effective employment disadvantage, in general the Project Corridor data indicates that the Project Corridors have been missing out on the virtuous cycle of economic development described by the Stylised Facts and are quite possibly suffering from the converse vicious cycle.

Figure 2.6: Local productivity – Project Corridor and Rest of Victoria, 1995-2019

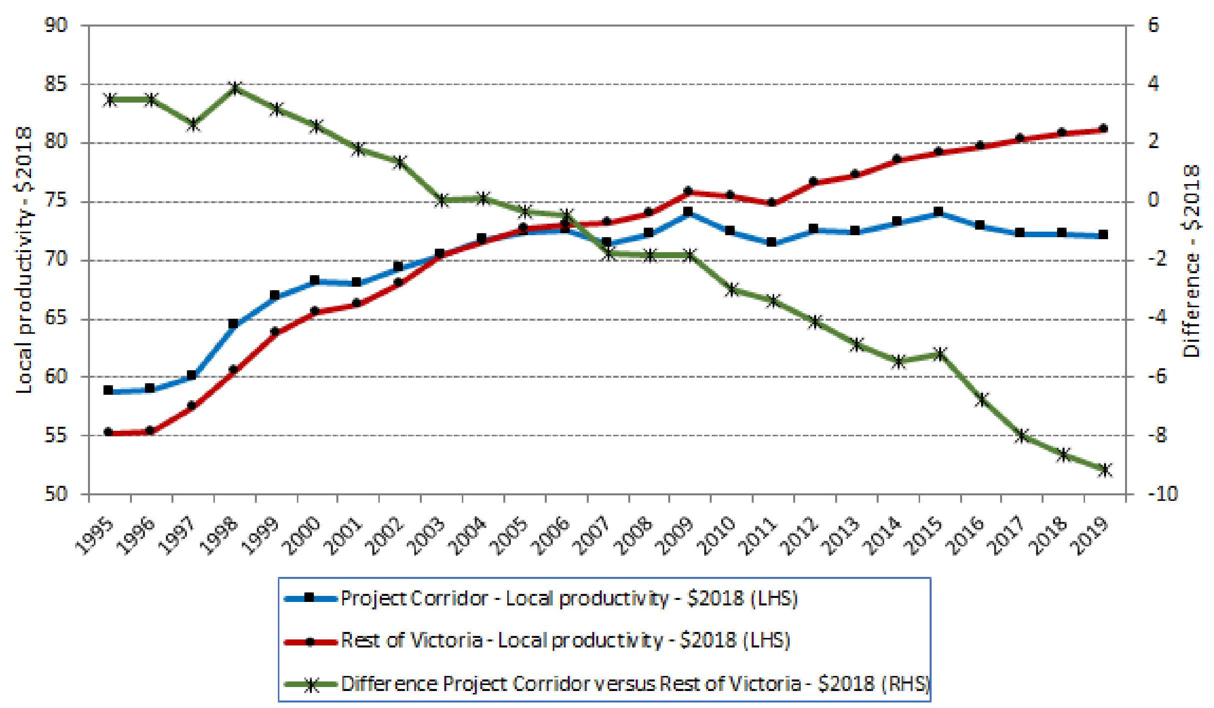


Figure 2.7: Hourly industry income from work – Project Corridor and Rest of Victoria, 1995-2019

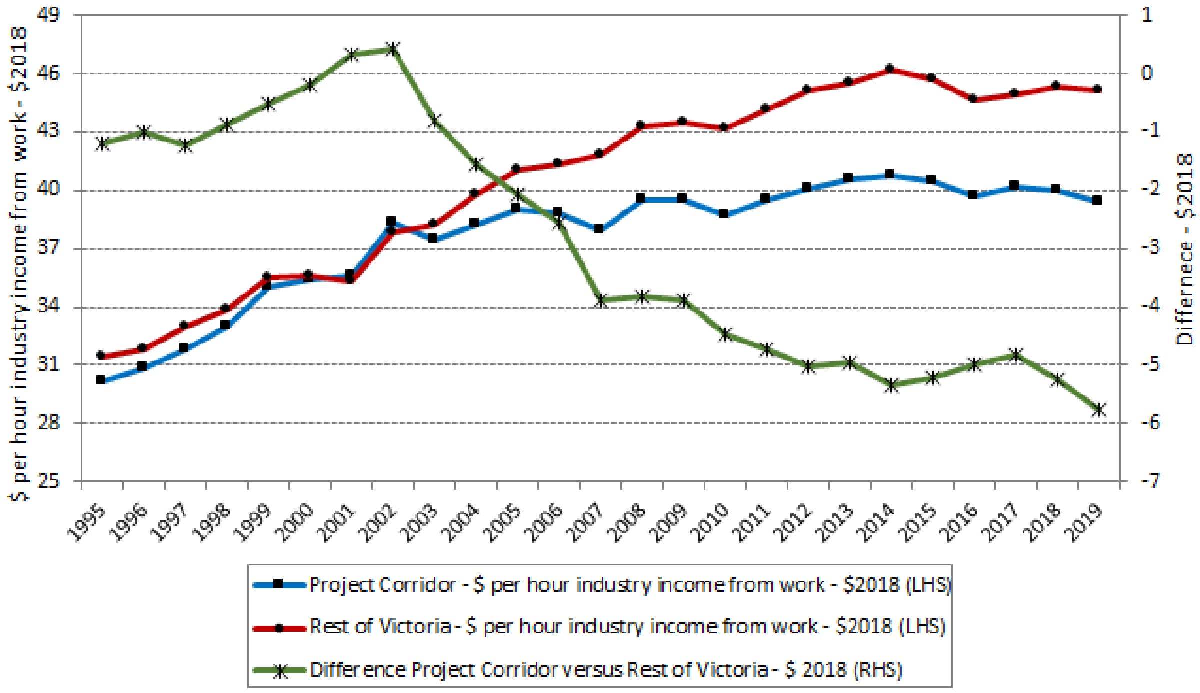


Figure 2.8: Household local income from work per capita of working age population – Project Corridor versus Rest of Victoria, 1995-2019 ($2018 ths.)

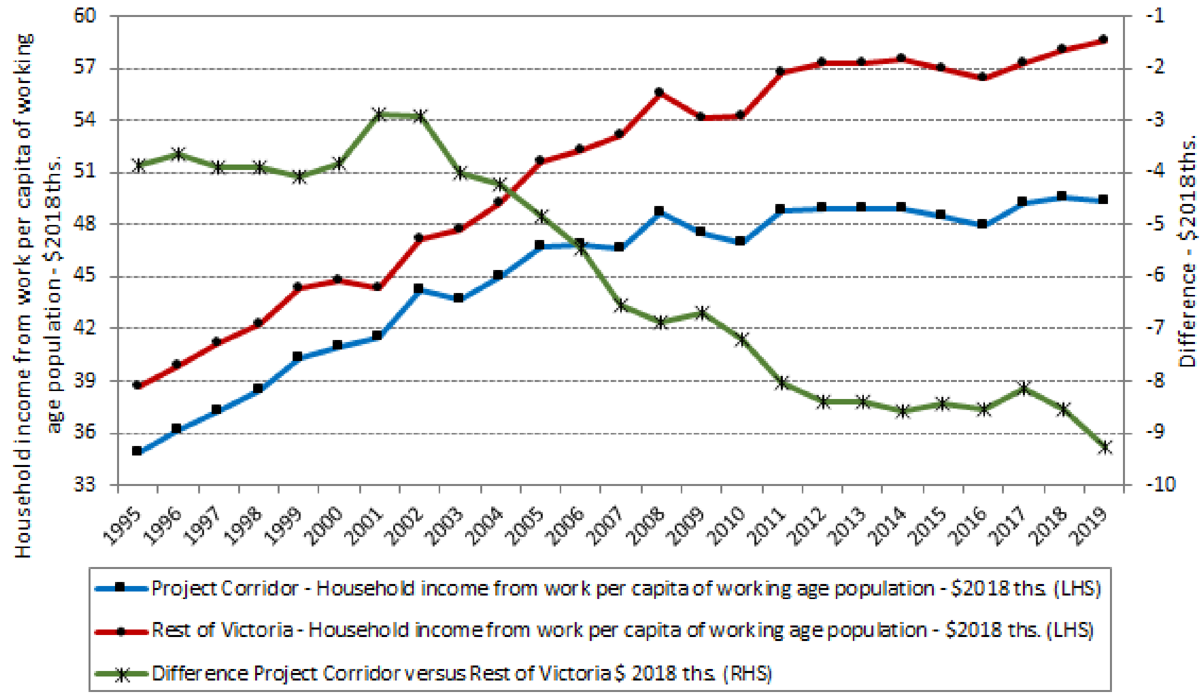


Figure 2.9: Household local residents – Hours worked per capita of working age population – Project Corridor versus Rest of Victoria, 1995-2019 ($2018 ths.)

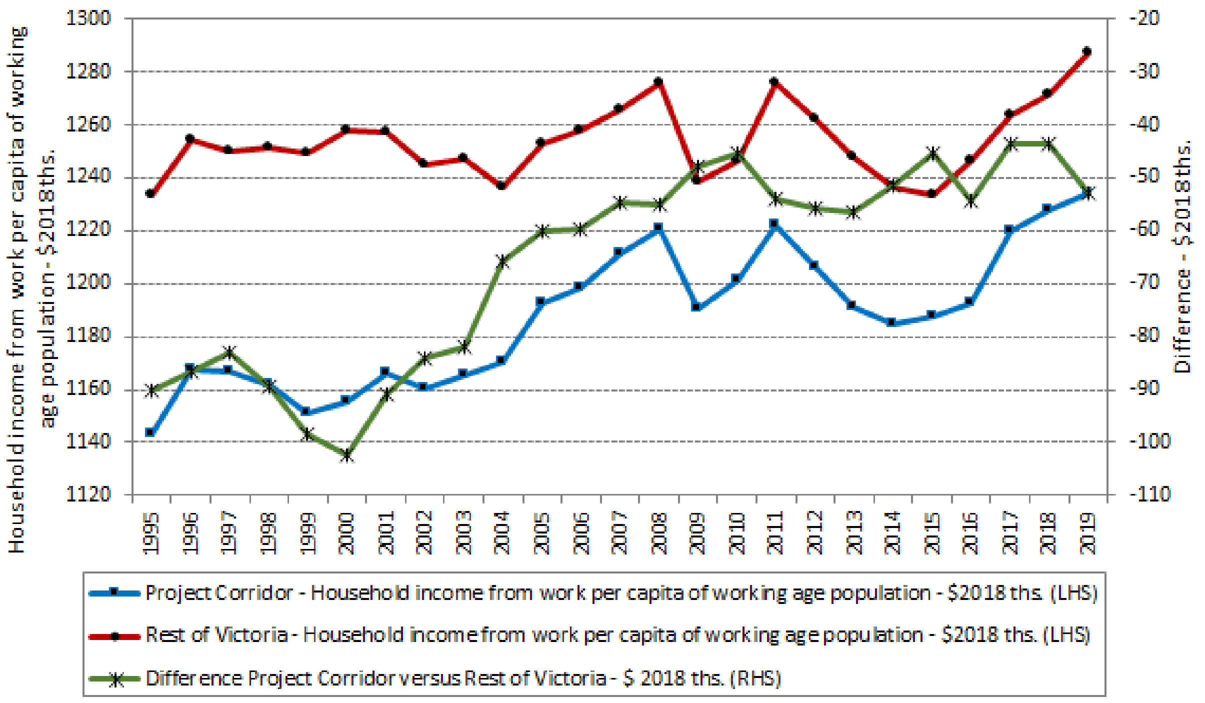


Figure 2.10: GRP per capita of working age population – Project Corridor versus Rest of Victoria ($2018 ths)

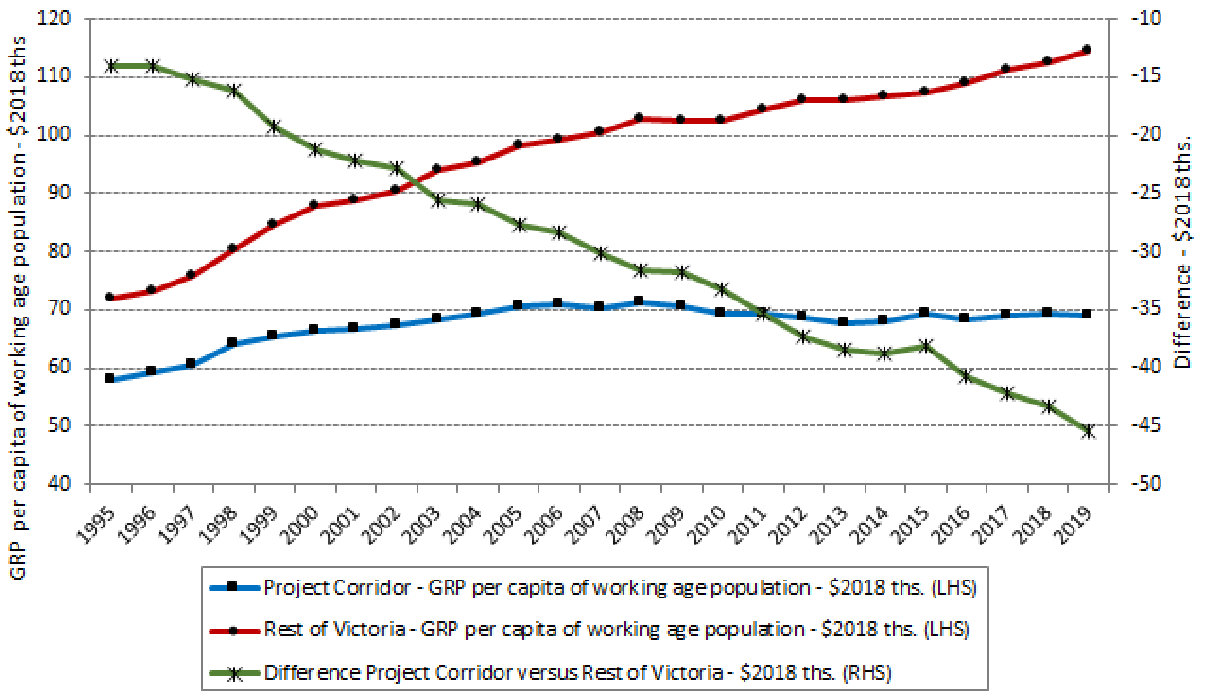
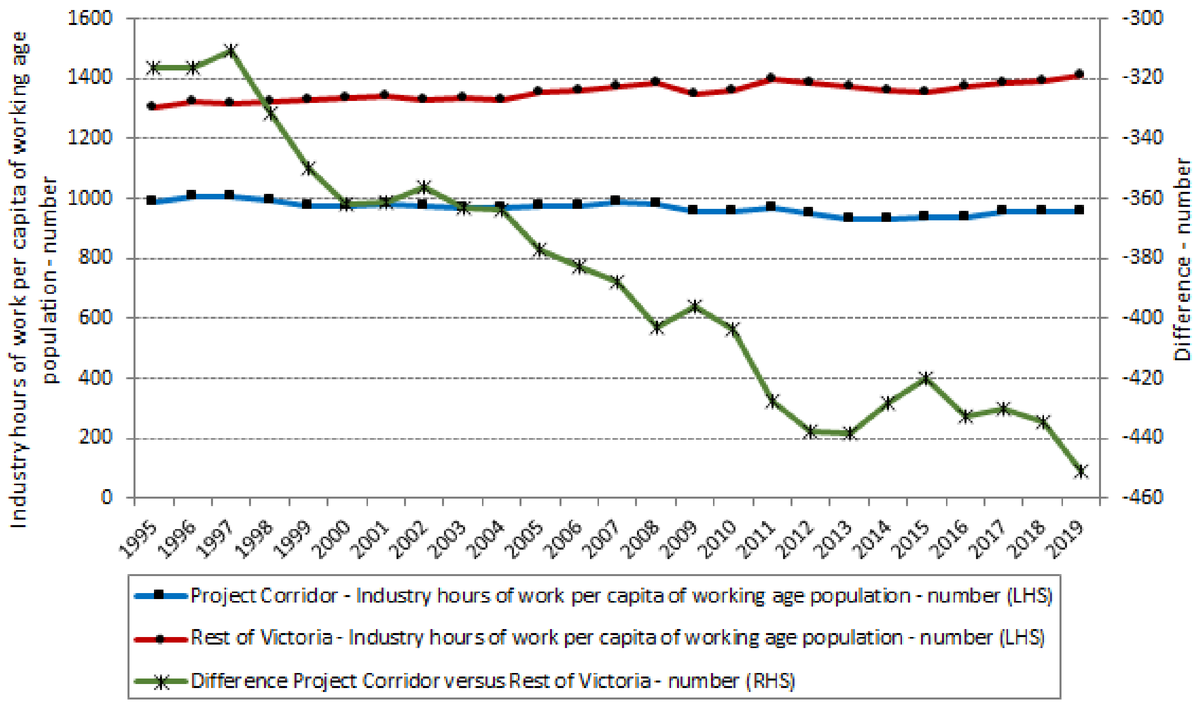


Figure 2.11: Industry hours of work per capita of working age population – Project Corridor versus Rest of Victoria (number)



2.7 The population carrying capacity of Australian LGAs: Over- or under-populated?

Australia's foreign immigration program has been successful in maintaining balance a between labour demand and supply at the national level. Since 2005, the overall Australian workforce deficit, or employment change less the natural increase in the workforce excluding the foreign migration intake, has been almost exactly balanced by the workforce growth from foreign immigration. The inference from this is that the main regional labour markets should be broadly balanced. Unfortunately they're not.

Whether or not a regional labour market is out of balance can be assessed by asking whether the region has too many, or too few, working age residents in relation to its stock of capital and other income-generating resources. Population, capital and other resources are all inputs to the generation of the regional standard of living, and this report answers the question as to the right balance by identifying regions where the standard of living diverges from the national average. The calculations were performed for all Australian LGAs and included the job opportunities made available by commuting (i.e. the calculations were by LGA catchments). The quantitative criteria applied in determining under- or over-population status are set out in Table 2.1. The source of the analysis below is John Stanley, Janet Stanley and Peter Brain "Population Growth: Making the Most of Our Opportunities", Municipal Association of Victoria, 2018. This study focused on Melbourne LGAs. The analysis was taken to the national level in Chapter One in NIEIR/ALGA "State of the Regions Report – 2018-19".

These criteria identify surplus population regions as regions which suffer one or more of the following:

(i) low and declining average hours of work per employed person;

(ii) low and declining earnings per hour from work due to relatively strong competition for jobs; and/or

(iii) low or declining workforce participation rates because of workers are discouraged by a lack of employment opportunities and/or low remuneration for their labour effort.

The indicator used to identify over-populated regions is gross regional product (GRP of residents, including commuter incomes earned in other regions) per working age resident. This indicator measures regional household income from economic activity and therefore captures the impact of both employment and the earning rates of regional incomes. It allows appropriate comparison between regional income and the national standard.

LGAs that in 2018 had redundant working age residents were identified as those where:

(i) the average annual growth rate of the working age population was above the state average working age population growth rate;

(ii) as of 2018 the GRP(R) per capita of the working age population was at least 10 per cent below the state average; and

(iii) over the past 26 years GRP(R) per working age resident had declined relative to the state average by more than 5 per cent.

In the main, the LGAs identified as over-populated by these criteria were found to have an excess population equal to the difference between the actual 2019 working age population and the population that would have prevailed in 2018 if actual population growth over the past 26 years had been restricted to state average working age population growth plus 0.5 per cent per annum.

It can be seen from Figure 2.12 that using this approach allows surplus population metropolitan LGS to be identified from the top left hand quadrant.

LGAs with population shortages were identified in two ways:

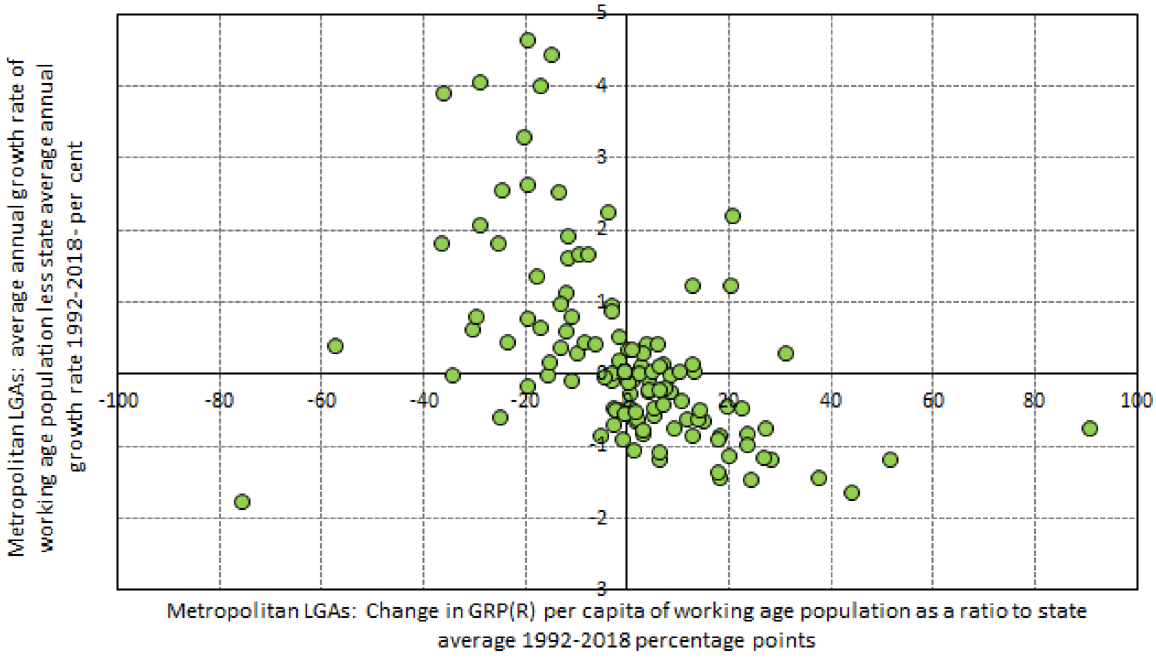
(i) those where employed residents were putting in more hours of work than the state average; and

(ii) those where population growth was less than the state average and had passed thresholds where population decline led to declines in GRP(R) per capita, leading to further population declines, and so on. The population "shortages" here would equal the difference between actual population in 2018 and the minimum population that would have prevented the triggering a vicious cycle of population and per capita income decline – basically the reverse of the virtuous circle outlined in Chapter 1.

In an analysis at LGA level, using 2018 data, strong evidence was found that some LGAs are overpopulated and some are under-populated. National balance is but an average of regional imbalances. Overall, from Table 2.1, in 2018, 89 of Australia's 543 Local Government Areas (LGAs) were found to have excess population (more working age residents than necessary to attain the national average standard of living given the non-labour resources available), while 258 LGAs had population shortages and were hence under-populated. Just under 40 per cent of the national total of excess population was located in the Metropolitan Melbourne fringe regions – more than the excess population estimated for the counterpart Sydney Metropolitan regions by a factor of over 3 to 1 and associated with the relatively low cost of land in outer suburban Melbourne.

Table 2.1	The rules for determining an LGA's working age population excess or shortage
Metropolitan LGAs: Surplus working age population	A metropolitan LGA was identified as having excess working age population if: (i) over the last 26 years the average annual population growth rate was above the state average; and (ii) in 2018 the GRP(R) per capita of working age population was more than 10 per cent below the state average; and (iii) if over the last 26 years the GRP(R) per capita of working age population fell by more than 5 percentage points compared to the state average; or: (iv) if (iii) did not hold but condition (i) did, an LGA was deemed to have excess working age population if it satisfied condition (ii) with the minimum threshold increased to -15 percentage points. The degree of excess population was estimated for LGAs that satisfied conditions (i) to (iii) by either: (1) the difference between the actual working age population in 2018 and the population that would have resulted if the LGA's working age population had grown at the state average annual growth rate plus 0.5 per cent per annum over the last 26 years; or: (2) the working age population decline that would be needed in 2018 to increase the GRP(R) per capita of the working age population to 10 percentage points below the state average. With the lower of these two calculation methods adopted, provided that (3) if an LGA satisfied condition (iv) for excess population then method (2) was used to estimate the surplus population with a 50 per cent discount applied to the estimates.
Non-metropolitan LGAs: Surplus working age population	A non-metropolitan LGA was deemed to have excess working age population if it met the same conditions specified for a metropolitan LGA. The calculation of the excess working age population was the same as for metropolitan LGAs with the only difference being for method (3) a 33 per cent discount rate was applied.
Non-metropolitan LGAs: Working age population shortages – the vicious cycle of population decline mechanism.	A non-metropolitan LGA was deemed to be in working age population shortage if: (i) the average annual population growth rate over the past 25 years was less than the state average; and (ii) in 2018 the GRP(R) per capita was at least 10 per cent below the state average; and (iii) the change in GRP(R) per capita relative to the state average over the last 26 years was a decline of at least 5 percentage points. If (i) to (iii) were satisfied, the estimated population shortage equalled the population that would have prevailed in 2018 if the population had grown at 0.3 per cent below the state average less the actual population in 2018.
All other LGAs: Working age population shortage – the constraints in labour supply mechanism.	Without respect to the distinction between metropolitan and non-metropolitan areas, a LGA was deemed to be in working age population shortage if: (i) it was not assigned to any of the categories defined above; and (ii) resident hours worked per capita of working age population relative to the national average was greater than the national average of hours worked per capita of working age population plus 30 per cent of the standard deviation of the LGA distribution of hours worked per capita of working age population relative to the national average. The population shortage was calculated as the additional population required to hold the hours worked per capita of working age population at the national average plus 0.3 of standard deviation divided by 0.7 to allow for working age population unemployed or not in the workforce.
All other LGAs: Balance of working age population	An LGA was deemed to be neither over- or under- populated if it was not assigned to one of the categories defined above.

Figure 2.12: Metropolitan LGAs – Change in GRP(R) per capita of working age population and average annual growth of working age population – Australia, 1992-2018



The national total of excess working age people living in over-populated LGAs exceeded the national total of shortages in under-populated LGAs by a factor of 1.7. The overall gross excess working age population was 750,000 in 2018 compared with gross population shortages totalling 441,000 across all LGAs. Theoretically it would be possible to increase national output by shifting people from the over-populated to the under-populated LGAs, but this is merely a theoretical exercise – it would involve shifting people from outer suburbs to inner, where there simply is no room. Even if it were possible, there would still be an excess of 309,000 working age citizens.

Table 2.2 indicates that there were 103 LGAs in the second of these categories. In some of them a boost to population growth would bring a bounce-back in economic activity due to increased utilisation of currently under-utilised infrastructure and a general improvement in business confidence, but some of them would have passed a point of no return, largely because of the degrading of the installed capital stock.

Other findings include:

(i) current regional population growth estimates to 2021, based on dwelling completions, will increase population imbalances if realised. It is accordingly projected that by 2021 excess regional population will rise by 130,000. The excess population in the over-populated regions of Sydney and Melbourne is projected to increase by at least 20 per cent; and

(ii) based on 2011 to 2016 trends, international migration has played a role in increasing the excess population in over-populated regions, but not disproportionately so, compared to internal sources of regional net migration.

In all likelihood, net foreign migration will fall over the medium term future as a result of a decline in the workforce deficit due to lower employment growth compared to the growth rates that prevailed during the mining boom, let alone the lingering effects of coronavirus restrictions. Against this background:

(i) the reason why the surplus population is greater in Melbourne than in Sydney, Figure 2.13, is simply due to dwellings having been more affordable in Melbourne over the last few years, although over the last couple of years Melbourne's superiority in this regard has been significantly eroded;

(ii) attempts to reduce regional excess populations by cutting net foreign immigration below the workforce deficit would be counter-productive as they would increase labour market inefficiencies, resulting in inflationary pressures and declines in productivity;

(iii) it would be preferable to improve the integration of labour markets within metropolitan areas and extend this integration to nearby regional labour markets to better utilise the excess working age population in the over-populated outer suburbs. This would involve investments in connectivity so that outer suburban residents can access work in the generally inner-suburban regions, which are short of working age residents. If this were done, net foreign immigration could be reduced without significant macroeconomic damage. There would, however, be a serious investment cost, on a first-estimate basis of around $240 billion. It is not known how much of this cost is already covered by the build-up in infrastructure expenditure expected between 2016 and 2030;

(iv) another way to reduce regional population imbalances without impacting overall growth would be to improve productivity in regions lagging compared to their peers, a strategy which is particularly appropriate for Regional Corridors. This again would involve investment, particularly in the generation of productive jobs. It would again allow net foreign migration to be reduced without impacting on overall growth; and

(v) it is sometimes contended that labour force imbalances can be corrected by directing immigrants to under-populated regions, and indeed this is the effect of some of the various categories of temporary visa. Such requirements can be effective in ensuring labour supply for unpopular jobs in agricultural and pastoral regions, but they do not address the major problem, which is imbalance within metropolitan and peri-urban areas.

Table 2.2 Working age over- and under-population: The number of LGAs by category in 2018

Category	Number of LGAs	Per cent of LGAs	Total working age population estimate ('000)
1. Metropolitan LGAs: Over-population	36	6.6	664
2. Non-metropolitan LGAs: Over-population	53	9.8	86
3. Non-metropolitan LGAs: Under-population (vicious cycle population decline)	103	19.0	-166
4. Other LGAs: Under-population (labour supply shortages)	155	28.5	-275
5. All other LGAs: Balanced population	196	36.1	–
Total	**543**	**100.0**	**309**

This double finding – that many regional labour markets are unbalanced and that the national total of regional labour markets is also unbalanced – contradicts the finding that labour demand and supply is balanced at the national level. This comes about because regional labour markets are semi-detached from the national market. The indicators of national balance, such as overall unemployment and the rate of growth of wage rates, can be satisfactory while hiding patterns of under- and over-employment at the regional level. The solution is to increase the degree of connectivity between regions.

2.8 Implications for the evaluation of the Project

It is transparent from the data that the surplus population status is a major concern for Victoria relative to other states. In metropolitan Melbourne as at 2020, up to half a million in population would prospectively be available to relocate to regions that offered:

(i) increased probability of satisfactory work hours;

(ii) increased probability of higher dollars per hours of work income;

(iii) the same or lower housing costs; and

(iv) relatively easy access to Melbourne City.

It will be seen below that the Project does offer these opportunities without requiring increased immigration into the state.

The other major finding of this section relevant to this study is that the major non-metropolitan LGAs that fall within the Project Corridor are not judged to have surplus populations. The exception to this is the Shepparton LGA.

Figure 2.13: SOR Regions – Working age population surplus, 2018 (‘000)

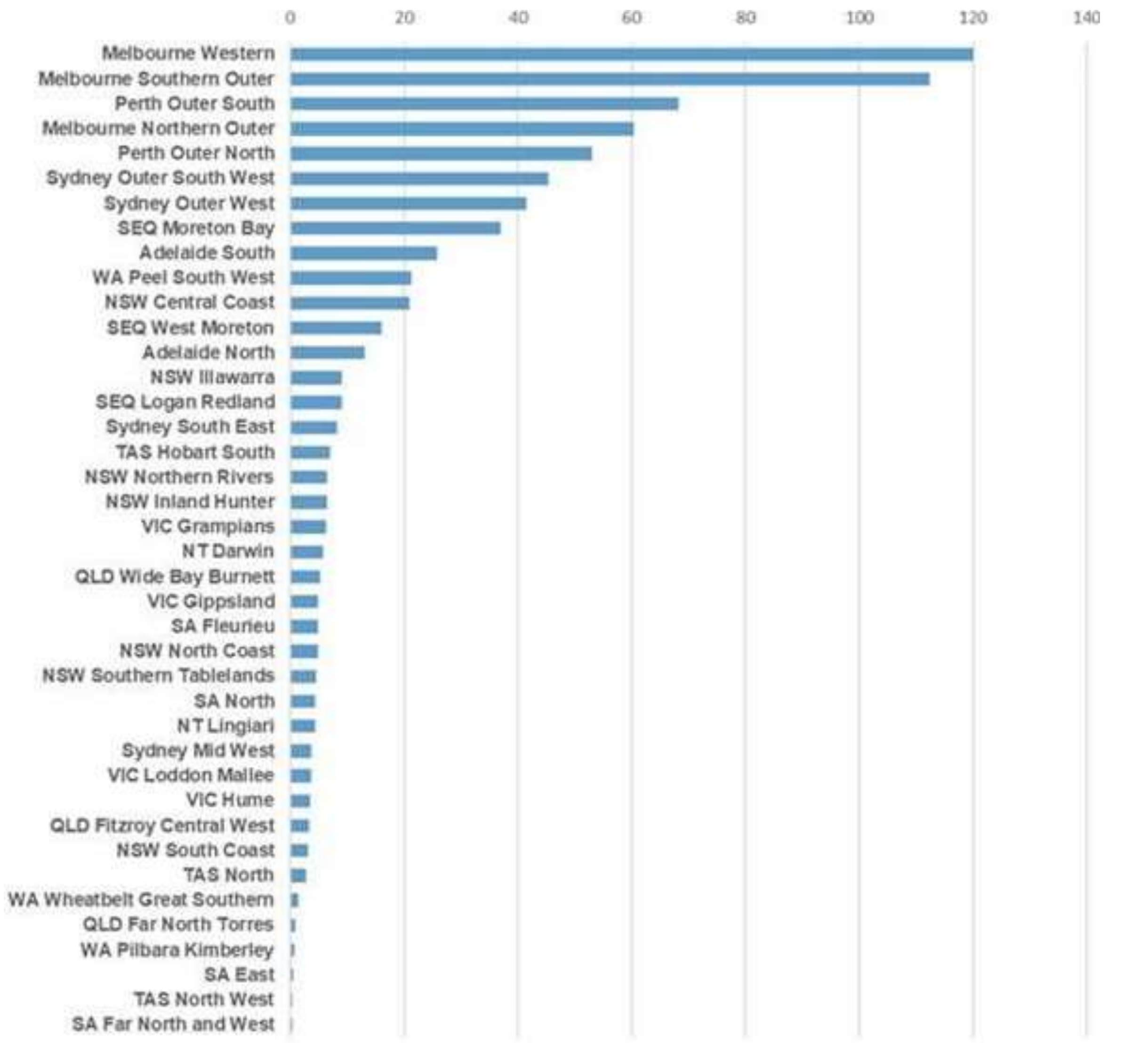
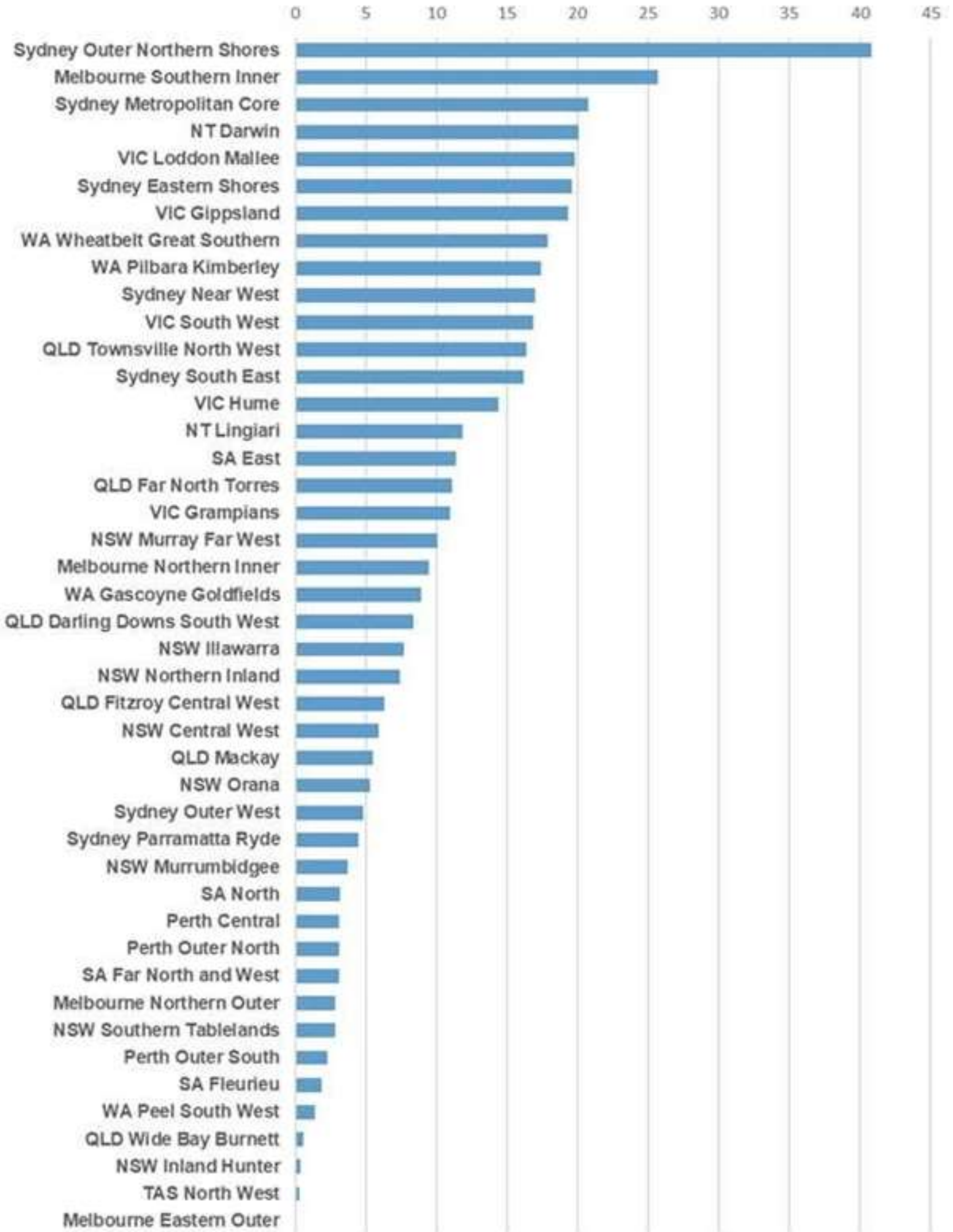


Figure 2.14: SOR Regions – Working age population shortage, 2018 (‘000)



3. The calculation of the SA2 catchments and the disturbance of the FTP

At the centre of the analysis of this study is the concept of a SA2 catchment for a given variable, whether it be GRP, industry hours of work, or working age population, etc.

3.1 The calculation of catchment values

Let:

$x_{i,k}$ = Local value of economic variable x (for example GRP, hours worked, etc.) for SA2 i for travel mode k.

Also:

$tt_{i,j,k}$ = Travel time between SA2 i and SA2 j in minutes for travel mode k.

Further:

$dc_{i,j,k}$ = Decay value for the role of x_j in the calculation of the catchment value of x for SA2 i for travel mode k.

Table 3.1	Threshold time for decay function (minutes)	
	Short	**Long**
Lower threshold time (THL)	18	30
Upper threshold time to zero (THU)	35	90

Hence, the catchment value for SA2 i type m is given by:

$$cx_{i,k} = \sum_{j=1}^{462} dc_{i,j,k} \cdot x_j$$

$$i = 1, \ldots\ldots, 462$$

There are two travel modes, namely:

$$k = \begin{cases} 1: \text{Motor vehicle, AM peak} \\ 2: \text{Public transport} \end{cases}$$

In terms of the determination of $dc_{i,j,k}$

If $tt_{i,j,k} < HL_m$,
then $dc_{i,j,k} = 1$

and,

THL_m = lower threshold bound two for catchment of type m.

There are two catchment types:

$$m = \begin{cases} 1: \text{ Short catchment} \\ 2: \text{ Long catchment} \end{cases}$$

If $tt_{i,j,k} > THU_m$,
then $dc_{i,j,k} = 0$

where,

THU_m = Upper threshold time for catchment of type m.

For $tt_{i,j,k}$ greater then THL_m and less than THU_m, then:

$$dc_{i,j,k} \quad = \quad 1 - (tt_{i,j,k} - THL_m) / (THU_m - THL_m)$$

Finally, the total catchment for variable x is given by:

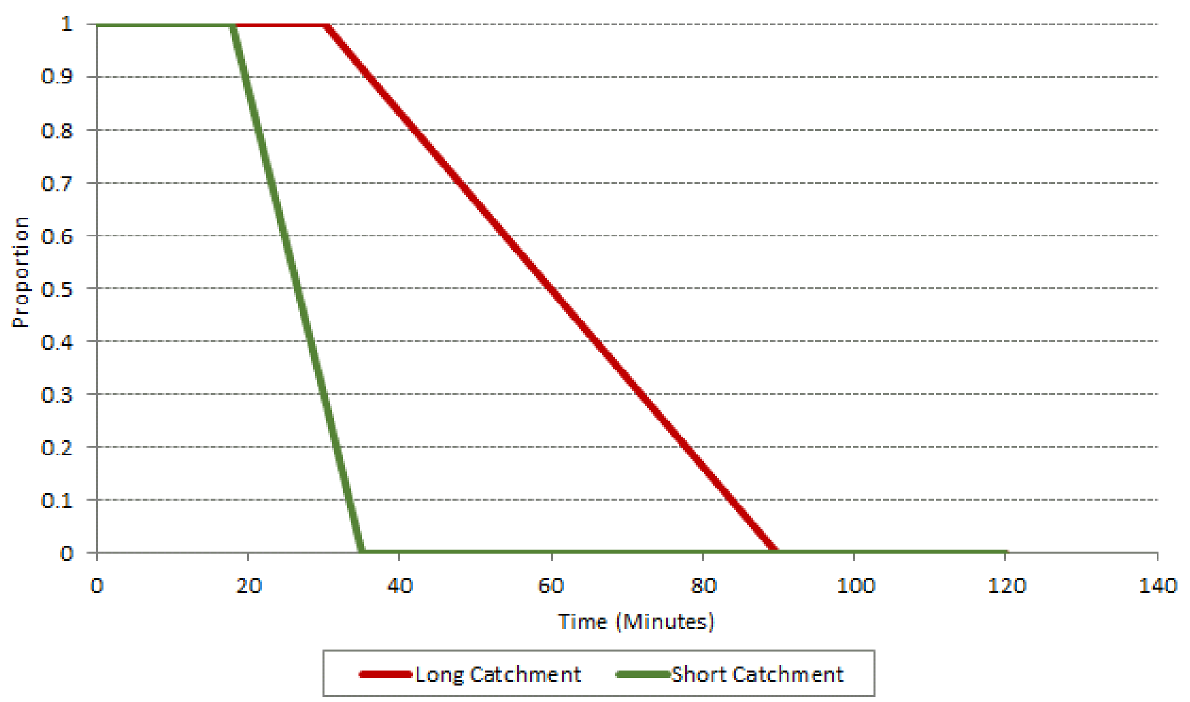
$$tcx_i \quad = \quad w_1 \,.\, cx_{i,1} + (1 - w_1) \,.\, cx_{i,2}$$

Where,

w_1 = Weight average of motor vehicle effect in overall journey to work effort from SA2 i to all j.

The THL_m and THU_m for the two catchment types used in this study, namely the short and long catchment, are given in Table 3.1. The $dc_{i,j,k}$ values vis a vis travel time are shown in Figure 3.1.

Figure 3.1: Short and long catchment calculation plots



3.2 Travel time adjustments for the Fast Train Project

Two travel time scenarios have been developed to support to economic analysis of implementing a fast regional rail network in Victoria. The travel time scenarios cover trips for all of Victoria's public transport network from the SA2 to SA2 level (Statistical Area 2). Victoria is made up of 462 SA2s which means that each scenario describes travel times for 213,444 distinct SA2 to SA2 trips. These scenarios are:

1. a Base scenario that describes current travel times; and
2. a Fast rail scenario that describes travel times for a 200km/h regional commuter rail program that covers Geelong, Ballarat, Bendigo, Shepparton and Traralgon lines as well as the interim stations toward Melbourne.

The travel time matrices represent the average weighted travel time in minutes that it takes to travel from the starting SA2 to the destination SA2. This means that travel times will inherently include information about all trips that originate from an SA2 and include all destinations within the destination SA2. For example, a trip from Geelong to Melbourne will include the travel time from Geelong station to Southern Cross station along the regional rail network. The travel time will also include the time it takes the traveller to get from their house to Geelong station, and from Southern Cross Station to their final destination. The travel times are intended to be trip weighted. Therefore, the averages are closer to the most common trips for any given SA2 to SA2 pair.

3.2.1 Base scenario

The Base scenario travel times were developed by NIEIR and adapted from published data from Infrastructure Victoria (IV), other published sources, rail and bus timetables, and the results of travel times from GPS mapping services. The travel times are for car and public transport travel for the 2016-2018 years that included variants for peak AM/PM, inter-peak and off-peak travel periods. For non-metropolitan Melbourne estimates were prepared for the SA4/SA3 level and then carried down to the SA2 level.

NIEIR have primarily used combined AM/PM peak hour public transport travel times for the Base and Fast rail scenarios. The travel times describe a representative weekday peak hour where the minimum of the AM or PM travel time has been used.

NIEIR disaggregated the travel time data into SA2 to SA2 form. This was done by applying the relative distances between SA2s and SA4s and using the original IV SA4 level data as the constraint. This provided an initial complete SA2 to SA2 travel time matrix.

NIEIR improved travel time accuracy by using a rules-based approach to remove and re-calculate unrealistic travel times from the first stage, such as rules for implied travel speed minimum and maximum. Trips involving regional rail network travel were also deconstructed into their components by chaining together travel via intermediate SA2s using the model outlined in Section 3.2.2. The public transport and car travel time were allowed to be combined for regional trips, where it is likely that car travel may be used for a small part of the trip. This is for cases where public transport links are inadequate. For example, travellers driving to the regional train station to park then ride, rather than catching a bus to the train station.

Finally, key trips were sense checked and manually adjusted if required. Particular attention was paid to ensuring accurate travel times along the Regional rail network to and from Melbourne.

In summary, the final Base scenario represents:

- SA2 to SA2 average weighted travel times in minutes;
- weekday peak hour travel; and
- majority public transport travel with some allowances made for car travel.

3.2.2 Regional rail travel time model

A simple regional rail travel time model was developed to identify and break down travel times for trips that involved a component of regional rail travel. The model simulates the available routes within the regional rail network. This was used to separate the total travel time data into the regional rail segment of the trip and travel time using other networks or modes of transport. SA2 regions that contained a regional train station were identified, as well as regions that were adjacent or nearby regional train stations.

SA2 to SA2 trips were classified into three types based on starting and ending SA2s:

1. Regional to Melbourne;
2. Regional to Regional; and
3. Melbourne to Regional.

For a trip that originated from a Regional SA2 and had a destination within a Greater Melbourne SA2 (1), three potential trips are identified. Firstly, the quickest time that it takes to get to an SA2 containing a regional train station is found, then the time that it takes to get from that regional train station to the most suitable Melbourne station that services regional routes (e.g. Southern Cross Station) and lastly the time that it takes to get from the Southern Cross Station (Docklands SA2) to the destination SA2 is identified. Regional to Regional (2) trips that include travel on separate lines are linked together through Melbourne, and Melbourne to Regional (3) trips are the reciprocal of the first case.

The model was used to calibrate travel times for the Base scenario and apply travel time savings in the Fast rail scenario.

3.2.3 Fast rail scenario

The Fast rail scenario reflects improvements to the regional rail network from Melbourne out to Geelong, Ballarat, Bendigo, Shepparton and Traralgon and all of the stations in between. The regional rail lines in this scenario are capable of reaching 200km/hr.

The Fast rail scenario applies the travel time improvements documented in the *Stronger Together* report to the Base scenario. The report contains the projected travel time savings for between key regional centres and metropolitan Melbourne. Table 3.2 summarises five key routes between major regional train stations and Southern Cross station. The current times within the table are based on the V/Line timetable during peak periods. While the new times are with fast rail implemented. Under the fast rail scenario, Geelong to Melbourne can be reached in 35 minutes, down from 62 minutes. Similarly, a traveller can now reach Melbourne from Ballarat in 56 minutes instead of the current 75 minute trip.

These key routes (among others detailed in the *Stronger Together* report) were used to calibrate the Fast rail scenario.

The trips involving regional rail travel were identified using the Regional rail travel time model. The trips were deconstructed such that the proportion of time spent using regional rail was separated from the rest of the trip. Travel time savings were applied to the regional rail travel time, and the residual travel time was added back on. The per cent discount was calibrated to match the travel time saving (minutes) on key routes from *Stronger Together*.

Travel time savings were only applied to the sections that are proposed to receive fast rail upgrades. The faster commuter network is detailed in Figure 1.1. The travel time spans within this diagram were also taken into account when developing the Fast rail travel time scenario.

The Base scenario and Fast rail scenario travel times for key SA2 regions to the Melbourne CBD are summarised in Table 3.3. The travel times from SA2 to SA2 are greater before and after than the point-to-point savings listed in Table 3.2. This is because the SA2 to SA2 travel times represent whole of trip travel times from starting location to destination within each of the respective SA2s.

It is important to note that the Fast rail scenario is a variation of the base scenario that only includes the travel time improvements as a result of the new fast rail network. The scenario does not consider all of the other infrastructure initiatives that are planned or likely to take place by the time fast rail has been implemented. In addition, there is not an allowance for increased congestion or other deteriorating factors that may occur in the future. As has been pointed out in Chapter One a ten year phase in to 2030 is allowed for. This means for example for 2027 the $dc_{i,j,k}$ for the base case is given a 0.3 weight and the $dc_{i,j,k}$ calculated for the FTP would receive a 0.7 weight.

Table 3.2 Current and projected fast rail travel times

From	To	Current time	New time	Savings (%)
Geelong Station	Melbourne (Southern Cross)	62	35	43.5
Ballarat Station	Melbourne (Southern Cross)	75	56	25.3
Bendigo Station	Melbourne (Southern Cross)	118	74	37.3
Shepparton Station	Melbourne (Southern Cross)	168	98	39.5
Traralgon Station	Melbourne (Southern Cross)	140	95	32.1

Source: *Stronger Together*, Juturna P/L and internal documents.

Table 3.3 Total travel times from key regions to Melbourne CBD – Base and Fast rail scenarios

SA2 Code		SA2 Name		Scenario (minutes		Straight line distance (km)
From	To	From	To	Base	Fast rail	
21039	21122	Geelong	Melbourne	76	49	65
21002	21122	Ballarat	Melbourne	86	67	103
21018	21122	Bendigo	Melbourne	129	85	133
21416	21122	Shepparton South	Melbourne	177	107	159
21097	21122	Traralgon	Melbourne	144	99	149

Source: NIEIR.

4. The Victorian SA2 model

This section outlines the Victorian SA2 model used to evaluate the Project.

4.1 NIEIR's databases and models

At the heart of the modelling system is NIEIRs LGA based modelling system.

NIEIR has built up a considerable body of intellectual capital for more than 25 years. A major part of this capital is NIEIR's IMP modelling suite, a range of powerful forecasting and analysis tools which give NIEIR "leading edge" capability in national, state, regional and local area economic and business analysis. Other formal models include:

- detailed industry modelling with forecasting sectors (86 industry sectors);
- regional models and forecasting covering all regions in Australia down to the LGA level based on the 86 industry input-output structure;
- models projecting equity market performance indicators at the industry level;
- national and State quarterly, medium and long term models producing forecasts from 6 quarters to 40 years ahead;
- an energy sector model with greenhouse impact and electricity load curve projection capability;
- international and trade models;
- economic activity "leading indicator" models; and

microsimulation models for assessing household level economic activity and the distributional consequences of short term policy changes, and local area consumer demands down to groups of 200 to 300 households.

Purpose built models and survey instruments are developed for specific consulting projects covering areas such as privatisation, regional development, industry policy and strategy analysis, infrastructure planning, major events and cost-benefit analysis.

For more than 20 years NIEIR has developed an extensive regional database. At the core of the database is the quarterly Local Government Area (LGA) database with consistent series from the June quarter 1991 to June quarter 2018 and by end May estimates to June Quarter 2019 which in regional summary form appear in the ALGA "State of the Regions" Report.

The database is based on the 86 industry 2-digit ANZSIC industry classification for 567 LGAs with each industry having time series indicators for:

- hours of work by place of work and place of residence;
- dollar per hour by place of work and place of residence;
- employment by place of work and place of residence;
- sales;
- value added;
- inter-regional and international exports;

- inter-regional and international imports;
- consumption expenditures by industry by households in an LGA; and
- final demand estimates for equipment investment, construction and current government expenditures.

Household income and expenditures by LGA is structured in accordance with the National and State Household Income Formation in the Australian Bureau of Statistics' Australian National Accounts.

The NIEIR LGA databases are available in the public domain on the ID supported websites for over 300 LGAs. The data is also available at the 67 regional level for the ALGA/NIEIR "*State of the Regions*" report.

Over the last three years annual databases have been developed with many of the LGA series broken down into estimates from 1995 to 2019 for the SA2 region level and for employment by place of work and place of resident employment at the 1-digit ANZSIC industry level at the SA1 level.

The databases have been used to construct a powerful quarterly integrated LGA regional modelling system based around:

- automatically updated input-output relationships for each LGA;
- inter-regional trade flow relationships between a given industry in a given LGA and all other LGAs in Australia; and
- investment formation and capacity expansion functions estimated for historical data for installed floor space capacity, infrastructure capital stock estimates and major individual investments time series.

The inter-regional trade flows between and within LGAs by industry are constrained to the relevant cell from the estimated quarterly updated 2-digit ANZSIC national direct allocation of imports input-output table estimates. For projecting the national trade flow constraints for intra and inter-regional trade flows the key national drivers are industry technological trends (digital disruption, etc.) final demand formation (consumption, investment built up from the regional level) and behavioural functions for international import penetration by 2-digit industry.

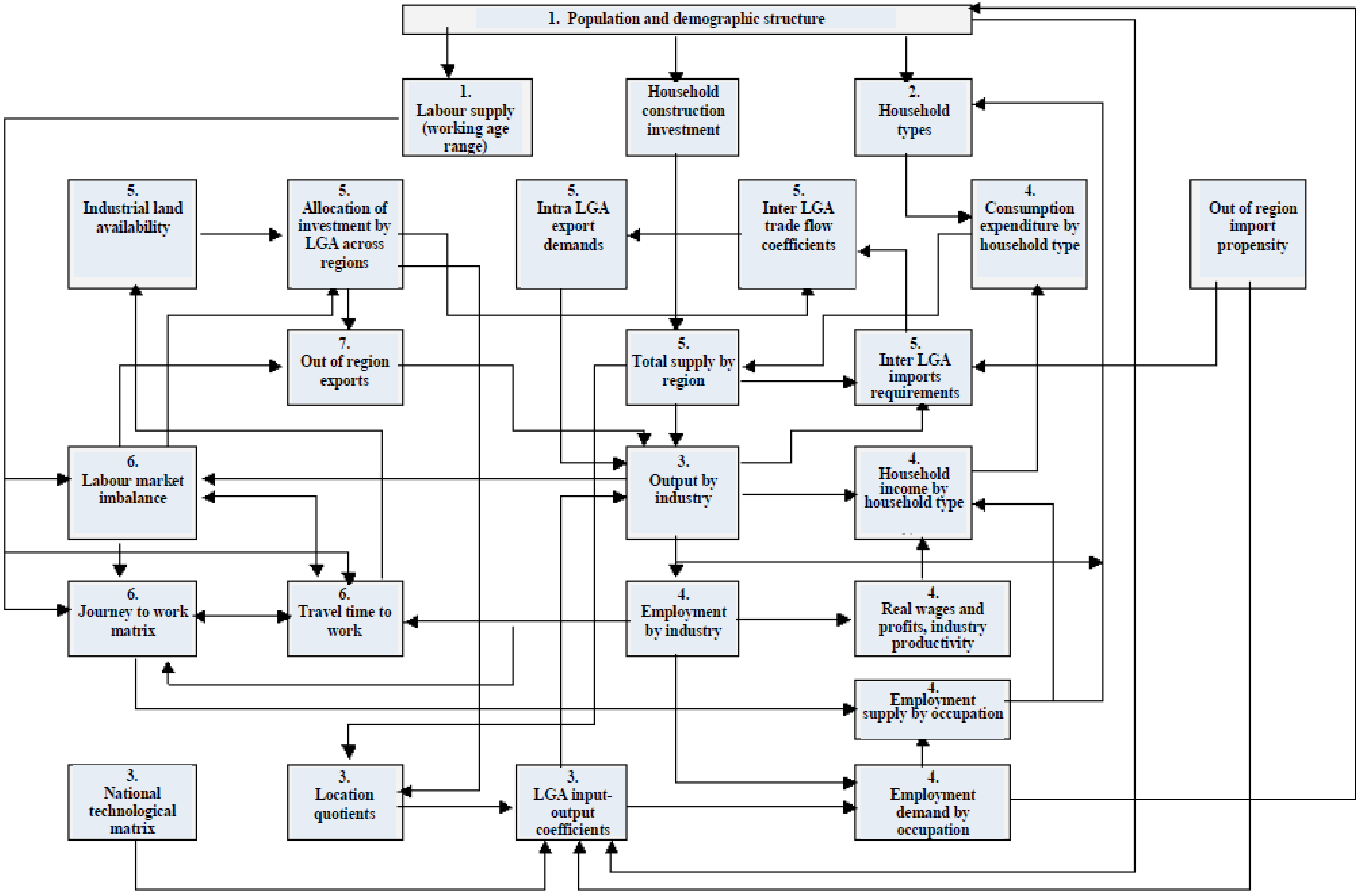
The allocation of international and inter-regional imports by industry to LGA region is based on allocation rules to maintain local and global demand/supply balance.

International exports by industry are projected from the local area based on national competitive drivers (the exchange rate) and local competitiveness indicators (based on productivity, industry cluster density, labour market scale, scope and skill density, etc.) of the LGA region. However, a major driver of projected export capacity expansion in goods tradable industries is driven by the nomination of identified potential major projects by scale and location that are "triggered" when appropriate by changes in the economic environment over the next three decades.

The inter and intra causal relationships in the model are given in Figure 4.1.

The modelling system has often been used to produce detailed results consistent with external general assumptions of general economic growth, population growth and industry activity. However this model was not used for this Study though at some point such a model should be used to complete the analysis as is noted in Chapter Five below. For this study a specific supply side transparent model was developed.

Figure 4.1: The IMP model: Intra and inter LGA relationships



NIEIR's industry structure

Table 4.1 Industry structure

ANZSIC 2-digit number	Industry		ANZSIC 2-digit number	Industry	
1	Agriculture	M	44	Accommodation	L
2	Aquaculture	M	45	Food and Beverage Services	L
3	Forestry and Logging	L	46	Road Transport	L
4	Fishing, Hunting and Trapping	M	47	Rail Transport	L
5	Agriculture, Forestry and Fishing Support Services	H	48	Water Transport	L
6	Coal Mining	M	49	Air and Space Transport	L
7	Oil and Gas Extraction	M	50	Other Transport	L
8	Metal Ore Mining	M	51	Postal and Courier Pick-up and Delivery Services	L
9	Non-Metallic Mineral Mining and Quarrying	M	52	Transport Support Services	M
10	Exploration and Other Mining Support Services	H	53	Warehousing and Storage Services	L
11	Food Product Manufacturing	M	54	Publishing (except Internet and Music Publishing)	H
12	Beverage & Tobacco Product Manufacturing	M	55	Motion Picture & Sound Recording Activities	H
13	Textile, Leather, Clothing and Footwear Manufacturing	M	56	Broadcasting (except Internet)	H
14	Wood Product Manufacturing	M	57	Internet Publishing and Broadcasting	H
15	Pulp, Paper and Converted Paper Product Manufacturing	M	58	Telecommunications Services	H
16	Printing (including the Reproduction of Recorded Media)	M	59	Internet Service Providers, Web Search Portals and Data Processing Services	H
17	Petroleum and Coal Product Manufacturing	H	60	Library and Other Information Services	H
18	Basic Chemical and Chemical Product Manufacturing	H	62	Finance	H
19	Polymer Product and Rubber Product Manufacturing	H	63	Insurance and Superannuation Funds	H
20	Non-Metallic Mineral Product Manufacturing	M	64	Auxiliary Finance and Insurance Services	H
21	Primary Metal and Metal Product Manufacturing	M	66	Rental and Hiring Services (except Real Estate)	L
22	Fabricated Metal Product Manufacturing	H	67	Property Operators and Real Estate Services	L
23	Transport Equipment Manufacturing	H	69	Professional, Scientific and Technical Services (Except Computer System Design and Related Services)	H
24	Machinery and Equipment Manufacturing	H	70	Computer System Design and Related Services	H
25	Furniture and Other Manufacturing	M	72	Administrative Services	M
26	Electricity Supply	M	73	Building Cleaning, Pest Control and Other Support Services	M
27	Gas Supply	M	75	Public Administration	M
28	Water Supply, Sewerage and Drainage Services	M	76	Defence	L
29	Waste Collection, Treatment and Disposal Services	M	77	Public Order, Safety and Regulatory Services	L
30	Building Construction	M	80	Preschool and School Education	M
31	Heavy and Civil Engineering Construction	M	81	Tertiary Education	H
32	Construction Services	M	82	Adult, Community and Other Education	H

Table 4.1	Industry structure (continued)				
ANZSIC 2-digit number	Industry		ANZSIC 2-digit number	Industry	
33	Basic Material Wholesaling	L	84	Hospitals	H
34	Machinery and Equipment Wholesaling	L	85	Medical and Other Health Care Services	M
35	Motor Vehicle and Motor Vehicle Parts Wholesaling	L	86	Residential Care Services	L
36	Grocery, Liquor and Tobacco Product Wholesaling	L	87	Social Assistance Services	L
37	Other Goods Wholesaling	L	89	Heritage Activities	M
38	Commission-Based Wholesaling	L	90	Creative and Performing Arts Activities	H
39	Motor Vehicle and Motor Vehicle Parts Retailing	L	91	Sports and Recreation Activities	L
40	Fuel Retailing	L	92	Gambling Activities	L
41	Food Retailing	L	94	Repair and Maintenance	M
42	Other Store-Based Retailing	L	95	Personal and Other Services	L
43	Non-Store Retailing and Retail Commission Based Buying	L	96	Private Households Employing Staff and Undifferentiated Goods-	L

Note: H = High, M = Medium and L = Low tech classifications.

4.2 Equation estimation

The equation estimation methodology is ordinary least squares (OLS) applied to pooled cross section data for the period 1992 to 2019 fiscal years.

4.3 The estimated model

Table 4.2 profiles the equations of the model. The key equations will be discussed in turn. However, in terms of model outcomes, the equations for catchment SA2:

(i) productivity;

(ii) industry hours of work; and

(iii) local working age population,

are by far the most important.

The 462 constant terms for each equation in Table 4.2 are given in Appendix B. Variables not defined in Table 4.2 are defined in Table 4.3.

4.3.1 SA2 catchment productivity

The modelling of short-distance catchment productivity adopts a counteraction in error correction approach which distinguishes between long-term trends and short-term adjustment dynamics. It therefore requires two equations, one generating the long run trend or "equilibrium" values for productivity represented by Equation 3 in Table 4.2, and a short-run adjustment equation represented by Equation 4 in Table 4.2.

The key equation is Equation 3, with the trend in equilibrium values determined by the fitted values from the equation.

If a multi-industry approach was taken for the determination of industry productivity, the methodology would be to determine which region was dominant for an industry i. An SA2 would be deemed dominant in a particular industry if:

(i) it had a scale in industry output greater than any other region;

(ii) it had a productivity level in industry i greater than any other region.

The modelling approach would then involve determining productivity for any other region in terms of the relativities of productivity and its drivers to the selected dominant region.

In aggregate this approach is also adopted with the dominant region, or at least the dominant region in terms of GRP catchment, was selected as Melbourne City. Thus, in Equation 3, the variables, both dependent and independent, are generally expressed in terms of their relativity to Melbourne City.

The theory is that productivity is positively related to scale. This is strongly supported by the relatively catchment GRP scale variable in the equation, namely RLHGRPC, in the estimated equation. However, as noted in Figure 2.2, the elasticity is non-linear and this is found to be the case with the inclusion of the squared value of RLHCRPC in the equation of a negative sign indicating that at high values of relative scale the elasticity between productivity and scale declines.

The general scale variable is based on the weighted average of travel times for motor vehicles and public transport. Included in the equation is the separate variable re-expressing the GRP catchment based on public transport travel times, or the RLSPTINC variable and its square value. The clear implication of the coefficients of these variables is that productivity is particularly positively sensitive at high values of the catchment variables to the importance of public transport infrastructure in the overall transport infrastructure. This is not the case at low levels of catchment size.

The inclusion of the primary industry (agriculture and mining) catchment GRP captures the fact that a key explanation of the productivity differences for non-metropolitan SA2s will be the quality of its natural (including rainfall) and mineral resources.

The final variable in the equation, or RLWAPOPC, captures the effect, outlined in Chapter 2, that the greater the growth in working age population relative to scale the lower the growth in productivity. The elasticity is a negative -0.37. This variable signifies that productivity will only be maximised if catchment scale grows at a faster rate than working age population in order to avoid the outcome of an SA2 being placed in the top left hand quadrant of Figure 2.10.

Equation 4 is the error correction equation for the adjustment of actual catchment productivity to equilibrium productivity. The greater the rate of change in working age population and catchment scale, the greater the rate of adjustment. Further, for any year nearby 20 per cent of the gap between actual productivity and trend productivity for the previous year is closed in the subsequent year.

In short, the estimated Equation 3 captures the dynamics of the Stylised Facts of Chapter 2 and, therefore, appears to be a valid key equation for capturing the benefits of the Project.

It should be noted that the underlying trend rate of productivity growth in the general economy is introduced via the Melbourne City productivity equation, or Equation 22.

4.3.2 Catchment industry hours creation

Equation 5 and Equation 6 are the two equations determining short catchment industry hours of work available. Like the productivity equations, a counteraction approach is taken. The fitted values from Equation 5 determines the equilibrium values and the actual industry hours determined from Equation 6.

For the productivity equation, the numeraire in the equation was the corresponding Melbourne City value. For the industry hours equation the numeraire is the long catchment working age population. From the narratives of Chapter 2, this is the key variable determining the growth in agglomeration economics, albeit indirectly via the hours component of overall productivity.

The first two independent variables for Equation 5 are the actual and squared value of short catchment GRP per capita of long catchment working age population.

The role of the LWAPOPC variable is to modify the implication of the dependent variable that a 1 per cent increase in long catchment working age population will result in a 1 per cent increase in industry hours of work. The correction to this elasticity is 16 per cent.

The sign of the primary industry variables, both in actual or squared terms, or LSPRIMGRPC, indicate that primary industry variables are a relatively low industry hours generator since many of the gains in these industries are channelled into investment and hence into additional productivity.

The coefficient signs of the share of catchment high technology industry in GRP and its square, or LHTSVAC, are consistent with the Stylised Facts, that high technology industry is an employment generator with the elasticity of industry hours with respect to high technology industry output increasing as the high technology share of industry output increases. This is what would be expected from the Stylised Facts of Chapter 2.

The LIDPHCPRODC is the ratio of catchment $ per hour remuneration to productivity. In effect, it captures the wage curve effect if the estimated sign of the variable is positive, which it is, and at 0.18 within the findings of the coefficient values found across international jurisdictions. Relatively high remuneration, provided it is consistent with underlying productivity, is a net positive for regional growth.

In terms of the evaluation of the Project, the best is kept to last. The share of the public transport in overall catchment GRP scale not only is positive for hours of work generation, but has a higher elasticity than unity indicating the tendency of enterprises and households to invest in regions which have secure connections to their labour market catchment that will not be diminished in the future as long commutes are made longer by increasing congestion and more expensive as increased demand drives up real parking costs. Very logical!

As would be expected, given the need to invest and reallocate investment to achieve the industry hours generation of Equation 5, the speed of adjustment between actual and trend industry hours is slow. The error correction coefficient of Equation 6 indicates that only 6 per cent of the previous year's difference between actual and trend industry hours is corrected in the current year.

Equation 22 gives the numeration increase using productivity as a function of time and the returns to scale from expansion of catchment GRP.

4.3.3 Working age and total population

A prerequisite for any model that is to be used to evaluate transport infrastructure projects is that it be capable of assessing the impact on population levels of all affected regions. The population analysis of Chapter 2 shows the need to assess whether or not the Project will reduce the population of those regions with excess population and increase the population in those regions that are currently subject to population balance or shortages. This requirement is supplied by Equation 7 which focusses on the local value of the working age population variable with the short catchment value of the variable supplied by Equation 3. The dependent variable is the change in local share of working age population in the Victorian total.

One independent or driver variable is the share of (long) catchment industry hours worked in the Victorian total. Allowing for long-run adjustment, it is the level of this variable that will determine the rate of change in the variable in any given year. This variable, therefore, attempts to capture one of the mechanisms that are consistent with the initial scale of the variable influencing future growth rates as is captured in aggregate by Figure 2.2.

A key variable influencing the decision of residents to relocate to another area is its employment to working age population ratio. The higher this ratio is the higher the probability of securing employment if a relocation decision is implemented. This driver is captured by the WAGEP5 variable.

Another driver of the relocation decision is not simply the employment probability but the relative cost of relocating in terms of dwelling prices. The WAGEP3 variable in Equation 7 is the lagged difference between the ratio of local SA2 population to residential land area and the same ratio for Victoria. Thus, as population density increases in a region relative to Victoria, land prices would be expected to increase, discouraging relocation to the region. The WAGE3 variable has the a priori expected negative sign.

The squared variable of the variable, or WAGEP6, is also included. The sign is negative. That is, as population densities reach high levels, with the availability of high rise apartments, the impact of the population density variable on dwelling prices reduces.

Another core driver of the relocation decision is the real income to be gained from work that can be secured from the region. The productivity variable is used as the variable to represent this, since relatively high productivity will generate relatively high income from work on a per capita basis. Thus, the RLGRPHC variable is included in the equation in level form again to capture the long run dynamics between initial scale and future growth. The estimated coefficient value indicates that a 10 per cent superiority in productivity compared to the average will increase future working age population growth by 0.1 per cent.

The lagged dependent variable is included in the equation.

Equation 1 allows the outcome for working age population to determine local total population. The elasticity between population and working age population is one.

Many of the remaining equations are required to translate from catchment variables to local variables.

4.3.4 Local values of variables

In order to determine the local values of usual residents hours worked (Equation 9), Equation 8 is needed to translate the long catchment of industry hours worked determined in Equation 3 from local industry hours worked, into the long catchment of usual residents hours worked. This is accomplished by Equation 8.

However, the long catchment value of usual residents hours worked is not the only variable in Equation 9. Also included in the equation is the lagged difference between the local ratio of hours worked relative to working age population and the corresponding catchment ratio. The sign is negative, indicating that if the local performance of the SA2 falls below the catchment ratio then there will be a tendency for the SA2 to improve its performance slowly over time. This is the role of the LDIFFHWP variable.

Equation 10, determining local industry hours worked from the catchment value of the same variable, has the same mechanism. It applies a short-run elasticity of local industry hours worked with respect to catchment hours worked and a negative elasticity with respect to the lagged difference between catchment hours worked.

Local resident employment is given by Equation 11. The basic dynamics of the equation is that resident employment will adjust to hours worked with a lag, with the speed of adjustment depending on the gap between per capita reemployment and per capita hours.

Equation 14 translates catchment productivity to local productivity. Like the other similar equations, the change in local productivity will be driven by the change in catchment productivity and the difference between lagged local and catchment productivity. However, another variable is included, namely the change in the share of the local high technology industry share in GRP.

4.3.5 High technology industry share

Equation 12 and Equation 13 give the catchment local share of high technology in GRP respectively. The catchment share of high technology industry in GRP is a positive function of its GRP per capita, previous year's value and negatively related to the primary industry share and the Melbourne City share.

The local high technology industry share is positively related to the catchment share, the local GRP per capita and negatively related to the lagged difference between the actual and catchment high technology industry share and the primary industry share.

4.3.6 Income remuneration

The short catchment ratio of industry dollar per hour remuneration from work to productivity, or Equation 2, is positively related to the lagged value of the long catchment ratio of usual residents total hours of work to long catchment working age population and a time trend. The dependent variable is negatively related to catchment productivity implying that the higher the productivity in a region, the less the share of productivity that flows to labour income.

Table 4.2 The equations of the Victorian SA2 model

MAIN EQUATIONS

Equation 1: SA2 Total population

$DEPPOP_{t,j}$	=	$0.991695 * INDVPOP1_{t,j}$ (1672.32)
		$+ 0.003964 * INDVPOP2_{t,j}$ (1.89)
		+ CONST1(j)
		$R^2 = 0.997$
$DEPPOP_{t,j}$	=	For period t first difference of natural log of local population for SA2 j.
	=	$\ln(POPL_{t,j}) - \log(POPL_{t-1,j})$
$INDVPOP1_{t,j}$	=	For period t first difference of natural log of local working age population for SA2 j.
	=	$\ln(WAPOPL_{t,j}) - \ln(WAPOPL_{t-1,j})$
$INDVPOP2_{t,j}$	=	Natural log of ratio of lagged population to working age population for SA2 j.
	=	$\ln(POPL_{t-1,j}) - \ln(WAPOPL_{t-1,j})$

Equation 2: Ratio of employment remuneration to productivity

$LIDPHCPRODC_{t,j}$	=	$0.846410 * LIDPHCPRODC_{t-1,j}$ (195.83)
		$+ 0.075621 * LURHWPCC_{t,j}$ (6.73)
		$- 0.036330 * LGRPHWC_{t,j}$ (-11.10)
		+ 0.000531 * TIME (7.99)
		+ CONST2(j)
		$R^2 = 0.942$
$LIDPHCPRODC_{t,j}$	=	Natural log of short catchment $ per hour remuneration to productivity for SA2 j.
	=	$\ln(IDPHC_{t,j}) / (GRPC_{t,j} / HWC_{t,j}))$
$LURHWPCC_{t,j}$	=	First difference of natural log of ratio of long catchment usual residents total hours worked per capita of long catchment working age population for SA2 j.
	=	$\ln(URHWC_{t,j} / WAPOPC_{t,j})$
Time	=	1992 equals 1.
$LGRPHWC_{t,j}$	=	Natural log of short catchment GRP per short catchment industry hours worked for SA2 j.
	=	$\ln(GRPC_{t,j} / HWC_{t,j})$

Table 4.2	The equations of the Victorian SA2 model (continued)

Equation 3: SA2 industry productivity

$RLGRPHWC_{t,j}$ = $0.548833 * RLHGRPC_{t,j}$
(59.35)
$- 0.010636 * SRLHGRPC_{t,j}$
(-13.86)
$+ 0.380100 * RLSPTINC_{t,j}$
(1.77)
$+ 3.16953 * SRLSPTINC_{t,j}$
(8.21)
$+ 0.016008 * LSPRIMGPC_{t,j}$
(5.96)
$- 0.369953 * RLWAPOPC_{t,j}$
(-30.97)
+ CONST3(j)

$R^2 = 0.969$

$RLGRPHWC_{t,j}$ = Natural log of ratio of short catchment productivity relative to Melbourne City for SA2 j or trend relative productivity for SA2 j when set equal to the fitted value of Equation 3. When this is the case the fitted value from Equation 3 is designated $FRLGRPHWC_{t,j}$.
= $\ln (GRPC_{t,j} / HWC_{t,j}) - \ln (GRPC_{t,21122} / HWC_{t,21122})$

$RLHGRPC_{t,j}$ = Natural log of short GRP catchment scale relative to City of Melbourne GRP catchment scale for SA2 j.
= $\ln (GRPC_{t,j} / GRPC_{t,21122})$

$SRLHGRPC_{t,j}$ = Square of natural log of short GRP catchment scale relative to City of Melbourne short catchment scale for SA2 j.
= $(RLHGRPC_{t,j})**2.0$

$RLSPTINC_{t,j}$ = Natural log of ratio of short catchment GRP scale contributed from public transport to the total scale relative to City of Melbourne for SA2 j.
= $\ln (1 + GRPCPT_{t,j} / GRPC_{t,j}) - \ln (1 + GRPCPT_{t,21122} / GRPC_{t,21122})$

$SRSPTINC_{t,j}$ = Natural log of short catchment GRP contributed from public transport to total scale relative to City of Melbourne for SA2 j squared.
= (RLSPTINC)**2

$LSPRIMGPC_{t,j}$ = Natural log of short catchment share of primary (agriculture and mining) industries in GRP for SA2 j.
= $\ln (SPRIMGPC_{t,j})$

$RLWAPOPC_{t,j}$ = Natural log of ratio of long catchment working age population to same ratio for Melbourne City for SA2 j.
= $\ln (WAPOPC_{t,j}) - \ln (WAPOPC_{t,21122})$

Table 4.2 The equations of the Victorian SA2 model (continued)

Equation 4: Adjustment of short catchment productivity to trend

$CRLGRPHWC_{t,j}$ = $0.681925 * CRLHGRPC_{t,j}$
(81.19)

$+ 0.225452 * CRLWAPOPC_{t,j}$
3.62)

$– .188777 * ERRORCP_{t,j}$
(-40.54)

+ CONST4(j)

$R^2 = 0.467$

$CRLGRPHWC_{t,j}$ = First difference of short catchment relative productivity for SA2 j.
= $RLGRPHWC_{t,j} – RLGRPHWC_{t–1,j}$

$CRLHGRPC_{t,j}$ = First difference of relative short catchment GRP for SA2 j.
= $RLHGRPC_{t,j} – RLHGRPC_{t–1,j}$

$CRLWAPOPC_{t,j}$ = First difference of relative long catchment working age population for SA2 j.
= $RLWAPOPC_{t,j} – RLWAPOPC_{t–1,j}$

$ERRORCP_{t,j}$ = Natural log lagged ratio of short catchment actual relative productivity to trend relative productivity for SA2 j.
= $RLGRPHWC_{t–1,j} – FRLGRPHWC_{t–1,j}$

Equation 5: Short catchment hours worked per capita of working age population

$LHWPCWAPC_{t,j}$ = $0.252895 * LGRPPCWAP_{t,j}$
(20.94)

$– 0.009644 * SLGRPPCWAP_{t,j}$
(-6.75)

$– 0.163956 * LWAPOPC_{t,j}$
(-22.01)

$– 0.082819 * LSPRIMGPC_{t,j}$
(-12.93)

$– 0.011791 * SLSPRIMGPC_{t,j}$
(-13.29)

$+ 0.211300 * LHTSVAC_{t,j}$
(14.09)

$+ 0.053448 * SLHTSVAC_{t,j}$
(14.90)

$+ 0.188673 * LIDPHCPRODC_{t,j}$
(26.10)

$– 0.001921 * TIME$
(-14.99)

$+ 1.02175 * LSPTINC_{t,j}$
(19.07)

+ CONST5(j)

$R^2 = 0.998$

Table 4.2		The equations of the Victorian SA2 model (continued)
$LHWPCWAPC_{t,j}$	=	Natural log of short catchment industry hours worked to long catchment working age population for SA2 j. The trend value of $LHWPCWAPC_{t,j}$ is the fitted value from Equation 5 and is designated $FLHWPCWAPC_{t,j}$.
	=	$\ln (JTWHWC_{t,j} / WAPOPC_{t,j})$
$LGRPPCWAP_{t,j}$	=	Natural log of ratio of short catchment GRP to long catchment working age population for SA2 j.
	=	$\ln (GRPC_{t,j} / WAPOPC_{t,j})$
$SLGRPPCWAP_{t,j}$	=	Square of the natural log of catchment GRP per capita of working age population for SA2 j.
	=	$(LGRPPCWAP_{t,j})**2.0$
$LWAPOPC_{t,j}$	=	Natural log of long catchment working age population for SA2 j.
	=	$\ln (WAPOPC_{t,j})$
$LSPRIMGPC_{t,j}$	=	Defined under Equation 3.
$SLSPRIMGPC_{t,j}$	=	Natural log of short catchment primary industry share squared.
	=	$(LSPRIMGPC_{t,j})**2.0$
$LHTSVAC_{t,j}$	=	Natural log of short catchment high technology industry share in GRP for SA2 j.
	=	$\ln (HTSVAC_{t,j})$
$SLHTSVAC_{t,j}$	=	Square of natural log of short catchment high technology industry share of total GRP for SA2 j.
	=	$(LHTSVAC_{t,j})**2.0$
$LIDPHCPRODC_{t,j}$	=	Natural log of short catchment $ per hour remuneration to productivity for SA2 j as defined under Equation 2.
$LSPTINC_{t,j}$	=	Natural log of ratio of short catchment GRP scale from public transport catchment contribution to total catchment GRP scale for SA2 j.
	=	$\ln (1 + GRPCPT_{t,j} / GRPC_{t,j})$

Equation 6: Adjustment of short catchment industry hours worked to trend per capita of working age population

$CRLHWPCWAPC_{t,j}$	=	$0.123430 * CLGRPPCWAPP_{t,j}$ (27.32)
		$– 0.062438 * ERRORCH_{t,j}$ (-18.07)
		+ CONST6(j)
		$R^2 = 0.162$
$CRLHWPCWAPC_{t,j}$	=	First difference of catchment industry hours worked per capita of working age population for SA2 j.
	=	$LHWPCWAPC_{t,j} – LHWPCWAPC_{t–1,j}$
$CLGRPPCWAP_{t,j}$	=	First difference of natural log of ratio of short catchment GRP to long catchment working age population for SA2 j.
	=	$LGRPPCWAP_{t,j} – LGRPPCWAP_{t–1,j}$
$ERRORCH_{t,j}$	=	Natural log of lagged ratio of catchment industry hours worked per capita of working age population to the trend value of the ratio for SA2 j.
	=	$LHWPCWAPC_{t–1,j} – FLHWPCWAPC_{t–1,j}$

Table 4.2	The equations of the Victorian SA2 model (continued)

Equation 7: Local working age population

$DEPWAGEP_{t,j}$ = $0.043850 * WAGEP1_{t,j}$
(3.27)

$+ 0.061848 * WAGEP5_{t,j}$
(1.73)

$- 0.038319 * WAGEP3_{t,j}$
(-24.44)

$+ 0.01116 * RLGRPHWC_{t-1,j}$
(1.74)

$+ 0.575361 * DEPWAGEP_{t-1,j}$
(76.33)

$- 0.003171 * WAGEP6_{t,j}$
(8.64)

+ CONST7(j)

$R^2 = 0.618$

$DEPWAGEPC_{t,j}$ = First difference of local working age population share in total Victorian working age population for SA2 j.
= $\ln (WAPOPL_{t,j} / WAPOPLV_{t,j})$

$WAGEP1_{t,j}$ = Natural log of the lagged ratio of long catchment industry hours worked to total Victorian hours worked for SA2 j.
= $\ln (JTWHWLC_{t-1,j} / URHWV_{t-1,j})$

$WAGEP5_{t,j}$ = First difference of ratio of usual resident employment to long catchment working age population for SA2 j.
= $\ln (UREMPL_{t,j} / WAPOPC_{t,j}) - \ln (UREMPL_{t-1,j} / WAPOPC_{t-1,j})$

$WAGEP3_{t,j}$ = Natural log of lagged value of ratio of local population to residential area available for SA2 j relative to the same ratio for Victoria.
= $\ln (POPL_{t-1,j} / RESA_{t-1,j}) - \ln (POPV_{t-1} / RESAV_{t-1})$

$RLGRPHWC_{t-1,j}$ = Lagged value of $RLGRPHWC_{t,j}$ as defined under Equation 3.

$WAGEP6_{t,j}$ = Natural log of population relative to area for SA2 j relative to the same ratio for Victoria squared.
= (WAGEP3)**2.0

$DEPWAGEP_{t-1,j}$ = Lagged dependent variable.

Equation 8: Catchment of usual residents hours worked

$LURHWC_{t,j}$= $0.969159 * LJTWHLC_{t,j}$
(923.40)

+ CONST8(j)

$R^2 = 0.999$

$LURHWC_{t,j}$ = Natural log of usual residents long catchment hours worked for SA2 j.
= $\ln (URHWC_{t,j})$

$LJTWHWLC_{t,j}$ = Natural log of long catchment industry hours worked, t, j.
= $\ln (JTWHWLC_{t,j})$

Table 4.2	The equations of the Victorian SA2 model (continued)

Equation 9: Local hours worked by usual residents

$CLURHWPC_{t,j}$ = $0.208174 * CLURHWPC_{t-1,j}$
(22.53)

$+ 1.01497 * CLURHWPCC_{t,j}$
(31.23)

$- 0.065523 * LDIFFHWR_{t,j}$
(-27.57)

$+ CONST9(j)$

$R^2 = 0.261$

$CLURHWPC_{t,j}$ = First difference of the natural log of the ratio of local hours worked by usual residents to local working age population for SA2 j.
= $\ln(URHWL_{t,j} / WAPOPL_{t,j}) - \ln(URHWL_{t-1,j} / WAPOPL_{t-1,j})$

$CLURHWPC_{t-1,j}$ = Lagged dependent variable or lagged value of $CLURHWPC_{t,j}$.

$CLURHWPCC_{t,j}$ = First difference of natural log of usual resident long catchment hours worked for SA2 j.
= $LURHWC_{t,j} - LURHWC_{t-1,j}$

$LDIFFHWP_{t,j}$ = Difference between the natural log of lagged local positive usual residents hours worked and the natural log of the same ratio for the catchment for SA2 j.
= $\ln(URHWL_{t-1,j} / WAPOPL_{t-1,j}) - \ln(URHWC_{t-1,j} / WAPOPC_{t-1,j})$

Equation 10: Local industry hours worked

$CLJTWHW_{t,j}$ = $0.319792 * CLJTWHW_{t-1,j}$
(51.50)

$+ 0.944509 * CLJTWHWC_{t,j}$
(103.79)

$- 0.017829 * LDIFFJTWHW_{t,j}$
(-13.63)

$+ CONST10(j)$

$R^2 = 0.658$

$CLJTWHW_{t,j}$ = First difference of the natural log of local industry hours worked for SA2 j.
= $\ln(JTWHWL_{t,j}) - \ln(JTWHWL_{t-1,j})$

$CLJTWHW_{t-1,j}$ = Lagged dependent variable or lagged value of $CLJTWHW_{t,j}$.

$CLJTWHWC_{t,j}$ = First difference of the natural log of the short catchment industry total hours worked for SA2 j.
= $\ln(JTWHWC_{t,j}) - \ln(JTWHWC_{t-1,j})$

$LDIFFJTWHW_{t,j}$ = Natural log of the lagged difference between local industry hours worked and short catchment industry hours worked for SA2 j.
= $\ln(JTWHWL_{t-1,j}) - \ln(JTWHWC_{t-1,j})$

Table 4.2 The equations of the Victorian SA2 model (continued)

Equation 11: Local resident employment

$CLUREPC_{t,j}$ = $-\ 0.059744 * DIFFUREPC_{t,j}$
(-34.63)

$+\ 0.071740 * CLUREPC_{t-1,j}$
(10.68)

$+\ 0.732207 * CLURHWPC_{t,j}$
(108.69)

$+$ CONST11(j)

$R^2 = 0.537$

$CLUREPC_{t,j}$ = First difference of the natural log of local usual resident employment relative to lagged local working age population for SA2 j.
= $\ln(UREMPL_{t,j} / WAPOPL_{t,j}) - \ln(UREMPL_{t-1,j} / WAPOPL_{t-2,j})$

$DIFFUREPC_{t,j}$ = Lagged difference between the natural log of the lagged ratio of local usual resident employment to local working age population and the natural log of the lagged usual hours worked per capita of local working age population for SA2 j.
= $\ln(UREMPL_{t-1,j} / WAPOPL_{t-2,j}) - \ln(URHWL_{t-1,j} / WAPOPL_{t-2,j})$

$CLUREPC_{t-1,j}$ = Lagged dependent variable or lagged value of $CLUREPC_{t,j}$.

$CLURHWPC_{t,j}$ = Is defined for Equation 9.

Equation 12: Catchment high technology industry share in GRP

$CLHTSVAC_{t,j}$ = $0.191656 * CLHTSVAC_{t-1,j}$
(21.39)

$+\ 0.157105 * CLGRPPCC_{t-1,j})$
(17.25)

$-\ 0.092587 * LHTS\_21122\_COMB\_D_{t,j}$
(-28.26)

$-\ 0.033281 * CLSPRIMGPC_{t,j}$
(-13.47)

$+$ CONST12(j)

$R^2 = 0.151$

$CLHTSVAC_{t,j}$ = First difference of the natural log in the short catchment high technology industry share in GRP for SA2 j.
= $\ln(HTSVAC_{t,j}) - \ln(HTSVAC_{t-1,j})$

$CLhTSVAC_{t-1,j}$ = Lagged dependent variable of $CLHTSVAC_{t,j}$.

$CLGRPPC_{t-1,j}$ = First difference of the natural log of short catchment GRP per capita of working age population.
= $\ln(GRPC_{t,j} / WAPOPC_{t,j}) - \ln(GRPC_{t-1,j} / WAPOPC_{t-1,j})$

$LHTS\_21122\_COMB\_D_{t,j}$ = Natural log of high technology industry share in GRP for Melbourne City j.

Table 4.2		The equations of the Victorian SA2 model (continued)
CLSPRIMGPC	=	First difference of the short catchment share of primary industry share in GRP for SA2 j.
	=	$LSPRIMGPC_{t,j} – LSPRIMGPC_{t–1,j}$

Equation 13: Local share of high technology industry in GRP

$CLHTSVA_{t,j}$ = $0.161860 * CLHTSVA_{t–1,j}$
(20.70)

$+ 0.975429 * CLHTSVAC_{t,j}$
(75.30)

$– 0.098738 * DIFFHTS_{t,j}$
(-28.09)

$+ 0.023383 * CLHGRPWA_{t–1,j}$
(3.88)

$– 0.007585 * CLSPRIMGP_{t,j}$
(-3.06)

+ CONST13(j)

$R^2 = 0.436$

$CLHTSVA_{t,i}$	=	First difference of the share of local high technology industry value added in GRP for SA2 j.
	=	$\ln (HTSVAL_{t,j}) – \ln (HTSVAL_{t–1,j})$
$CLHTSVA_{t–1,i}$	=	Lagged dependent variable.
$CLHTSVAC_{t,j}$	=	First difference of the natural log of short catchment share of high technology industry in GRP for SA2 j.
$DIFFHTS_{t,j}$	=	Difference of natural log of local high technology industry share in GRP and the corresponding short catchment share for SA2 j.
	=	$\ln (HTSVAL_{t–1,j}) – \ln (HTSVAC_{t–1,j})$
$CLHGRPWA_{t–1,j}$	=	First difference of natural log of local GRP per capita of local working age population for SA2 j.
	=	$\ln (GRPL_{t,j} / WAPOP_{t,j}) – \ln (GRPL_{t–1,j} / WAPOP_{t–1,j})$
$CLSPRIMGP_{t,i}$	=	First difference of natural log of local share of primary industries in GRP for SA2 j.
	=	$\ln (SPRIMP_{t,j}) – \ln (SPRIMP_{t–1,j})$

Equation 14: Local productivity

$CLLOCGRPHW_{t,j}$ = $0.208422 * CLLOCGRPHW_{t–1,j}$
(33.56)

$+ 0.938574 * CLGRPHWC_{t,j}$
(102.89)

$– 0.041817 * DIFFPROD_{t,j}$
(-20.88)

$+ 0.039496 * CLHTSVA_{t–1,j}$
(7.96)

+ CONST14(j)

$R^2 = 0.596$

Table 4.2 The equations of the Victorian SA2 model (continued)

$CLLOCGRPHW_{t,j}$	=	First difference of local productivity for SA2 j.
	=	$\ln(PRODL_{t,j}) - \ln(PRODL_{t-1,j})$
$CLLOCGRPHW_{t-1,j}$	=	Lagged dependent variable.
$CLGRPHWC_{t,j}$	=	First difference of the natural log of short catchment productivity for SA2 j.
	=	$\ln(PRODC_{t,j}) - \ln(PRODL_{t-1,j})$
$DIFFPROD_{t-1,j}$	=	Lagged difference of natural log of local productivity and catchment productivity for SA2 j.
	=	$\ln(PROD_{t-1,j}) - \ln(PRODC_{t-1,j})$
$CLHTSVA_{t-1,j}$	=	Lagged first difference of the natural log of local high technology industry share in GRP for SA2 j.
	=	$\ln(HTSVAL_{t-1,j}) - \ln(HTSVAL_{t-2,j})$

OTHER EQUATIONS

Equation 15: Total short catchment GRP

$$GRPC_{t,j} = GRPCC_{t,j} + GRPCPT_{t,j}$$

Equation 16: Total Victorian working age population

$$WAPOPLV_t = \sum_{j=1}^{462} WAPOPL_{t,j}$$

Equation 17: Total Victorian hours worked

$$URHWV_t = \sum_{j=1}^{462} URHWL_{t,j}$$

Equation 18: Total Victorian residential area available

$$RESAV_t = \sum_{j=1}^{462} RESAV_{t,j}$$

Equation 19: Catchment GRP

$$GRPC_{t,j} = PRODC_{t,j} * HWC_{t,j} / 1000$$

Equation 20: Local GRP

$$GRP_{t,j} = PROD_{t,j} * HWL / 1000$$

Equation 21: Catchment productivity

$$PRODC_{t,j} = EXP(LGRPHWC_{t,j}) * PRODC_{t,21122}$$

Equation 22: Melbourne City catchment productivity

$$\ln(GRPC_{t,21122} / HWC_{t,21122}) = \underset{(5.05)}{1.090 + 0.006 * Time} + \underset{(14.81)}{0.280 \ln(GRPC_{t,21122})}$$

$R^2 = 0.894$

Table 4.3	Variable definitions not included in Table 4.2
GRPC	Short catchment gross regional product for SA2 j
GRPCC	Short catchment gross regional product for SA2 j based on motor vehicle travel times weighted by motor vehicle share of trips between SA2s.
GRPCPT	Short catchment gross regional product for SA2 j based on public transport travel times weighted by public transport share of trips between SA2s.
GRPL	Local gross regional product for SA2 j. Sum of value added by industry at factor cost $ 2018 million, excluding ownership of dwellings.
HGRPL	Headline gross regional product for SA2 j. Sum of value added by industry at factor cost $ 2018 million, including ownership of dwellings and indirect taxes less subsidies.
HTSVAC	Short catchment share of value added of high technology industries in GRP for SA2 j.
HTSVAL	Local share of value added of high technology industries in GRP for SA2 j.
HWC	Short catchment hours worked per annum for SA2 j (ths.).
HWL	Local hours worked per annum for SA2 j (ths.).
IDPH	Local industry dollar per hour income paid to employed - including mixed income for SA2 j
IDPHC	Short catchment industry dollar per hour income paid to employed - including mixed income for SA2 j.
JTWHWC	Total short catchment SA2 industry hours worked for SA2 j (ths.).
JTWHWL	Total SA2 industry hours worked (ths.).
JTWHWLC	Total long catchment SA2 industry hours worked for SA2 j.
POPL	Local total SA2 population (number).
POPV	Local total Victorian population (number).
PRODC	Short catchment productivity or, $ of GRP per hour worked for SA2 j.
PRODL	Local productivity or, $ of GRP per hour worked for SA2 j.
RESA	Area available for residential construction in SA2 j (hectares).
RESAV	Area available for residential construction in Victoria (hectares).
SPRIMGP	Local share of primary (agriculture and mining) industries in GRP for SA2 j.
SPRIMGPC	Short catchment share of primary (agriculture and mining) industries in GRP for SA2 j.
UREMPL	Local usual resident employment for SA2 j (number).
URHWC	Total SA2 long catchment hours worked by usual residents (ths.).
URHWL	Total SA2 hours worked by usual residents (ths.).
URHWV	Total Victorian hours worked by usual residents.
WAPOPC	Long catchment total SA2 working age population (number).
WAPOPL	Local total SA2 working age population (number).
WAPOPLV	Victorian working age population (number).

4.4 Local and catchment GRP consistency

It will be noted from the equation listing that there are two different ways of determining short catchment GRP. One way is via Equation 19. The other is via the catchment determination formula using the results for local GRP from Equation 20.

Equation 19 is given the primacy in determining catchment GRP. This required the insertion of an interactive algorithm into the solution process to ensure local GRPs were consistent with the corresponding catchment GRPs. The algorithm involved adjusting the $dw_{i,j}$ above 0.8 intentionally until the sum of the differences between time-weighted short catchment GRP and the catchment GRP from Equation 20 were minimised.

This also involved adjusting $PROD_{t,j}$ and HWL to obtain the GRPL until the required outcome was achieved.

4.5 Supply side model

It is transparent from the equation specifications that the model is not in the short-term a demand side model. Rather it is a supply side model built on the assumption that if internal demand is maintained at a trend rate which satisfies growth and unemployment outcomes and addresses the question of the changes to internal supply side factors that will determine the productivity outcome and, therefore, real income outcomes per hour or per capita.

In effect Equation 3 and Equation 5 combined produce a production function capturing a number of driver variables, including variables which implicitly capture the role of capital stocks (which are not available).

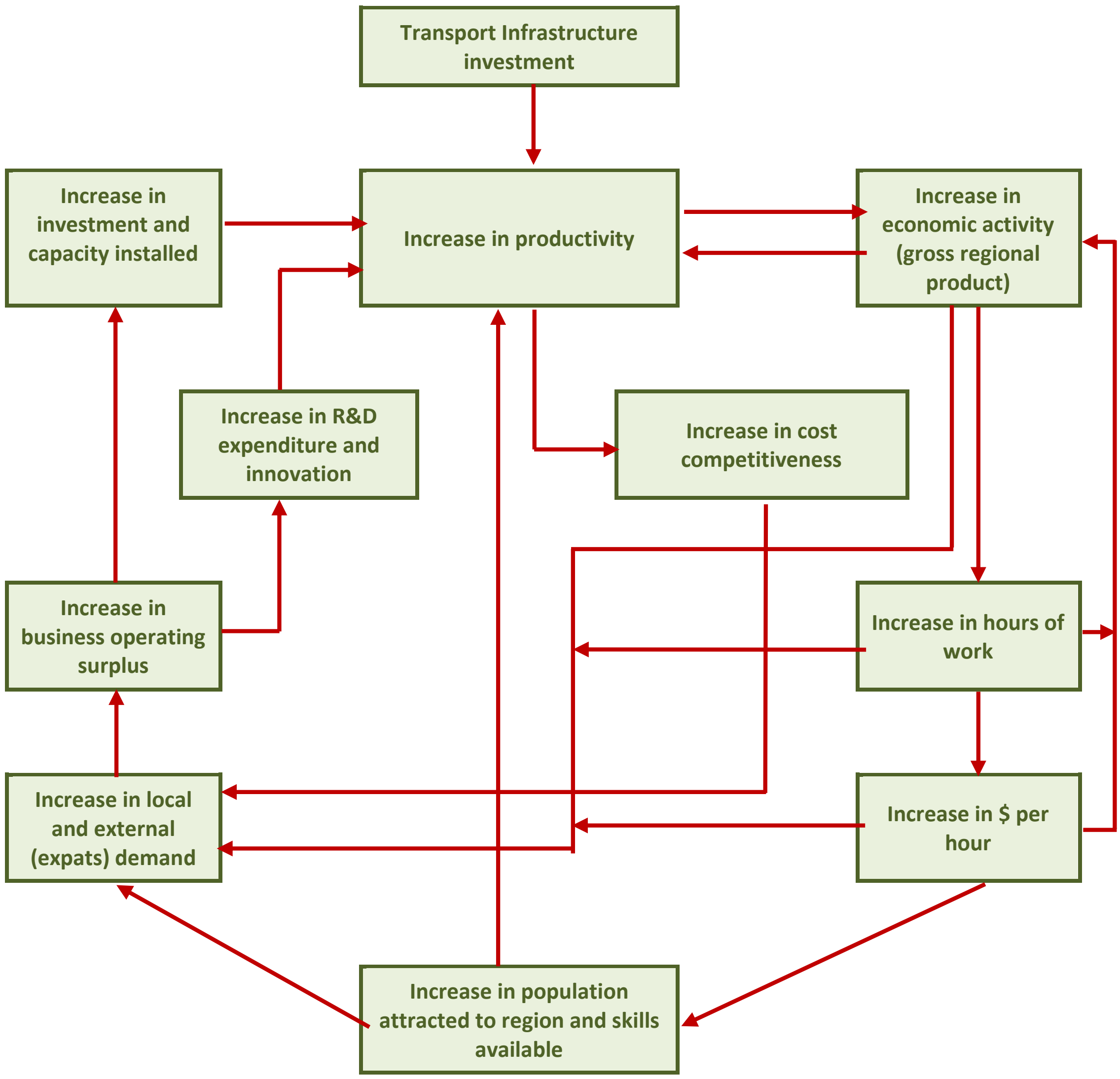
If the capital stock data was available, the formal specification of the model would change to specify a catchment production function for each SA2 and model capital and labour input into each catchment with the same driver variables used in Table 4.2. In aggregate the level of demand would be maintained at a level to achieve a target Victoria-wide capacity utilisation rate consistent with wide variation in capacity utilisation rates at the SA2 catchment level.

4.6 An overview of the model dynamics

The model parameters of Table 4.2, along with the lag structure, provide an overview of model dynamics which is reproduced in Figure 4.2. The implied aspect in Figure 4.2 refers to the role of investment and capital stocks which, as outlined above, is implicit in the actual model structure.

The key point is that any positive initial shock to productivity from transport infrastructure investment will create a virtuous cycle of further increases in productivity with an eventual equilibrium position, either a long way off or not reached within a plausible time horizon. Figure 4.2 describes the sequences of steps/outcomes/decisions that creates the virtuous cycle.

Figure 4.2: The actual and implied model dynamics



4.7 Agglomeration economies quantified

Given the importance of agglomeration economies to the evaluation of the impact of transport infrastructure investments, it would be remiss not to evaluate the implications of the coefficients of RLHGRPC and SRLHGRPC in more detail.

The coefficient of RLHGRPC at 0.55 is higher than what is found in the literature, or indeed the implicit value of the elasticity from Figure 2.1. However, what has to be taken into account is the role of the squared value of the GRP scale variable. The presence of this variable requires that the elasticity between productivity and scale varies by catchment size.

Using the two coefficients of the variables, Table 4.4 provides the productivity calculations for each GRP scale value to $_{2018}$ 150 billion additional GRP. The table indicates that the elasticity declines from in excess of 1 for low levels of catchment GRP scale to low elasticity levels at high catchment scales, as charted in Figure 4.3. Two points flow from Figure 4.3. First, the average elasticity of circa 0.14 from the foreign and Victorian data disguises substantial inter-regional variation. This is also the approximate average from Figure 4.3 since the majority of SA2s have a scale in excess of $_{2018}$ 50 billion as per Figure 2.1. The second point is Table 4.4 has relatively low levels of scale, implying an elasticity of near unity.

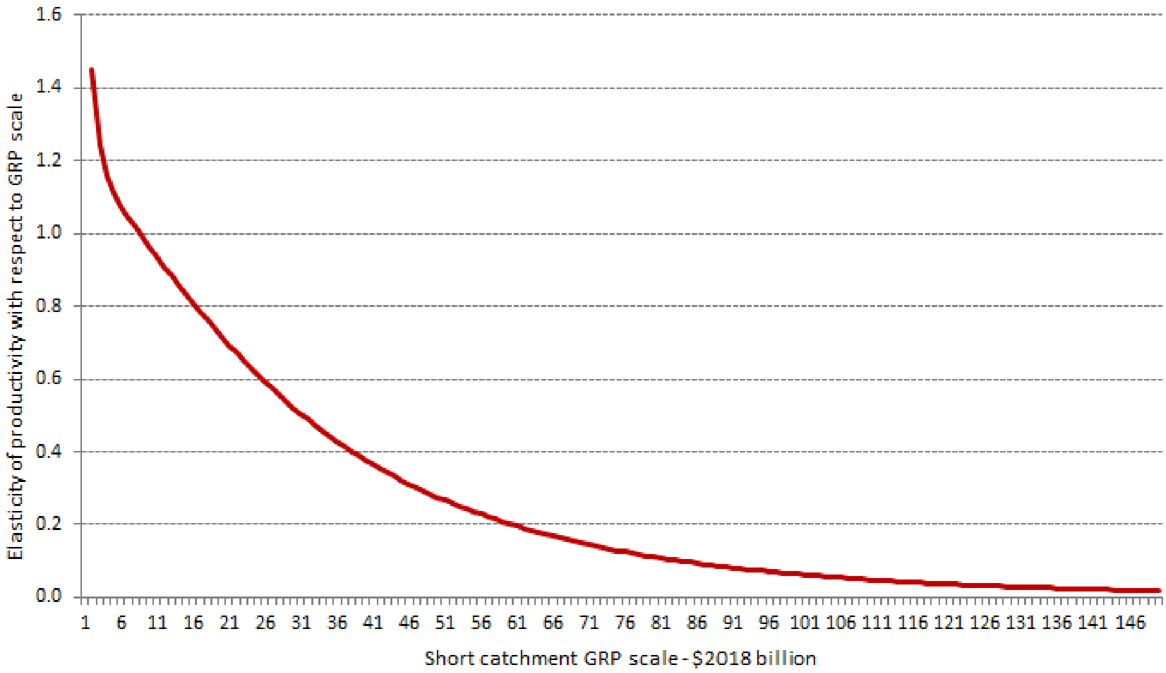
Table 4.4 Short catchment GRP scale at key Project SA2s

	$2018 billion
Ballarat	6.3
Bendigo	5.8
Geelong	13.8
Shepparton	3.6
Warrigal	3.9
Winchelsea	2.3
Trafalgar	4.3

It should be noted that the SA2s will also obtain, albeit delayed, benefits of the agglomeration economies from Melbourne City, albeit via Equation 22, since the catchment productivity is relative to Melbourne City. This would increase the elasticity, particularly for those SA2s with high catchment scales, namely inner and middle regions of Melbourne. The elasticity would converge to the Melbourne City elasticity.

It should also be noted that the most powerful impact on productivity does not come from the impact on the short catchment scale from the Project, which has an initial minimum impact, but from the indirect impact of long catchment working age population working through the model structure and increasing population and labour market reach of the pre-existing population. Over time these impacts will start to drive the increase in catchment scale and, therefore, productivity growth.

Figure 4.3: Elasticity of catchment productivity with respect to catchment scale – Victoria, 2019



Note: Excludes Melbourne City returns to scale effect.

5. The economic impact of the Fast Train Project on Victorian SA2s

This chapter applies the model developed in the previous chapter to assess the impact of the Fast Train Project. The economic impact is assessed in terms of the difference between the Base projection of the model, that is, excluding The Fast Train Project (FTP) and a projection from the model including the FTP. The terminal year of analysis is 2060.

5.1 The Base projection

The model is not a forecasting model. However, the model was adjusted to ensure that in the main it produced a Base projection with plausible and reasonably stable vales for most variables to 2060.

The first stage of adjustment was to adjust the constant terms of Equation 7, or the CONST7(j) to ensure that the model via Equation 1 projected local SA2 populations which in structure, if not overall level, accorded with the latest Victorian Government SA2 population expectations, at least to 2036. (The level of population growth has been revised downward in the light of the pause in national immigration due to the Coronavirus and also in line with modest assumptions for GSP growth.

The next step was to adjust the constant terms of Equation 3, or CONST3(j) to ensure that current productivity relativities were maintained.

Finally, the constant terms of Equation 5, or CONST5(j) were adjusted to ensure that hours worked per capita of working age population were, in the main, plausible.

The overall objective in preparing the Base case was to project modest overall Victorian GSP growth and distribute that growth between SA2s in a way reasonably close to the structure of 2019. This ensures that the results of the evaluation process are not unduly influenced by the Base case. For example, if in the Base case projection the Victorian economy had a high overall economic growth, the absolute change (if not the percentage change) in economic indicators and in particular GRP would also be relatively high, especially by 2060.

The main reason for preferring a modest Base case is the lack of grounds for buoyant optimism about the Victorian economy, at least in the medium term. The COVID-19 event has brought forward a world economic and financial crisis NIEIR expected by the mid-2020s (P.J. Brain and I.G. Manning, "*Credit Code Red – How financial deregulation and world instability are exposing Australia to economic catastrophe*", 17 July 2017, Scribe Publications) with the economic response to COVID-19 further reducing underlying capacity for GSP growth. In the longer term, Victoria's high household debt levels and a deteriorating Western Pacific security environment will be major headwinds for the economy.

For the record, the average annual growth rate for Victorian GSP 2020-2060 for the Base case is 1.9 per cent per annum. The population growth rate is 1.3 per cent per annum.

5.2 The Project case

The disturbed or Project case projection is carried out by making one change to the model structure. That is, by replacing the $dc_{i,j,k}$ for the base case by the values of the FTP for the $dc_{i,j,k}$ as outlined above in Chapter Three.

5.3 The difference between the Project projection and the Base case projection

The difference between the two model runs may be documented by a series of SA2 maps, line graphs and tables.

5.3.1 The Project: Impact on working age and total population

The initial effect of the Fast Train Project (FTP) will be a reduction in travel times resulting in expansion of the long-catchment working age population of many SA2s, even if no relocation of population occurs. This will change the attractiveness of different SA2s and, remembering that (by assumption) total state population is the same in both projections, a reallocation of population gradually appears.

The maps to be considered below have ten ranges. In general the data are mapped as the percentage deviation of the FTP projection from Base case. Values are positive for those SA2s that have greater populations and/or economic in the FTP case and negative otherwise. The 462 SA2s are divided into ten groups with five groups for the positive results and five groups for the negative results. In turn the ranges for the groups are specified so that there are equal numbers of SA2s in each positive group and similarly equal numbers in each negative group. Typically there will be 100 to 200 positives for any variable implying the negative group will consist of between 262 and 362. This means that there will be between 20 and 40 SA2s in each positive group and between 52 and 72 SA2s in each negative group.

Figure 5.1 shows the percentage change in long catchment working age population for the FTO as a per cent of the Base case for 2031. By 2030 the phase-in period ends so the 2031 outcome in Figure 5.1 will represent the full impact of faster public transport plus some population reallocation because of announcement effect impacts on population relocation decisions. However, the dominant impact will be due to public transport speed, modelled via the combined effect of increased motor vehicle and public transport speed.

The strongest initial expansion of the long catchment working age population is in the Bendigo and Geelong FTP corridors, followed by the Ballarat, Warrigal and Seymour corridors. The percentage increase ranges from 7 per cent to greater than 10 per cent for the Bendigo and Geelong corridors and 3.7 to 7.0 per cent for the Ballarat and Warragul corridors. The impact on the long catchment working age population for Shepparton is near zero. This is because of the threshold upper limit of 90 minutes for the long catchment decay factors.

It will be noted from Figure 5.1 that there are negative outcomes for the percentage change of long catchment working age population for Eastern Melbourne, North Eastern and Far Eastern Victoria and Western Victoria. The travel times for these areas would not have changed between the Base and FTP projections. The only factor driving these negative outcomes is the relocation of populations, chiefly to Mid-Western Victoria. However, the population relocation is only relatively minor as the maximum decline in the long catchment working age population is less than -1.2 per cent.

Figure 5.1: Catchment working age population difference from Base, 2031 (per cent)

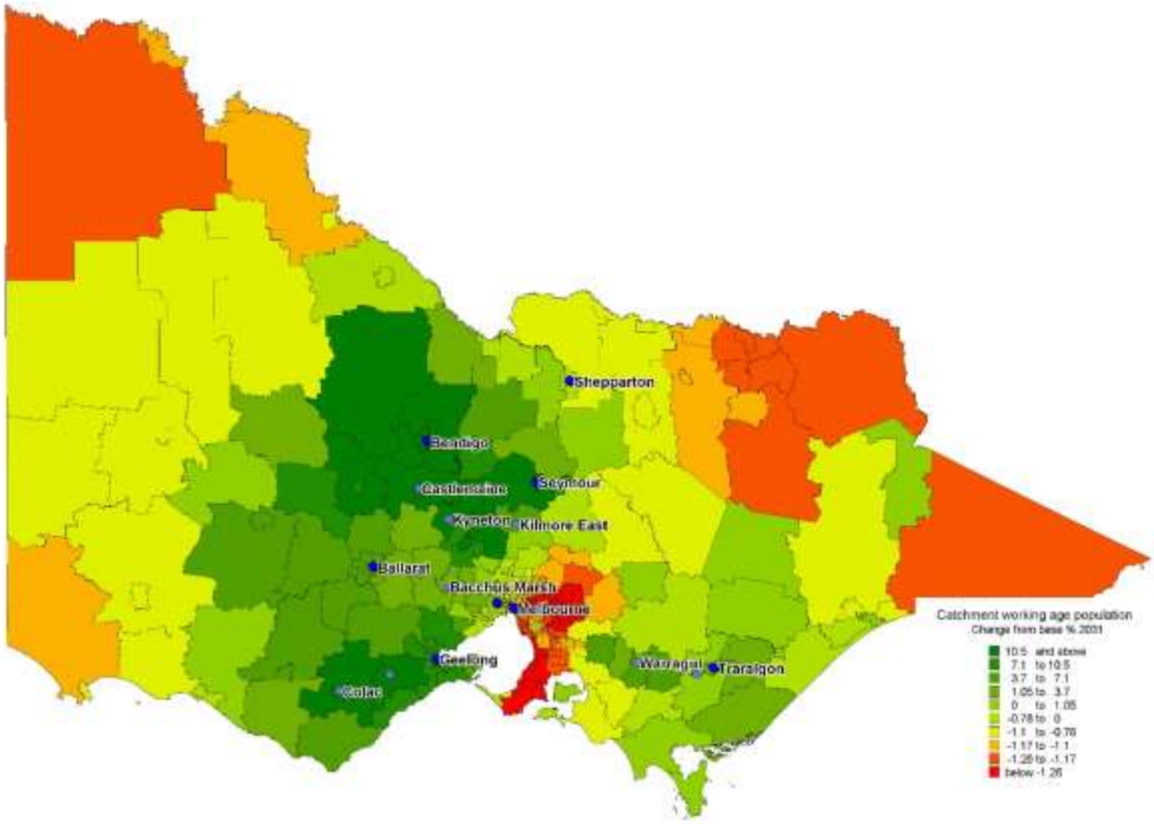


Figure 5.2 shows the same matrix as Figure 5.1, except for the year 2060. There are now 107 SA2s which experience an increase over Base case in long catchment working age population and, therefore 355 SA2s which experience a decline. The non-metropolitan SA2s which suffer a decline in working age population are in the Far East, North East and West of Victoria. However the SA2s where the population declines ae concentrated in Melbourne especially in Eastern and Southern Melbourne.

Of the 107 SA2s that experience an increase in population, 27 experience a percentage increase of more than 28 per cent by 2060 compared to the Base projection, with the same number experiencing a change of between 13 per cent and 28 per cent, the same number again experiencing a gain of between 9 and 13 per cent. Fifty-four SA2s experience a gain of between 0 and 9 per cent.

Among the 355 SA2s that experience a decline in catchment working age population, 40 per cent, or 142 SA2s, experience a working age population change relative to the Base projection of greater than -4.7 per cent. Sixty per cent of the SA2s, or 213 SA2s, experience a population decline of less than -4.7 per cent.

The three decades of adjustment time separating 2030 and 2060 increase the range of outcomes, with the top positive range increasing from 10.5 per cent above Base case to 28 per cent and above and the bottom range of negative outcomes falling around fourfold from -1.25 to -4.7 per cent and below. The change between Figure 5.1 and Figure 5.2 is solely due to the more intense relocation of population away from Eastern Melbourne, Northern East Victoria, Far Eastern Victoria and Far West Victoria to Mid-Western Victoria and also Mid-Northern Victoria.

Figure 5.2: Catchment working age population difference from Base, 2060 (per cent)

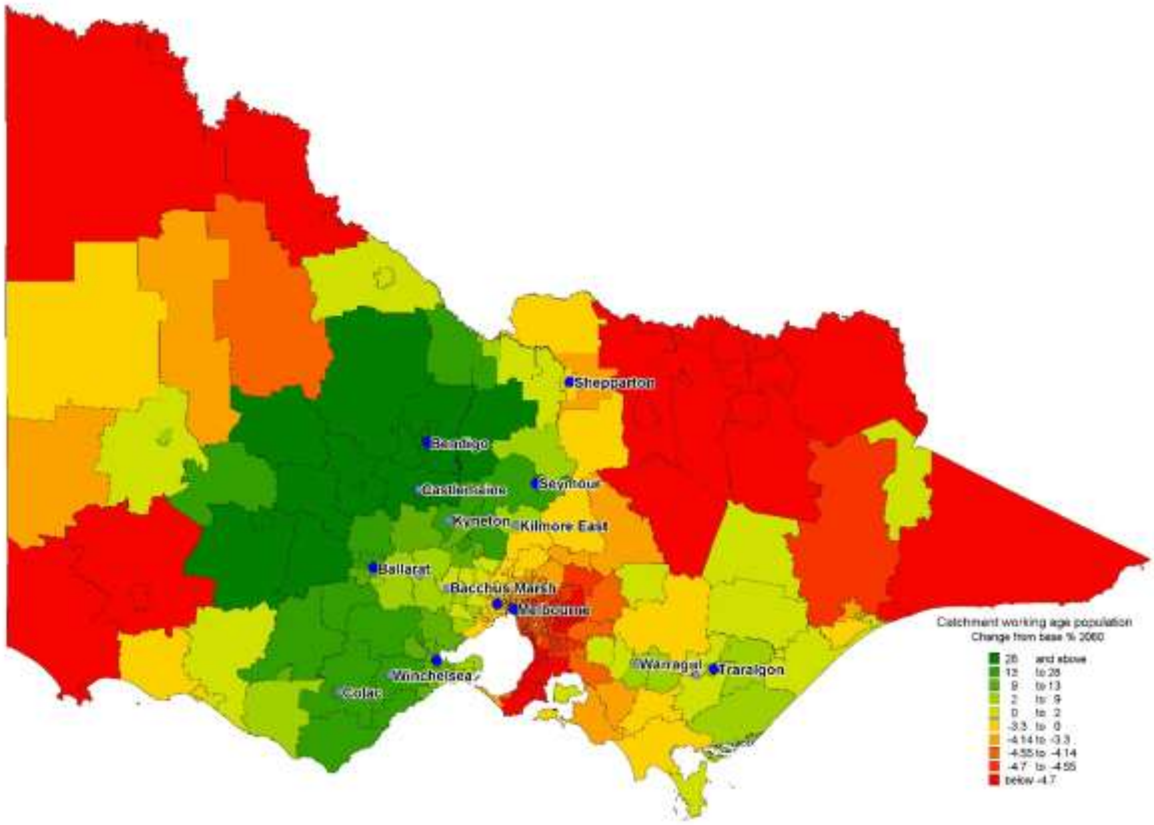


Figure 5.3 profiles the change in the local working age population by 2060 while Figure 5.4 shows the corresponding change in local total population. By 2060 ninety seven SA2s experience an increase in either local working age population or total local population from the base case and therefore 365 SA2s experience a fall in both working age population and total population from the base case. The number of winners and losers in each Figure is the same.

From Figure 5.3 eighty per cent of the SA2s with a positive increase in local working age population, or 78 SA2s, have an increase in population of less than 4,500. For 20 per cent of SA2s that have an increase in population greater than 4500, or 19 SA2s, the increase in working age population can be up to 26,000. This outlier SA2 is adjacent to the Central Bendigo SA2. The high increase is in part explained by the fact that the baseline projection for the working age population is 20 per cent below the Victorian Government projection to 2036 and by 2060 only a little more than the 2019 estimated actual. This part of the increase may reflect an over-estimation of the population growth capacity of the region round Bendigo. The most important result is not so much which SA2s receive the biggest population increases, but whether each corridor catchment as a whole can sustain its population increase, perhaps with reallocation of population from what is shown here to obtain a more plausible balance of population within the corridor.

The results from Figure 5.3 drive the outcomes in Figure 5.4, or the map of SA2 local population changes induced by the FTP. The results in Figure 5.4 are proportional to the results in Figure 5.3. For example from Figure 5.4, 80 per cent of the SA2s which are subject to a population gain have a population gain of up to 8,700. Forty per cent have a population gain of up to 2,000. Twenty per cent have a population gain of over 8,700.

Figure 5.5 re-presents the data in Figure 5.4 in terms of percentage changes in local population from base in 2060. Twenty percent of the SA2s which experience an increase in population have a percentage increase in 2060 compared to the base case of greater than 60 per cent. Twenty per cent of the SA2s which experience a decline in local population compared to the base projection have a population decline of less than – 5.5 per cent.

Because 97 SA2s experience an increase in total population as against 365 that experience a fall in local population compared to the Base case, there is a prima facie case that the FTP will increase widespread (if mild) indirect damage. However, as will be seen below, this is not necessarily the case.

Figure 5.6 dramatizes the finding that, by 2060, half a million of the total Victorian population could be reallocated from the rest of Victoria to the FTP corridors. Since the total Victorian population is held constant, the gain in population to the Project Corridors will be matched by a decline in population relative to the Base case elsewhere. The question is whether this is desirable.

Map 5.3: Local working age population difference from Base, 2060 (number)

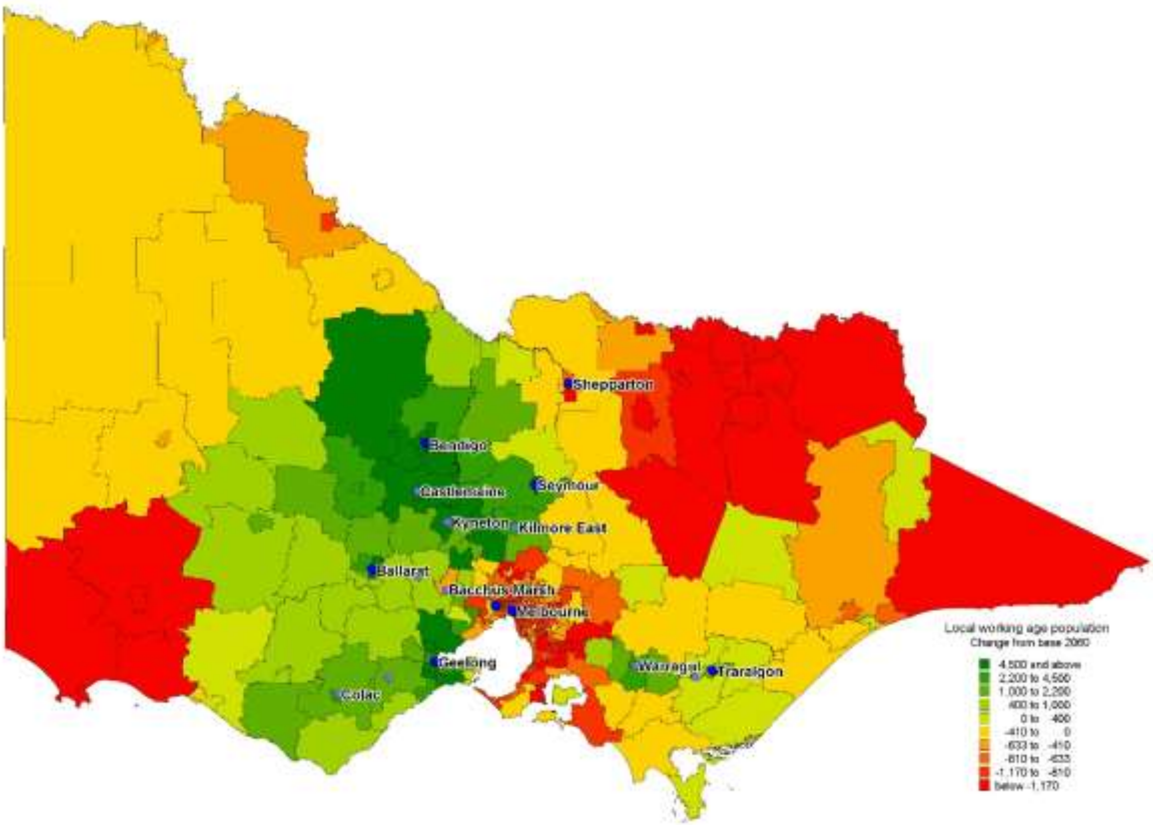


Figure 5.4: Local population difference from Base, 2060 (number)

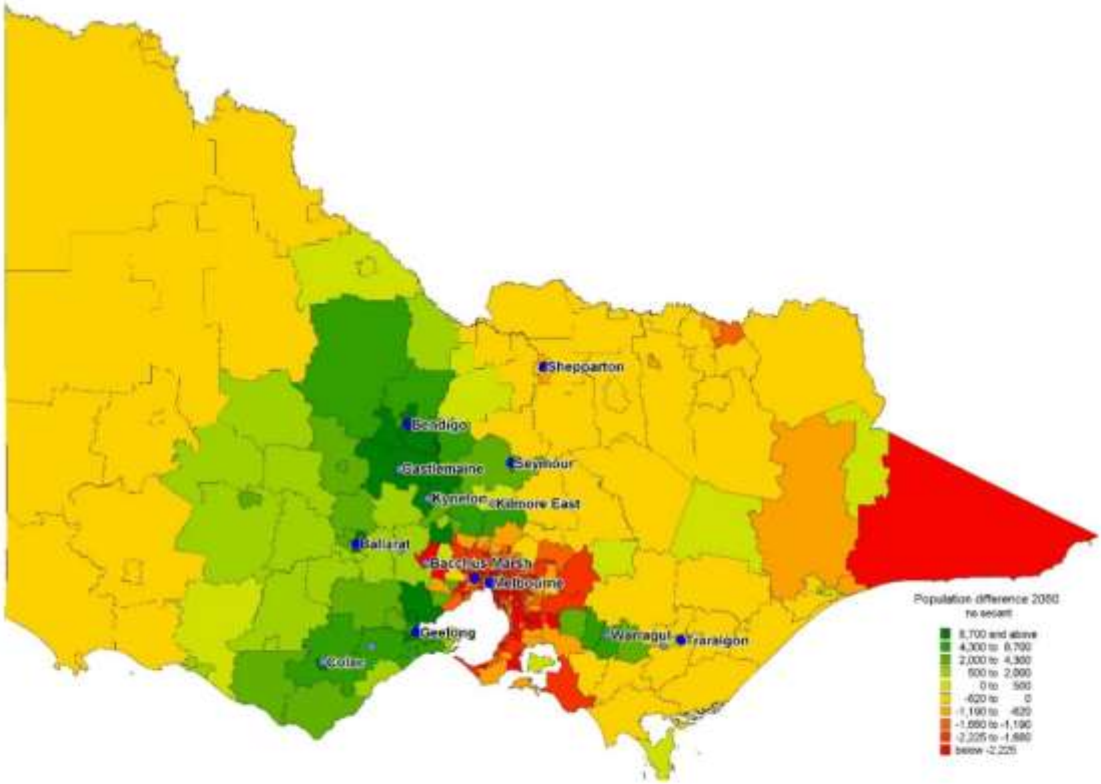


Figure 5.5: Local population difference from Base, 2060 (per cent)

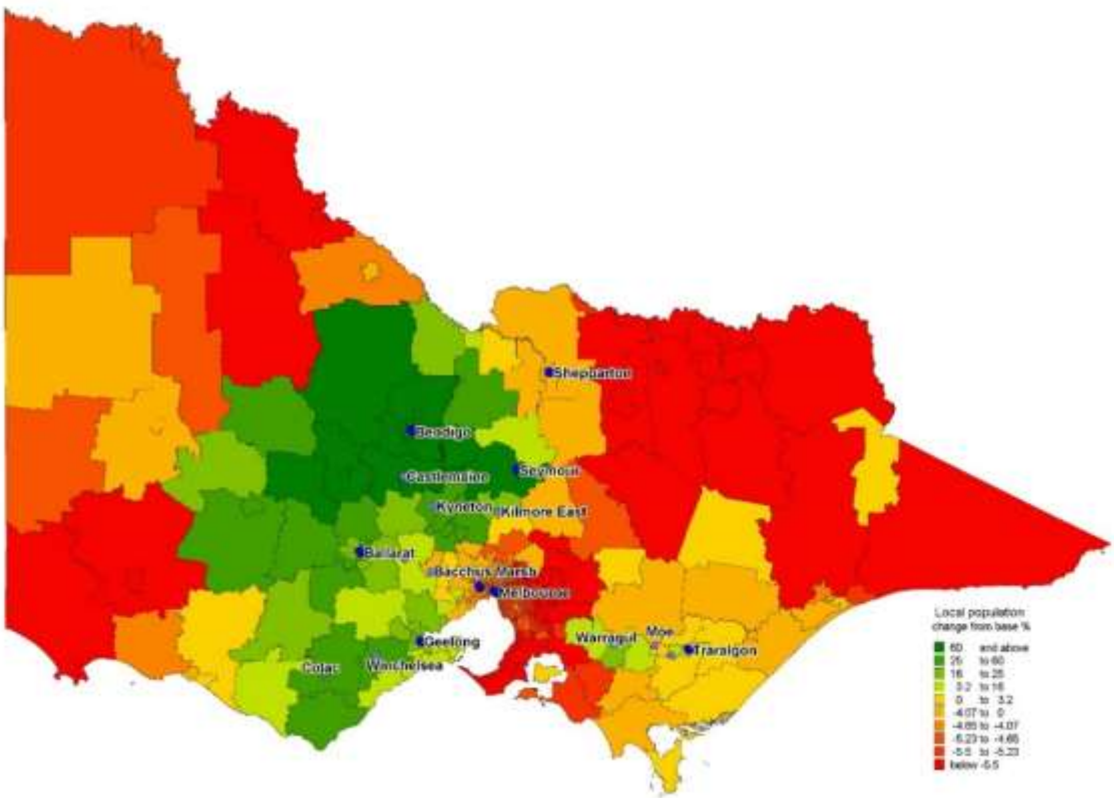
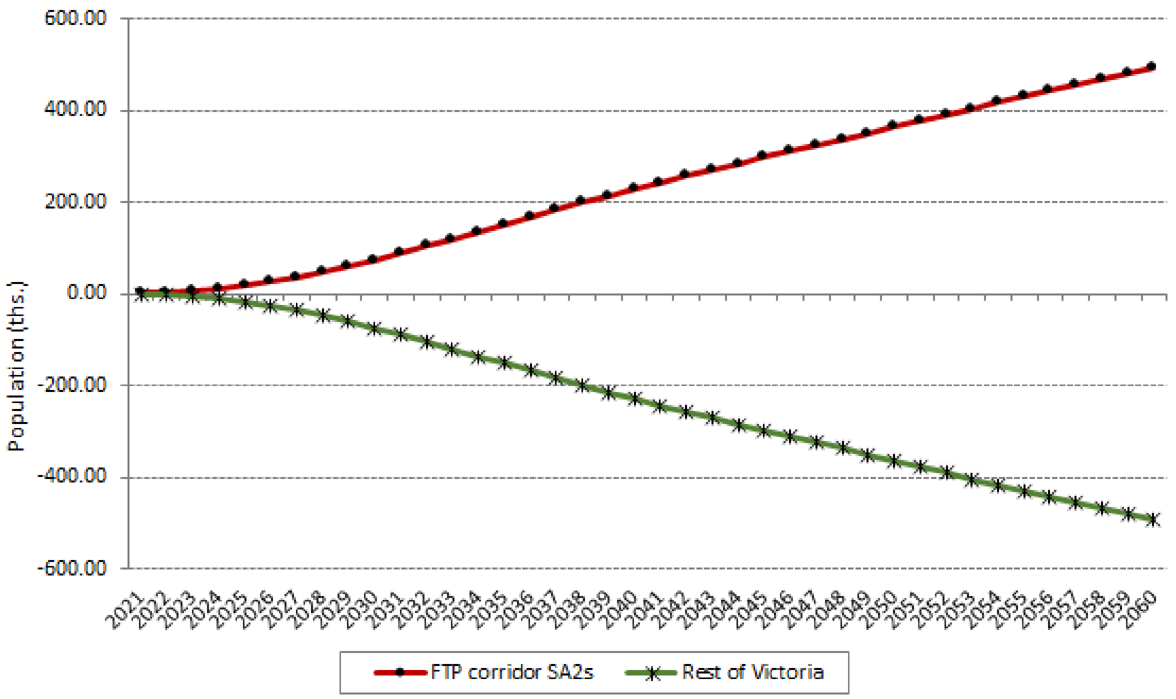


Figure 5.6: Population change from Base – FTP corridors versus Rest of Victoria, 2020-2060 (ths.)



5.3.2 Impact of FTP: The first driver of GRP increase – productivity

The initial impact of the FTP will be to increase working age population catchments directly from reduced travel times, giving an initial stimulus to productivity and as a consequence to GRP. This will then commence the virtuous cycle of productivity expansion leading to real income increases, increased hours of work available, attracting additional population and, therefore, further increases in productivity and economic activity. The allied question is – "are SA2s that experience a fall in population subject to a vicious cycle of economic decline"?

Figure 5.7 profiles the change in (short) catchment productivity from Base case for 2060 in $\$_{2018}$ terms while Figure 5.8 provides the same information in terms of percentage deviations.

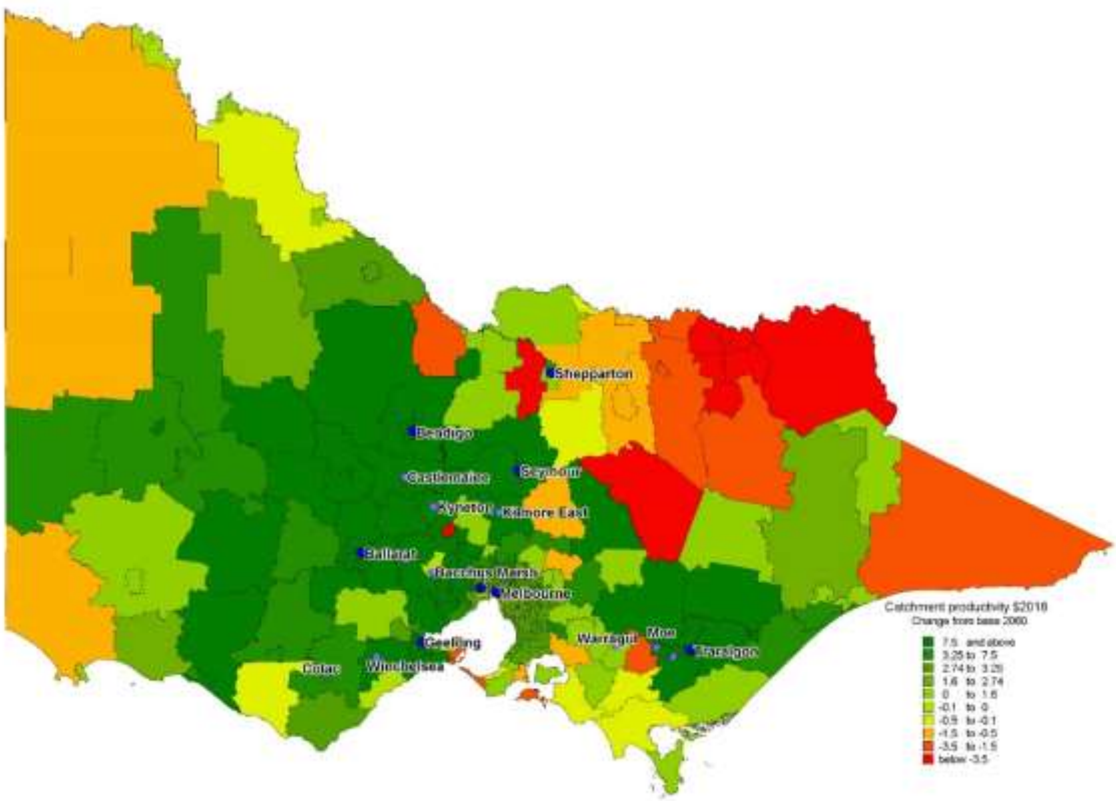
Thus, from Figure 5.7, 20 per cent of those that experience an increase in productivity have a productivity increase by 2060 greater than $\$_{2018}$ 7.5 per hour worked. From Figure 5.8, this translates into a productivity increase of 9 per cent or greater.

At the other end of the spectrum, the 20 per cent of SA2s that experience a decline in catchment productivity compared to the Base case have a decline in productivity of less than -$\$_{2018}$ 3.5 per hour worked which, from Figure 5.8, implies a percentage decline in productivity of less than -3.9 per cent or, in absolute terms, greater than 3.9 per cent.

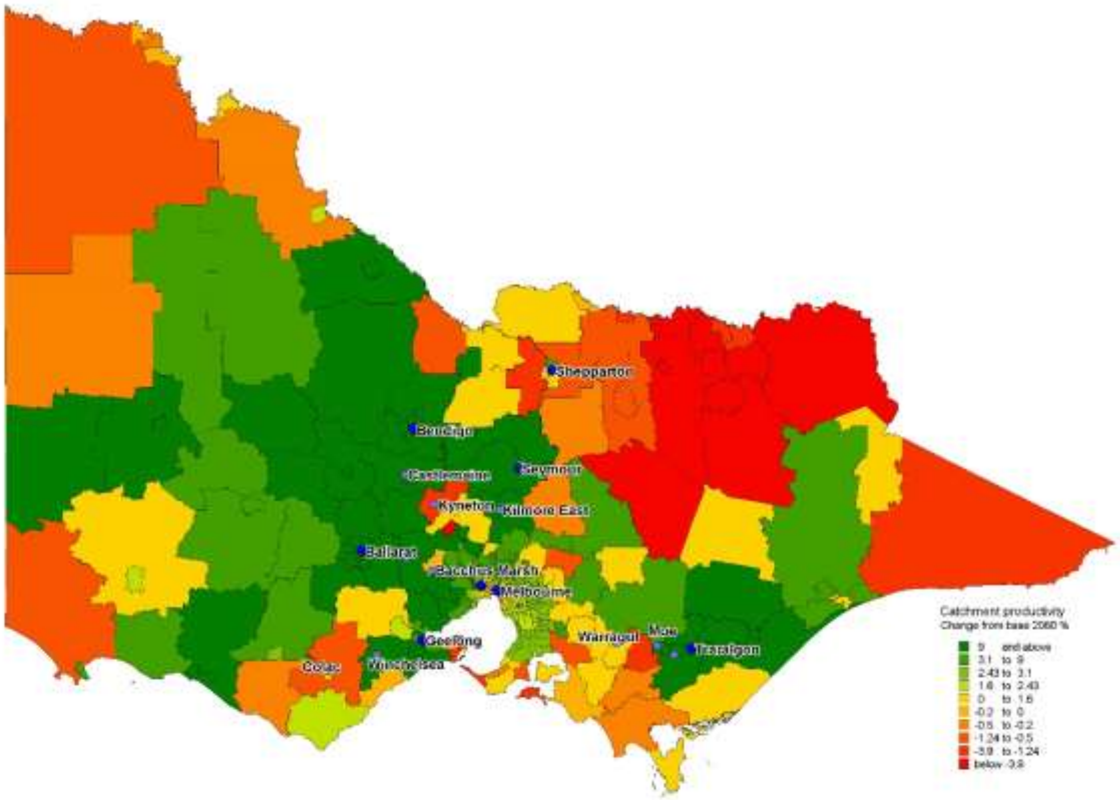
Prima facie this implies that the FTP will inflict considerable economic damage on these SA2s. However, the damage is less worrying if it is subtracted from a high level in the base case and leaves a final positive result. By and large this is the case, and the actual outcome by 2060 is that only 50 SA2s experience a fall in catchment productivity either in dollar terms per hour worked or in percentage terms. This implies that 413 SA2s experience an increase in catchment productivity. The redistribution of population and activity as a result of the FTP accordingly increases productivity for Victoria as a whole.

It can be seen from Figures 5.7 or 5.8 that the majority of SA2s in metropolitan Melbourne experience an increase in productivity, while in non-metropolitan Victoria the SA2s that experience a fall in productivity relative to Baseline are in Far Eastern, Far North Eastern and Far Western Victoria. Primarily this outcome reflects the role of working age population growth in suppressing productivity growth in regions with excess working age population. It also implies that a high majority of regions experience a positive change in GRP per capita of working age population. It will be seen below that this is indeed the case.

Figure 5.7: Catchment productivity – Difference from Base, 2060 ($2018)



Map 5.8: Catchment productivity – Difference from Base, 2060 (per cent)



The time series aggregates for productivity, that is, for the Project Corridors and the rest of Australia is between 2020 and 2060, as profiled in Figures 5.9 and 5.10. Figure 5.9 shows productivity in 2018 dollars while Figure 5.10 shows productivity in percentage terms.

For the Project Corridors the increase in productivity reaches a peak of $\$_{2018}$ 13 for GRP per hour worked in the mid-2050s before declining to $\$_{2018}$ 10 by 2060. There are two reasons for the decline from the mid 2050s:

(i) the lagged adjustment of industry hours to the increase in GRP; and

(ii) the fact that productivity is a function of the rate of growth of the economy. Up to the mid-2050s the FTP engineers a higher rate of GRP growth compared to the Base.

It is important to note that, from 2035 or so, the productivity for the Rest of Victoria also increases over the Base case, reaching an additional $\$_{2018}$ 2.5 an hour by 2060. The corresponding percentage change from Figure 5.10 indicates that the catchment corridor productivity will increase by 11.7 per cent by 2060 and the Rest of Victoria by 2.4 per cent, giving an overall increase in Victorian productivity of 4.7 per cent.

Figure 5.9: FTP impact – Local productivity – Project Corridors versus Rest of Victoria, 2020-2060 ($2018)

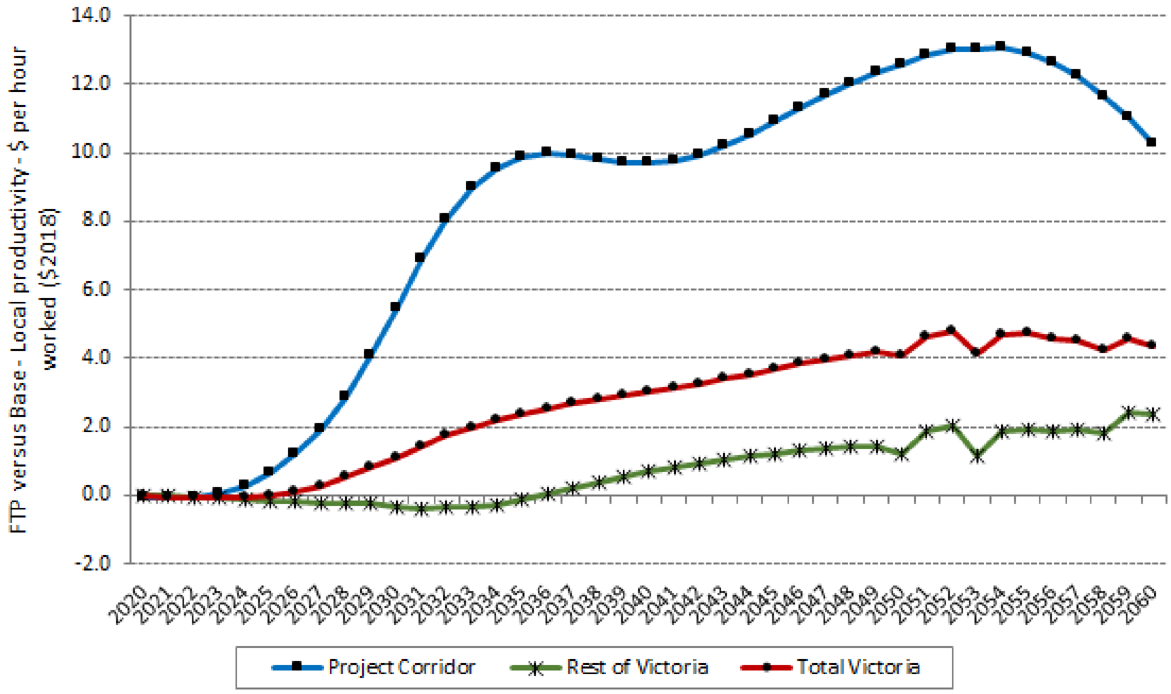
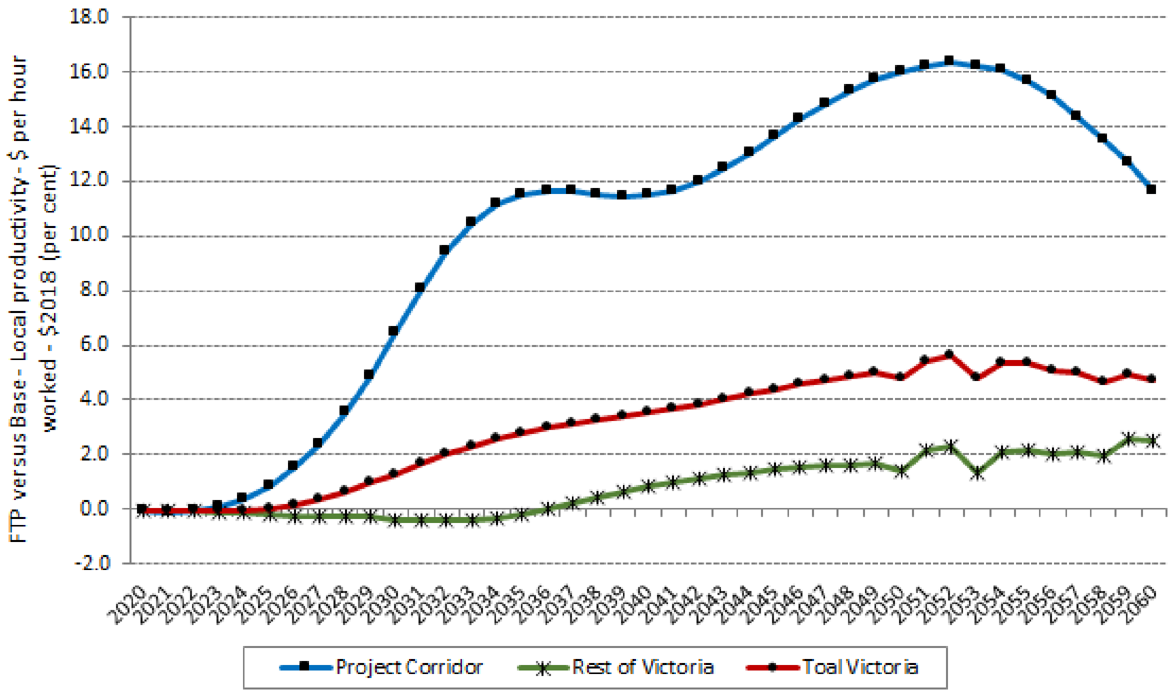


Figure 5.10: FTP impact – Local productivity – Project Corridors versus Rest of Victoria, 2020-2060 (per cent)



5.3.3. The impact of the FTP: The second driver of GRP increase – industry hours worked

Figure 5.11 profiles the change in catchment hours of work as a percentage change from the Base projection. A total of 119 SA2s experience an increase in catchment hours of work and, therefore, 343 SA2s that experience a decline in catchment hours of work in 2060 compared to the Base projection.

Of the 20 per cent of SA2s that are positively impacted by the FTP in terms of hours of work, 20 per cent have an increase of greater than 30 per cent (Figure 5.11), while in 20 per cent of the SA2s that experience a fall in catchment hours of work the percentage fall is more than -3.4 per cent. The majority of metropolitan Melbourne SA2s experience a decline in catchment hours of work.

However, from the point of view of evaluating the impact of the FTP, the more important outcome is what happens to catchment hours of work relative to catchment working age population. This is shown in Figure 5.12. In terms of numbers, the outcome is that 436 SA2s experience an increase in the ratio of catchment industry hours to working age population increases. A mere 25 SA2s experience a decrease. The impact on Melbourne SA2s is strongly positive.

Eighty per cent of the SA2s that have a positive increase in the ratio have a percentage increase greater than 2.7 per cent, while in the 5 per cent of SA2s that have a decline the maximum decline is around -2.8 per cent.

This outcome partly explains the role of the catchment working age population variable in the adjustment of short-term productivity to trend equation in the model (Equation 5, Chapter 4) which is also consistent with the impact of excess population in the narrative of Chapter 2.

Figure 5.11: Catchment hours of work – Difference from Base, 2060 (per cent)

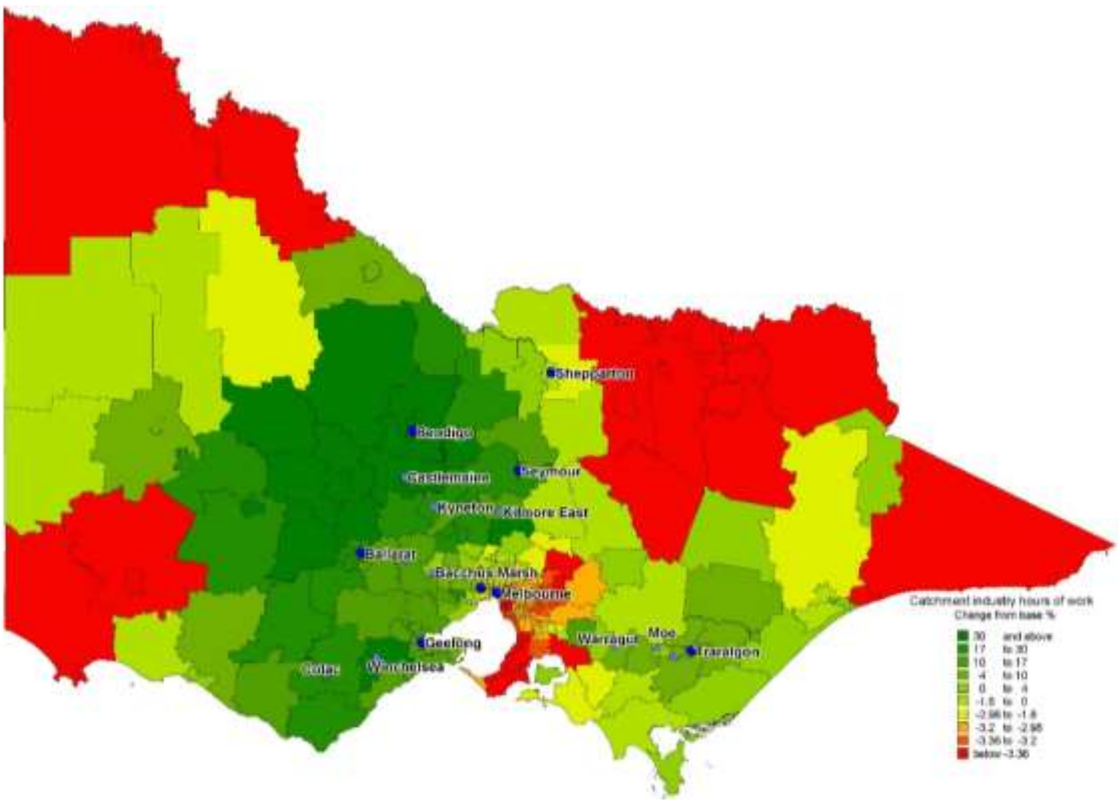
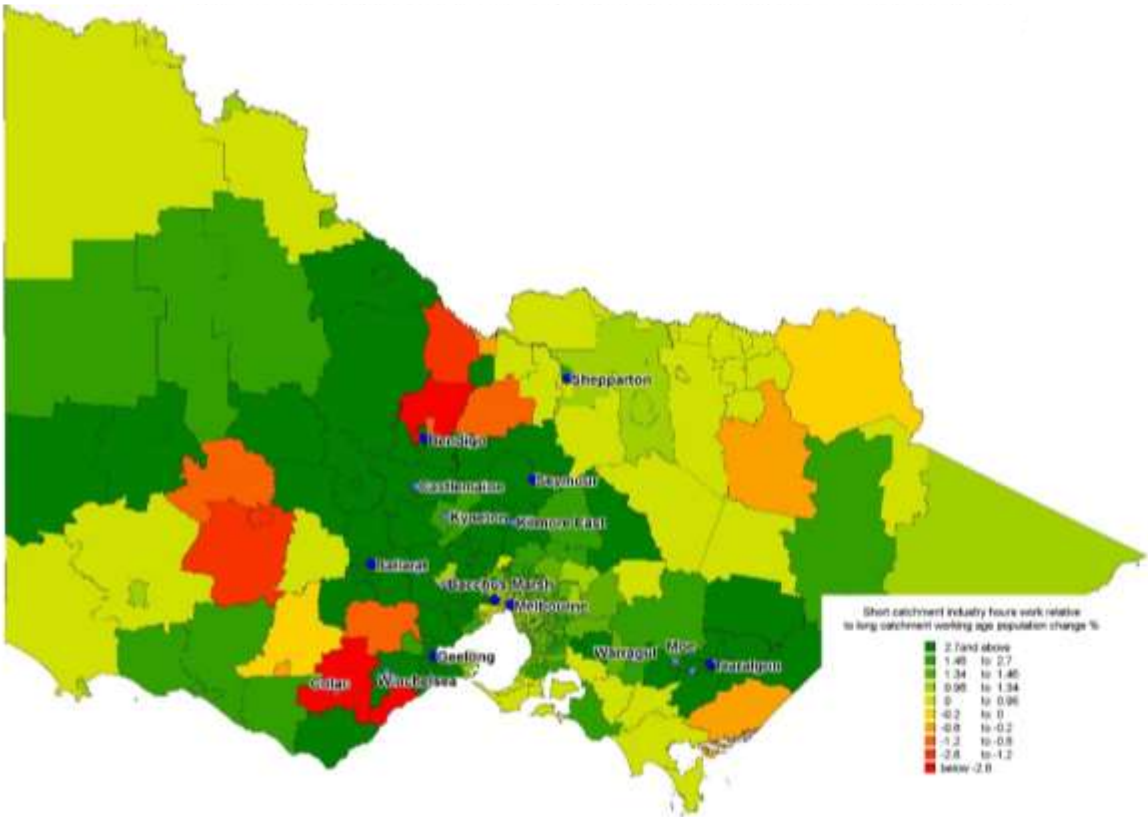
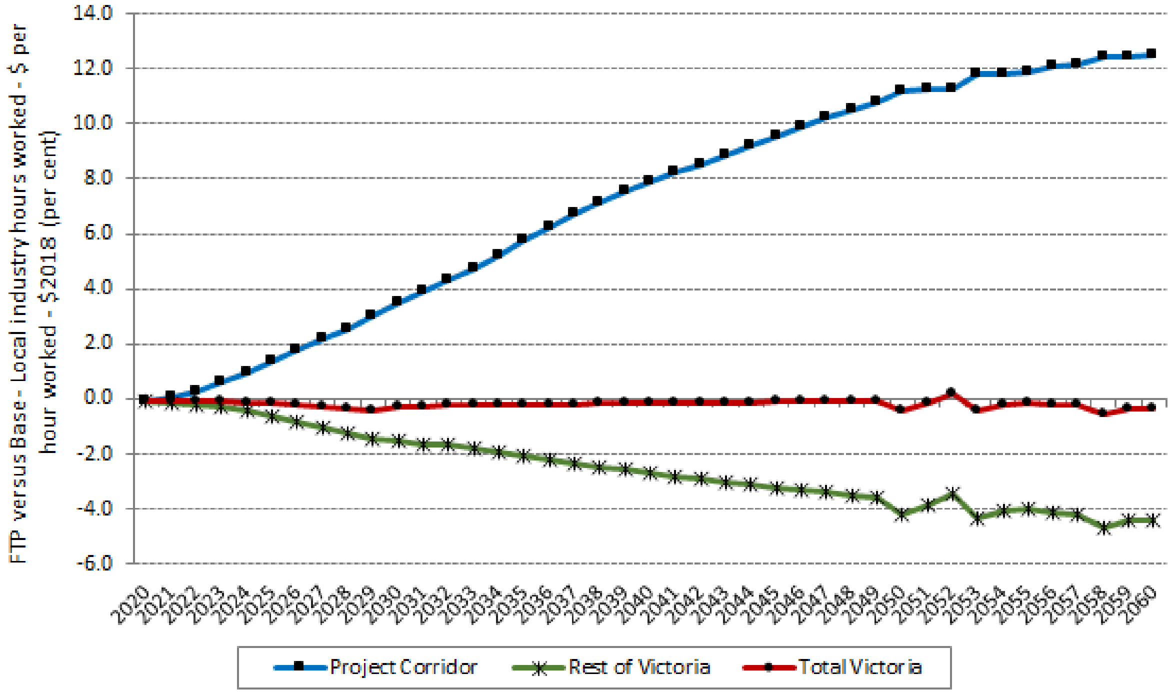


Figure 5.12: Short catchment hours worked relative to long catchment working age population change – Difference from Base, 2060 (per cent)



In terms of the time series for hours worked, Figure 5.13 compares the percentage change in hours worked between the Base and FTP cases for the Project Corridors and the Rest of Victoria. For the Project Corridors the percentage change increases to 12.5 per cent by 2060. For the Rest of Victoria, by 2060 there is a 4.4 per cent decline from the Base case. Overall, for Victoria as a whole there is a small decline in industry hours worked of -0.3 per cent.

Figure 5.13: FTP impact – Local place-of-work hours worked – Project Corridors versus Rest of Victoria, 2020-2060 (per cent)



5.3.4 The impact of the FTP: The change in gross regional product (GRP)

Industry hours worked multiplied by productivity equals GRP. Therefore, the GRP outcome will be determined by the catchment and local outcomes for these variables.

The percentage change in catchment GRP for 2060 from the Base case as a result of the FTP is given in Figure 5.14. Figure 5.14 is also important because provides an economic definition of the Project Corridors. An SA2 can be defined as lying within the Project Corridors if it is expected to achieve an increase in GRP over Base Case by 2060. It is projected that a total of 198 SA2s will experience an increase in catchment GRP, or 43 per cent of all SA2s. Of these, 39 SA2s will experience a percentage increase in GRP of greater than 44 per cent, while 39 will experience an increase of between 20 and 44 per cent. Seventy eight SA2s will experience an increase of between 2 per cent and 20 per cent by 2060 compared to the Base case.

In terms of the SA2s with declines in catchment GRP compared to the Base case, 53 will have declines greater than 2.2 per cent, with four-fifths of the SA2s with a decline in GRP having a decline of less than 2.2 per cent.

An increase in catchment GRP for a SA2 does not mean that the local GRP for the SA2 will increase. A SA2 can fail to benefit from growth in the GRP of its catchment if surrounding SA2s grow bigger and if they have better access to the FTP, at least over the medium-term. However, over the long-term, that is, beyond 2060, the expectation would be that the increase in catchment GRP would at some point result in an increase in local GRP.

By the same token, an SA2 that experiences a decline in catchment GRP will not necessarily suffer a fall in local GRP. This is because the relative increase in the catchment working age population may allow a given GRP within a catchment to expand at the expense of other SA2s in the catchment.

Figure 5.15 shows the change in local GRP in $_{2018}$ million from the Base case. There are 235 SA2s which have a positive gain in local GRP by 2060 compared to the Base case. This is just over 50 per cent of total SA2s. Fifty two SA2s will have an increase in GRP greater than $_{2018}$ 350 million, while the same number of SA2s will have a fall in GRP of greater than $_{2018}$ 114 million. Three-fifths of the SA2s that experience a decline in GRP compared to the Base case will have a fall in GRP of less than $_{2018}$ 47 million.

Figure 5.14: Catchment GRP – Per cent change from Base, 2060

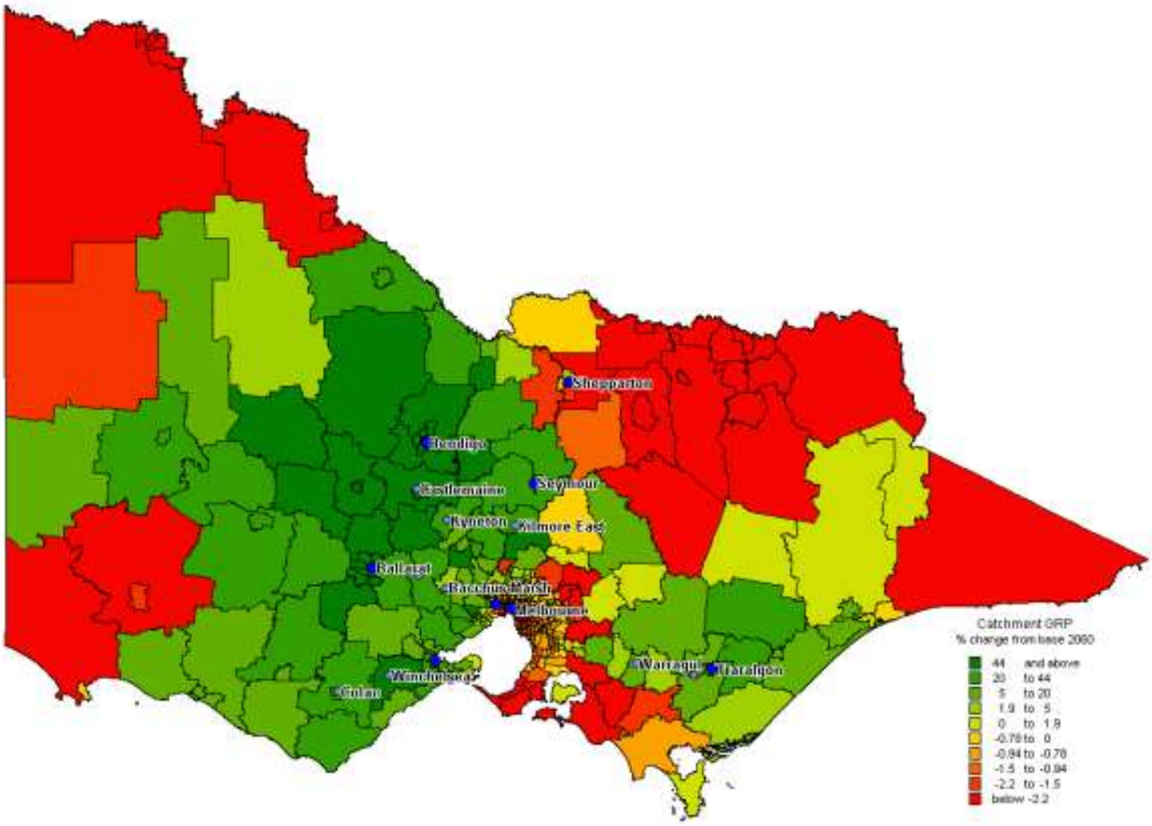


Figure 5.15: Change in local GRP from Base, 2060 ($2018 million)

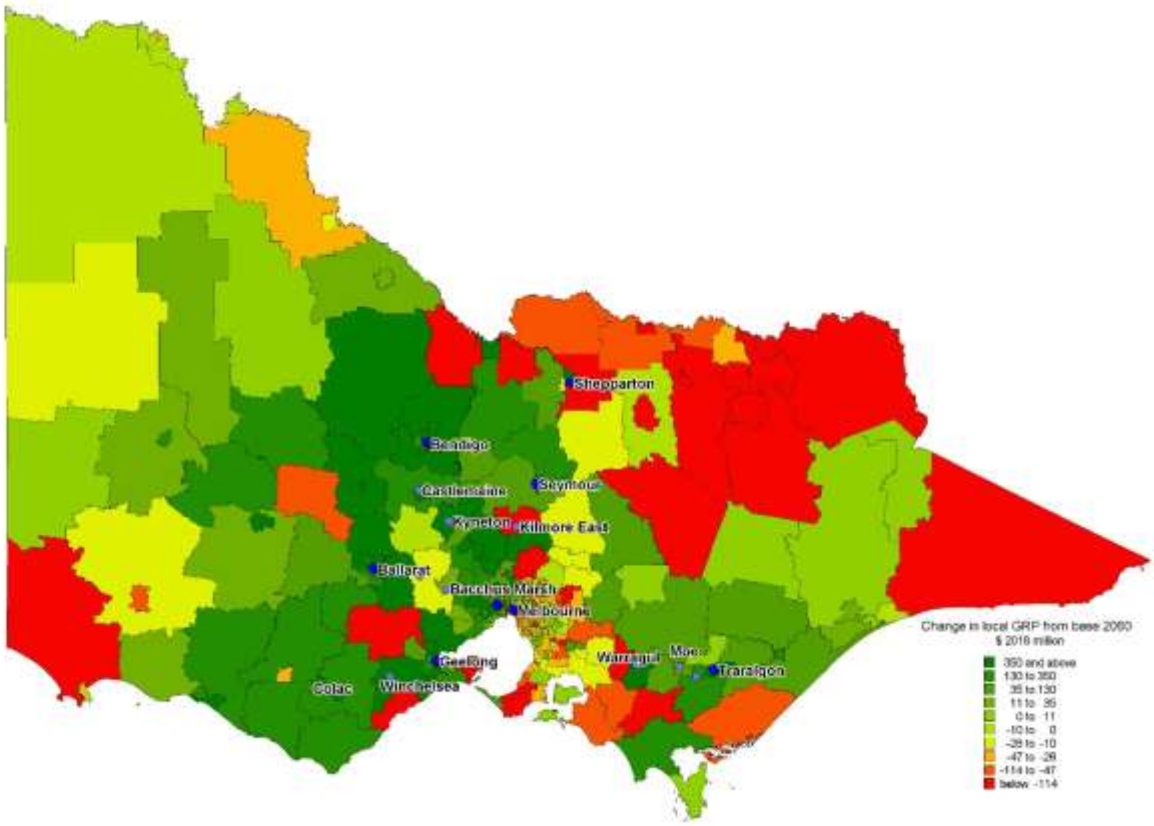
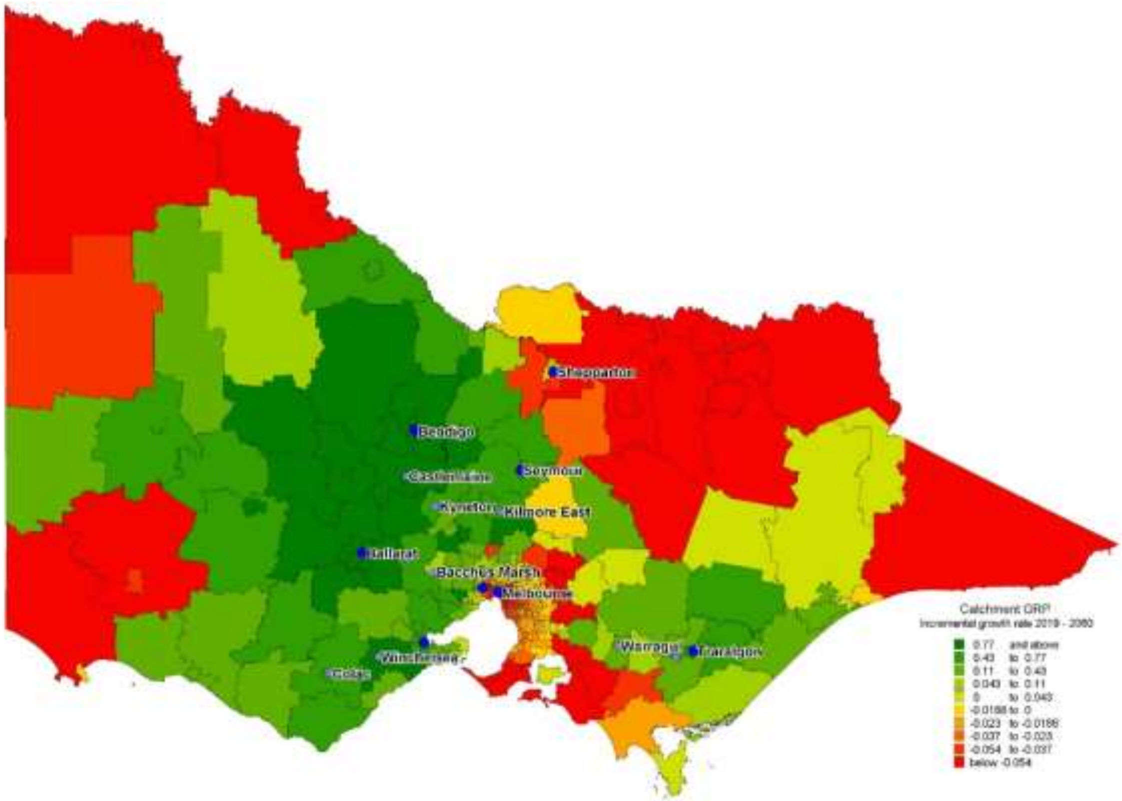


Figure 5.16 profiles the incremental GRP growth rate from 2020 to 2060 as a result of the FTP. The numbers and distribution of SA2s will be similar to Figure 5.14. As a result of the FTP a total of 39 SA2s have an increment to their GRP growth rate over 2020-2060 of greater than 0.8 per cent per annum. Four-fifths of the positive GRP SA2s from the FTP will have an incremental growth rate of up to 0.43 per cent per annum.

In comparison the incremental growth rate decline will be greater than 0.054 per cent per annum for 53 SA2s. In eighty per cent of the SA2s that experience a growth rate decline, the decline will be less than 0.054 per cent per annum.

Figure 5.17 is perhaps the most important figure in Chapter 5 for evaluating the impact of the FTP. It shows that 20 per cent of the SA2s that experience an increase in catchment GRP per capita of working age population have an increase greater than 11.8 per cent, while 20 per cent of those SA2s experiencing a decline have a decline that falls below -4.2 per cent.

Figure 5.16: Catchment GRP – Incremental growth rate – Difference from Base, 2020-2060 (per cent)



The key question is the number in the green segment of Figure 5.17. The number is 421 SA2s, or 91 per cent, of the total SA2s. This means that the overwhelming majority of SA2s in Victoria benefit from the FTP in per capita terms, which is the most appropriate matric for evaluating the FTP.

This conclusion is reinforced by the data in Figure 5.18 for resident household income from work per capita of working age population. This shows that 20 per cent of the SA2s that experience a positive impact from the FTP for this ratio experience an increase in average income per capita of $\$_{2018}$ 6,700. The 20 per cent of the SA2s that experience a decline in household per capita direct work related income experience a decline which, in dollar terms, is greater than -$\$_{2018}$ 2,000 per capita. The key metric is the number of SA2s that experience an increase in per capita direct work income and this is 403, or 87 per cent, of the total Victorian SA2s.

Figure 5.17: Ratio of catchment GRP to catchment working age population – Difference from Base, 2060 (per cent)

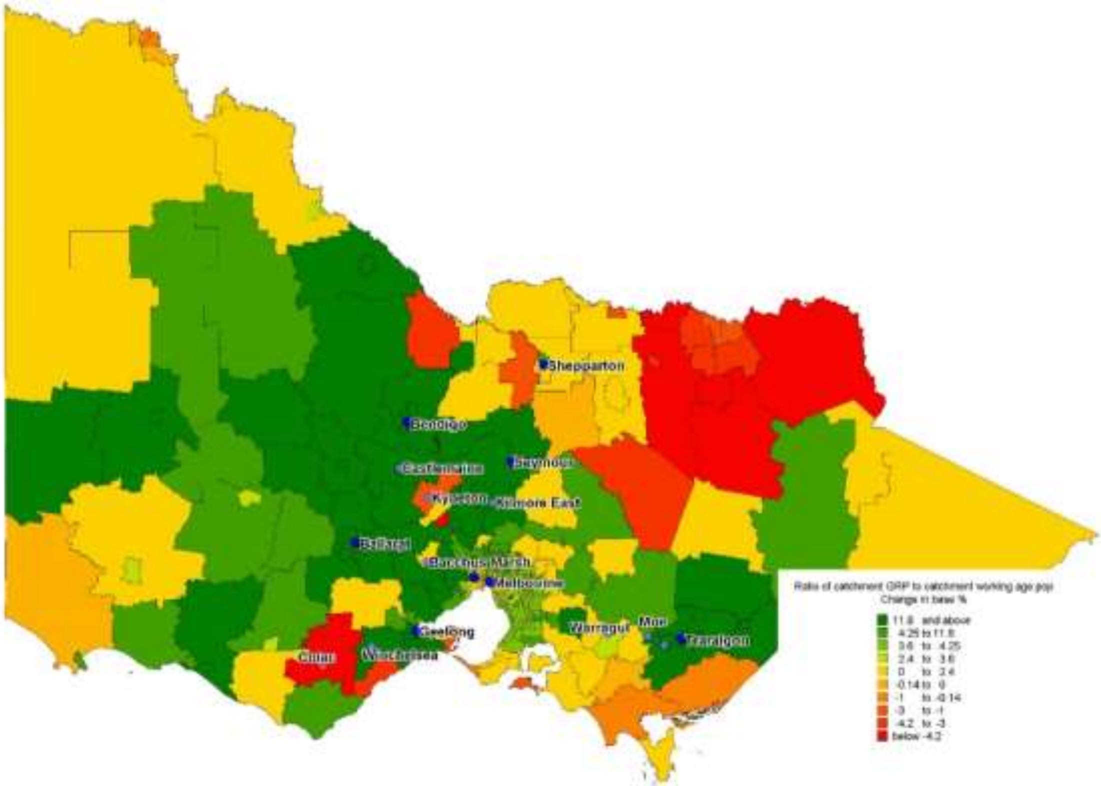


Figure 5.18: Change in household direct income from work per capita of working age population – Difference from Base, 2060 ($2018 ths.)

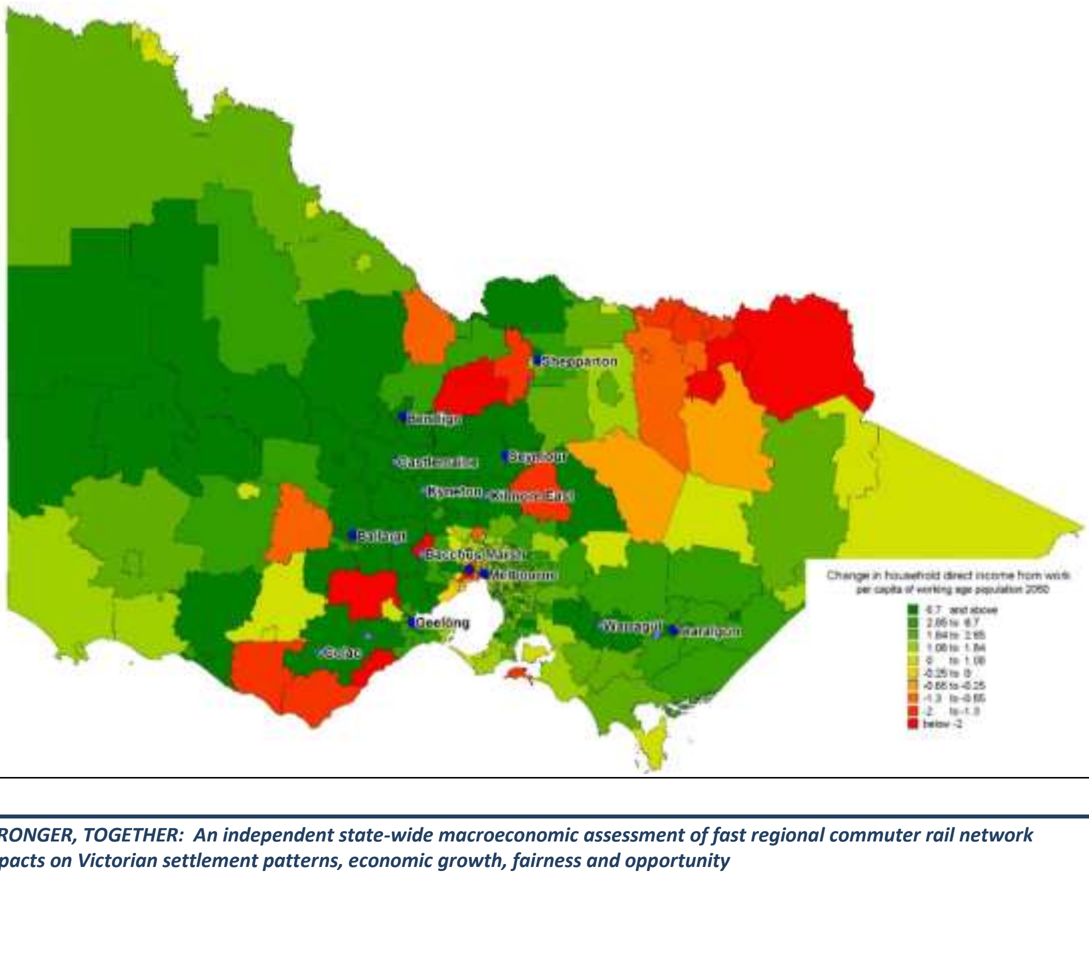


Figure 5.19(a) shows the time series outcomes for the Project Corridors and the Rest of Victoria for local GRP. For the Project Corridors the increase in GRP builds up to $\$_{2018}$ 50 billion by 2050 and $\$_{2018}$ 55 billion by 2060. The decline in GRP from baseline for the Rest of Victoria is $\$_{2018}$ 16.8 billion by 2050 and $\$_{2018}$ 14.4 billion by 2060. This gives a total increase in Victorian GRP of $\$_{2018}$ 33 billion by 2050 and $\$_{2018}$ 44.6 billion by 2060.

In percentage terms, from Figure 5.19(b), by 2060 the Project Corridors percentage increase in local GRP is 26 per cent with a 2 per cent decline in Rest of Victoria GRP giving a 4.4 per cent increase in total Victorian GRP. This increase is achieved purely by productivity increases as hours worked on a Victoria-wide basis declines slightly. It achieves this by providing the infrastructure to allow Victorians to achieve a higher level of productivity.

Figure 5.19(a): Local GRP – Difference from Base – Project Corridors versus Rest of Victoria, 2060 ($2018 billion)

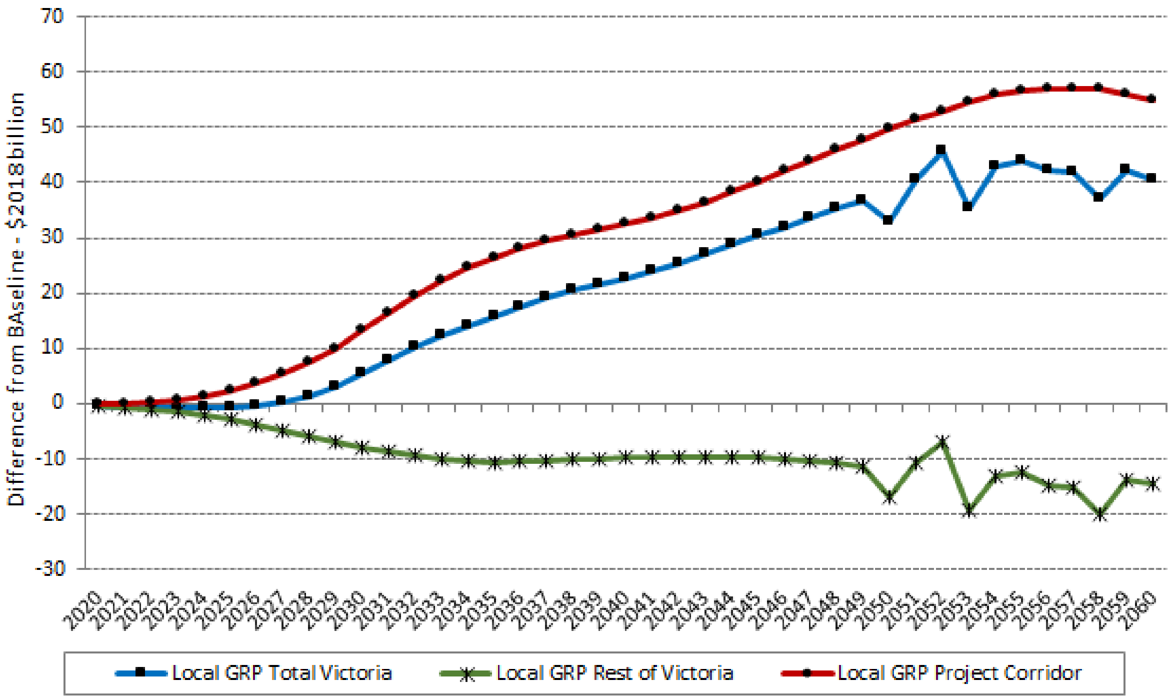
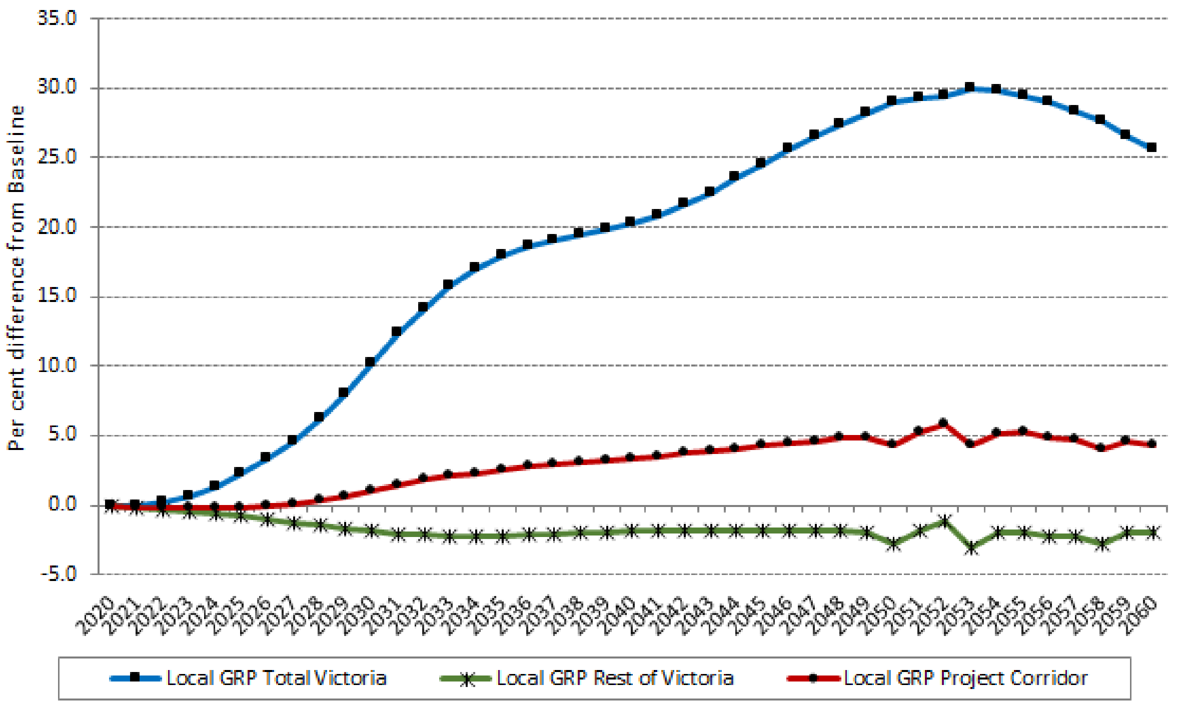


Figure 5.19(b): Local GRP – Per cent difference from Base – Project Corridors versus Rest of Victoria, 2060 (per cent)



5.4 The FTP impact: Regional inequality

The impact on Victorian productivity is an important variable to evaluate the impact of the FTP. It may not, however, be the most important metric. Arguably the most important metric is the impact of the FTP on regional inequality, especially its impact in closing the regional inequality gap.

One important regional inequality indicator is GRP per capita of the working age population. The outcomes for this variable for the Project Corridors and the Rest of Victoria are given in Figure 5.20. By 2060 the increase in GRP per capita for the Project Corridors is $\$_{2018}$ 11,600 per capita of the working age population, corresponding to a 12.3 per cent increase. For the Rest of Victoria the increase in GRP per capita of the working age population is $\$_{2018}$ 3,200.

It is known from Chapter 2 that the gap between local GRP per capita for the Project Corridors compared to the Rest of Victoria is -$\$_{2018}$ $45,000. Hence, the $\$_{2018}$ 12,000 gain in per capita GRP will close a quarter of the gap, at least in 2019 terms.

However, in terms of the most important indicator for the political argument for the FTP which would be direct household income indicator per capita of working age population. Table 5.1 indicates that the FTP will halve the household direct work income gap compared to the Rest of Victoria. This is approximately the same for the 2019 or the 2060 baseline gap.

Figure 5.20: Equality indicator – Local GRP per capita of working age population

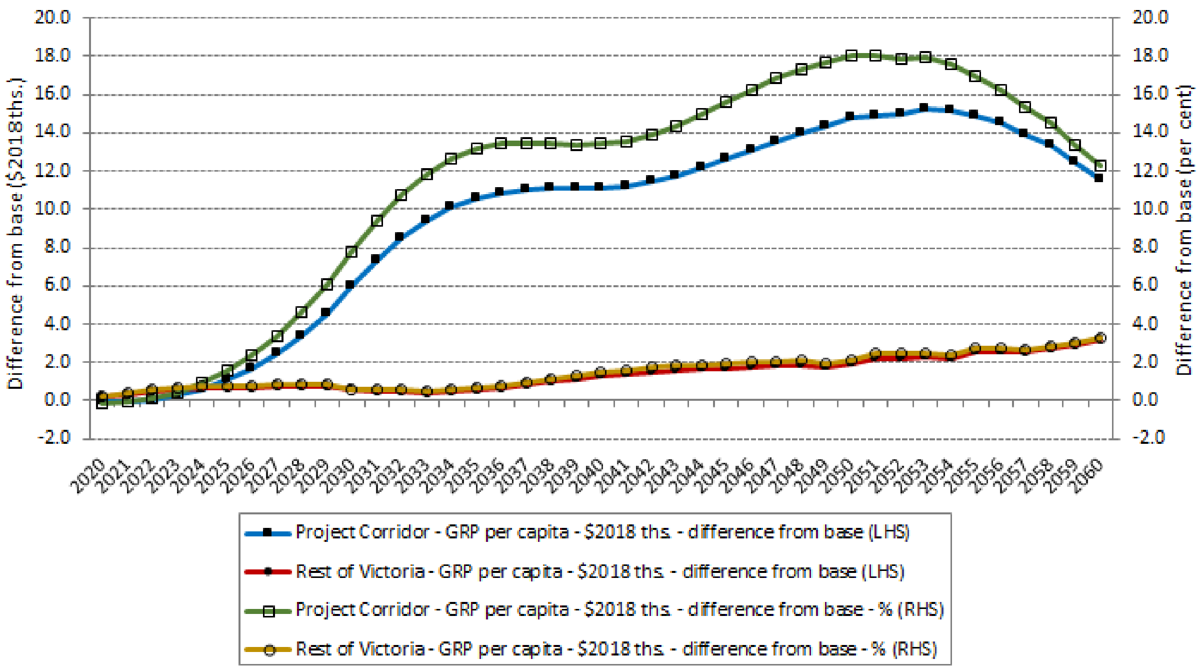


Table 5.1	Equality impact indicator – Usual residents' local income from work per capita of local working age population					
		1995	**2010**	**2019**	**2050**	**2060**
Project regional catchment – $2018 ths. – base	: difference from Rest of Victoria	-5.5	-9.3	-11.5	-10.5	-10.4
Project regional catchment – $2018 ths. – disturbed	: difference from Rest of Victoria	-5.5	-9.3	-11.5	-4.7	-5.6
Project regional catchment – $2018 ths. – base	: difference from Rest of Victoria – per cent	86.1	83.3	81.0	85.2	87.2
Project regional catchment – $2018 ths. – disturbed	: difference from Rest of Victoria – per cent	86.1	83.3	81.0	93.6	93.2

5.5 The FTP impact: The dynamics of adjustment

In Appendix A, where foreign fast train projects are reviewed, it is noted that regions adjacent to regions with stations lost population and economic activity as households relocated to shorten the travel times to the station. There is evidence of this in the figures.

However, the main mechanism is one of "trickle out". The strengthening of population or economic activity in the regions most directly impacted by the fast train initially rebounds within these regions themselves. However, this immediately strengthens the catchment if not the local values for population and economic activity in nearby regions. This with a lag will lead to an increase in local values for population and economic activity in these adjacent regions which will then allow the same "trickle out" mechanism to spread to areas further afield again. It can be seen from Figure 5.4 that this incremental creep outwards from the initially highly impacted SA2s is strongest in Mid-Western Victoria.

It is also apparent for populations, and for other variables, that the strength of "trickle out" also depends on the strengths of the initial impact of the FTP on the SA2s it directly serves. The lower this impact, the less strong the "trickle out". This is evident for the outcomes in the Goulburn Valley and to some extent in Gippsland.

The decline in population for Melbourne metropolitan middle and outer SA2s would not be expected given the analysis of Chapter 2 above. However in per capita terms most of metropolitan Melbourne is better off. Relocating Melbourne's surplus population to improve Melbourne's per capita income and employment outcomes is a clear implication of the analysis of Chapter 2. The modelling for the FTP has validated this conclusion.

5.6 With further adjustment nearly all SA2s in Victoria will benefit from the Project

Finally, it should be recognised that the conclusions so fare reached derive from a strictly supply side model focussed on direct productivity determination, and not from a Keynesian income-expenditure multiplier model. As a supply side model it credits the productivity gains entirely to the SA2s of residence of the people who generate the gains. When these people spend their increased incomes the gains will become more widespread and, if there is spare capacity, will also be enhanced through increased demand. A Keynesian type regional model is required to assess the distribution and amount of this second round of benefits from the unlocking of these productivity gains.

If the productivity and population changes from the model used here were imposed on NIEIR's LGA interregional input-output model, the positive impulses occurring in SA2s in Mid-Western, Mid-Northern and Mid-Eastern Victorian SA2s would, via the stimulus to interregional trade flows, transfer the positive benefits to the Mid-Victorian SA2s to most other Victorian SA2s. Once this dispersion of benefits is allowed for, there will be little chance of more than a few, if any, SA2s that will be negatively impacted by the FTP.

This modelling exercise should be performed at a later stage in the feasibility investigation, including estimating the benefits of induced construction expenditures. However, before this is done, the focus should remain on long-term productivity gains, since these are the most important criterion for public sector assessors.

Finally, provided Victoria has a reasonably supportive international and domestic economic environment, this exercise in supply-aide modelling concludes that the FTP will be a necessary and sufficient condition for generating the productivity increases outlined above.

This does not mean that centres such as Shepparton cannot generate benefits beyond those which are assessed here. The low level of benefit assessed for Shepparton in this exercise, compared with the high level assessed for Bendigo, derives from the one being outside the 90-minute limit for long-distance commuting and the other being within it. Though this cut-off generates significant results, it may not be quite so precisely defined in practice.

This raises the question of the sensitivity of different industries to the scale of labour market catchments' scale and local density of supply chains. For centres like Shepparton, the FTP could be a necessary, but not sufficient, generator of positive outcomes provided that they have industries that are directly sensitive to the availability of the FTP. Indeed, any centre can achieve benefits beyond those assessed here if it has industries that are directly sensitive to travel times or related factors. They will have to leverage industry development from the FTP for reasons that lie outside the scope of this study.

6. Congestion cost benefits

BITRE (2016) congestion cost scenarios for Melbourne were used to develop an estimate of potential congestion cost savings from a slower rate of population and associated traffic growth in Melbourne. This is intended to be illustrative of the congestion cost savings potentially associated with substantial changes in the distribution of population growth in Victoria. Two BITRE scenarios were used for this purpose:

1. the high VKT scenario, which with a Melbourne population of 5.02 million in 2020 is the closest of the BITRE scenarios to the ABS estimated resident population in Melbourne in 2019 of 5.08 million,[1] rising to 6.01 million in 2030 and with high VKT growth as a reasonable reflection of Melbourne's travel patterns associated with rapid urban sprawl; and
2. the Low VKT scenario, with 4.98 million population in 2020 and 5.76 million in 2030. This alternative scenario has been chosen because a significantly slower population growth rate for Melbourne is likely to be reflective of a wider set of policy measures that are intended, inter alia, to slow the growth in motor vehicle use, to reduce the attendant social costs.

The population difference between these two scenarios is thus about 250,000 in 2030. This can be compared to the NIEIR projected population differences between Melbourne and regional Victoria of about 600,000 in 2050.

Congestion costs for the two scenarios were extracted from Excel spreadsheets accompanying BITRE (2016) on a year-by-year basis, from 2020 to 2030, the differences being depicted in Figure 6.1. The cost differences reach $5 million (in 2010 prices) by 2028, in undiscounted terms. The linear trend line in Figure 6.1 suggests that congestion costs differences for Melbourne between these two scenarios were implicitly projected (by BITRE) to increase at around $0.525 billion annually through the 2020-2030 period.

Two alternative projections of congestion costs for the 2030 to 2060 period were developed. Because of the uncertainties involved, these should be seen as no more than order of magnitude estimates. First, congestion costs between 2030 and 2060 were increased annually from the 2030 level by using the beta coefficient of 0.5247 in the equation in Figure 6.1. It may be suggested that this will underestimate the potential savings between 2030 and 2060 because the trendline is below the actuals for the last few years of the 2020-2030 period. Offsetting this, however, the population difference between the two scenarios, which was approximately 250,000 after the 15-year period to 2030, would probably be greater than 500,000 by 2060 (BITRE did not extrapolate to this time). Also, and more importantly, extrapolating estimated costs for a future decade (2020-2030) over a further 30 years is heroic in the extreme and the results should be treated with caution.

Second, and given the uncertainties involved in predicting future traffic volumes, the undiscounted dollar value of congestion cost savings from the slower rate of population/traffic growth was held constant at the 2030 level (of $6.33 billion). This is a more conservative approach but probably more defensible given the uncertainties involved.

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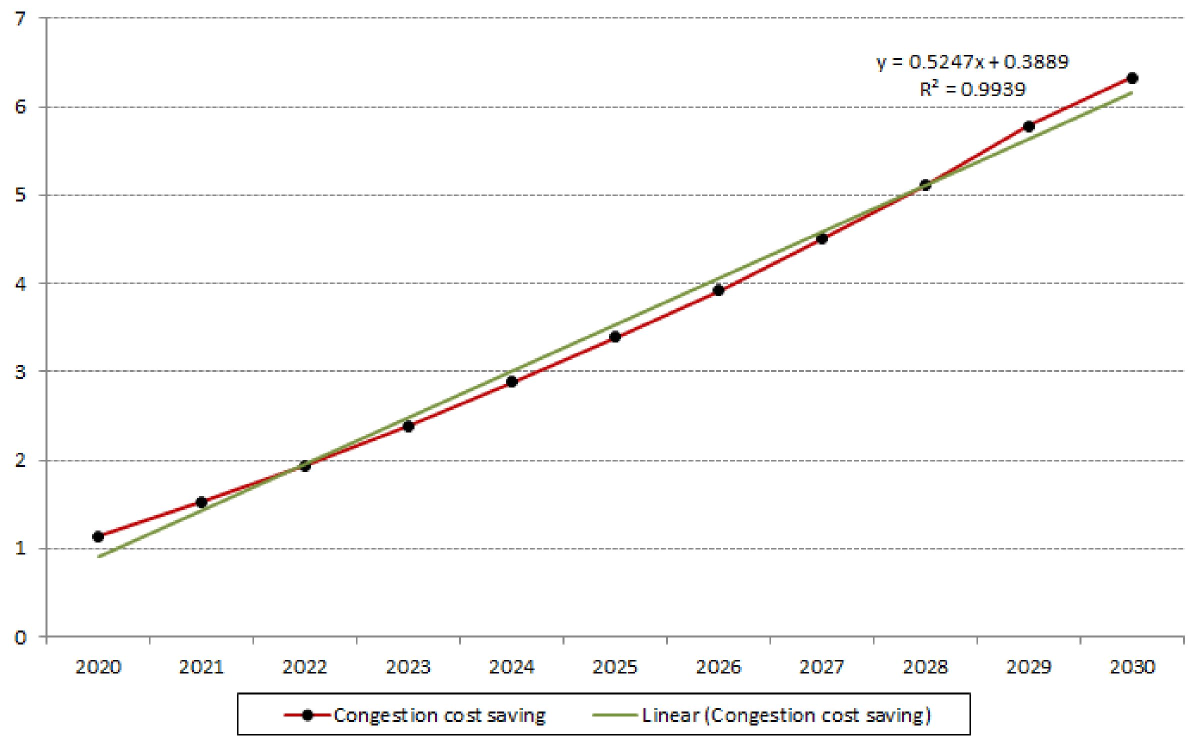
[1] ABS Cat. 3218.0.

Figure 6.1: Potential congestion cost savings between two Melbourne growth scenarios ($billion; 2010 prices)



The resulting two streams of congestion cost savings projected to arise from slowing Melbourne's population growth rate (with about 250,000 fewer people in 2030) were converted into NPVs by using a conventional 7 per cent real discount rate (which is looking increasingly irrelevant to today's real world) and a 3.5 per cent rate, reflecting a social opportunity cost rate. Table 6.1 shows that the present value of resulting congestion cost savings ranges between around $60 and $200 billion, in 2010 prices.

Table 6.1 Discounted congestion cost savings between 2020-2060 from Melbourne having a slower population growth trajectory (approximately 250,000 less in 2030) ($billion; 2010 prices)

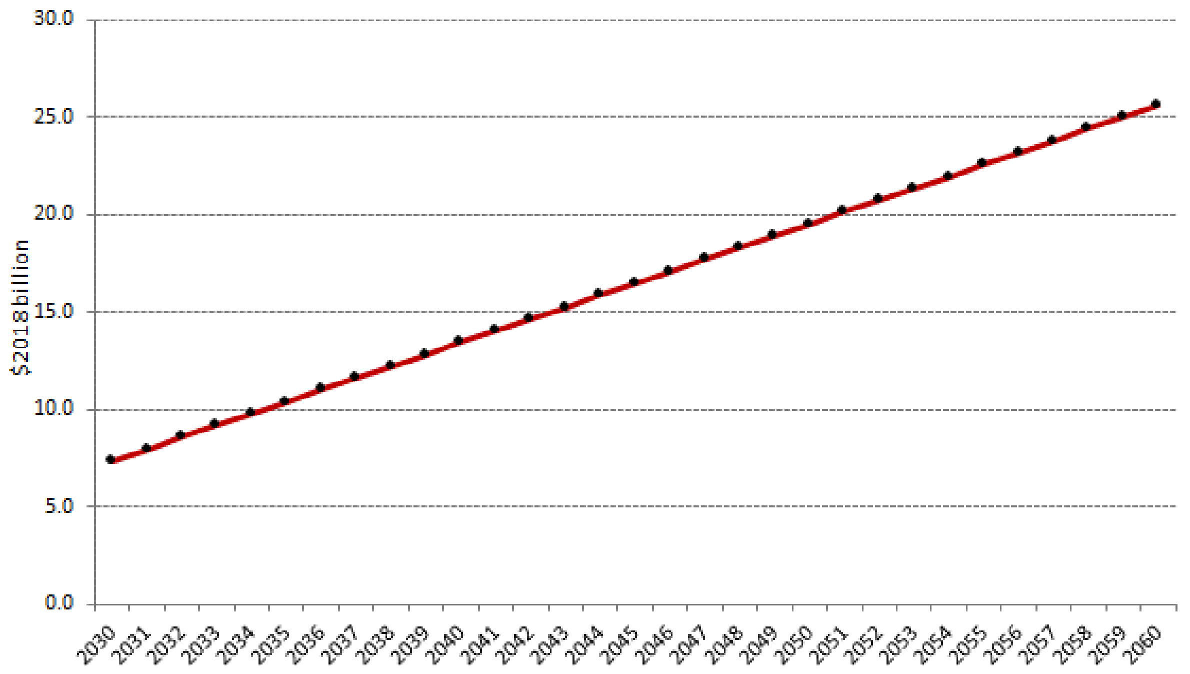
Projection	7% discount rate	3.5% discount rate
2030-2060 linear extrapolation	92	196
Congestion cost savings held at 2030 level	60	110

The slower rate of population growth in Melbourne, accompanied by policy measures which further slow the rate of growth in vehicle kilometres of motor vehicle travel, is thus projected to generate huge congestion cost savings. Increasing these savings to from 2010 prices to 2020 prices would lift them by around one-fifth. As noted above, the values that mirror congestion savings held at 2030 levels are considered more reliable.

It should be noted that increasing the rate of population growth in Victoria's regional cities will increase congestion costs in those locations. However, the shape of the congestion cost curve is such that the increase in congestion costs in the regions will be very much smaller than the savings from lower traffic levels in Melbourne. Our rough estimate is that no more than one-fifth of the cost savings noted in the preceding paragraph would be lost to increased congestion costs in the faster growing regions of Victoria. In short, the net effect is likely to be congestion cost benefits of between $60-200 billion in present value terms ($60-90 billion at 7 per cent discount rate; $100-200 billion at 3.5 per cent discount rate), covering the 40 years to 2060. Because of the uncertainties involved in this exercise, the more conservative estimates are considered to have greater likelihood of achievement ($60-110 billion benefits in present value terms). Figure 6.2 shows the build-up in benefits for a 0.5 million population transfer over 30 years.

To put these figures in some context, the Victorian Government currently has over $60 billion worth of major transport infrastructure projects in build or committed, with over half being rail (not including the proposed Suburban Rail Loop).

Figure 6.2: Congestion cost savings by relocation of 0.5 million out of Melbourne ($2018)



Adjusting the above analysis to match exactly the requirement here, which is the transfer of 0.5 million from metropolitan Melbourne outside Melbourne, gives the savings in available congestion costs as shown in Figure 6.2. The annual congestion cost savings reach $\$_{2018}$ 25.6 billion by 2060. As already noted, there are difficulties with this estimate which was obtained by extrapolating projected trends from 2020 to 2030 through to 2060 – not really a sound basis for a 2060 estimate. To be conservative the approach adopted here is to take the 2030 benchmark and index the increase to 20 per cent of the increase of the series shown in Figure 6.2. This gives a 2060 value of congestion savings of $\$_{2018}$ 11 billion. The data in Figure 6.2 assume a 0.5 million transfer at each year. In the first half of the 2020s very little population would have been transferred. Its only at 2060 that the full 0.5 million in population is achieved.

In discounted terms, the present value of the congestion cost savings allowing for the phase-in of population reallocation reaches $\$_{2018}$ 29 billion 2020-2060 for a 7 per cent discount rate and $\$_{2018}$ 66 billion for a 3.5 per cent discount rate. These are not insignificant contributions.

References

Australian Bureau of Statistics (2020), 'Regional population growth: Australia 2018-19', *Cat. 3218.0*, Canberra: Author.

Bureau of Infrastructure Transport and Regional Economics (2015), 'Traffic and congestion costs for Australian capital cities', *Information Sheet 74*, Canberra: Author.

NIEIR (2018), *Making the most of our opportunities, First Report to the Municipal Association of Victoria*, Melbourne: Author.

7. The Fast Train Project: The outcome for macroeconomic indicators

Table 7.1 profiles a selection of macroeconomic evaluation indicators for the FTP for the aggregate Project Corridors and at state level.

One standard approach for evaluation of the Project is to calculate the present value of the increase in GRP between the Project and Bae cases over the evaluation period. In Australia the discount rates are generally in the range of 3.5 to 7.0 per cent. However, for the analysis here, this method would only be valid for the state level where overall population is unchanged. At the regional level changes in population between regions require the evaluation criteria to be expressed in per capita terms.

Table 7.1 reports the major evaluation indicators at both these discount rates. The use of the 7 per cent discount rate halves the present values so comments will be restricted to the 3.5 per cent discount rate. In terms of the overall state increase in GRP, the present value is $\$_{2018}$ 361 billion by 2060. For Victoria as a whole and in working age population per capita terms, the GRP increase is $\$_{2018}$ 63,700 per person. However, in the Project Corridors the increase will be $\$_{2018}$ 178,300 present value per person. The population in the Rest of Victoria will be better off by $\$_{2018}$ 25,100 per person in present value terms at a discount of 3.5 per cent per annum.

Adding estimated savings in congestion costs increases the present value of the benefit to the Rest of Victoria (at a 3.5 per cent discount rate per working age resident) by $\$_{2018}$ 11,000, reducing to $\$_{2018}$ 8,100 for Victoria as a whole after allowing for increased congestion along the Project Corridors. Adding these estimates to the other GRP estimates increases the working age per capita present value to $\$_{2018}$ 18,100 for Rest of Victoria and $\$_{2018}$ 71,700 for Victoria as a whole.

Taking into account the capital cost the internal rate of return is 10 per cent without congestion costs and 11 per cent with congestion cost savings. The internal rate of return discounts the GRP benefits back to 2020 with the capital investment set at -$\$_{2018}$ 70 billion in 2020.

However, perhaps the most important metric is that the Project will raise both incomes and GDP per working age resident in the Project Corridors relative to the Rest of Victoria (dominated by the metropolitan area), so reducing the 2019 gap between these two regions by a quarter.

Table 7.1	Fast Train Project – Macro evaluation metrics, 2000-2060			
	Discount rate	Project Corridor	Rest of Victoria	Victoria
Excluding congestion cost savings				
Present value – GRP change ($2018 billion)	7 per cent	n.a.	n.a.	159.8
	3.5 per cent	n.a.	n.a.	361.4
Present value – GRP change per capita of working age population ($2018 ths.)	7 per cent	89.3	13.1	32.1
	3.5 per cent	178.3	25.1	63.7
Internal Rate of return – GRP or GRP per capita (per cent)				**10%**
Congestion cost savings				
Avoided congestion costs – Present value – ($2018 billion)	7 per cent	n.a.	29.1	29.1
	3.5 per cent	n.a.	66.4	66.4
Avoided congestion costs – Present value – per capita of working age population ($2018 ths.)	7 per cent	n.a.	5.0	3.7
	3.5 per cent	n.a.	11.0	8.1
Including congestion costs				
Present value – GRP change ($2018 billion)	7 per cent	n.a.	n.a.	188.9
	3.5 per cent	n.a.	n.a.	427.8
Present value – GRP change per capita of working age population ($2018 ths.)	7 per cent	89.3	18.1	35.8
	3.5 per cent	178.3	36.1	71.7
Internal rate of return – GRP or GRP per capita (per cent)				**11%**
Average return on infrastructure investment – GRP perspective (per cent only)				**33.2%**

Notes: To bring the GRP to headline GRP status GRP is adjusted upwards for ownership of dwellings.
n.a. denotes not applicable.

Appendix A: Evidence from foreign fast rail projects

As part of the preparation for this analysis, NIEIR undertook a literature review on fast rail. The predominant part of that literature is about high-speed rail, such as the French TGV or Japanese Shinkansen. We draw on some of that literature in this paper, although it is more relevant to east coast high speed rail than to inter-regional rail within a state. There is much less material on fast rail but a couple of interesting Scandinavian examples are considered.

Vickerman (2018) sets out an overview of the theoretical arguments about the potential benefits of high speed/fast rail, arguing that it is ultimately an empirical matter as to whether or not these benefits are delivered in any particular circumstance (before and after studies are important). The theoretical arguments about potential benefits largely turn on opportunities for what are known as wider economic benefits (DfT 2005; Graham 2007), which are either not, or not fully, accounted for by conventional transport cost benefit analyses. World Bank (2014) for example, points out that there is an emerging consensus that major transport investments have significant regional impacts that are not well captured by such CBA.

The major opportunity for wider economic benefits is generally for the achievement of transport-induced agglomeration economies. These are beneficial productivity effects explained by increased access to input/output markets, innovation spillovers, and a greater labour pool. The result is positive externalities from increased economic density that flow from expanded labour, product and information catchments that are facilitated by a major transport improvement. Other wider economic benefits are associated with output change in imperfectly competitive markets, labour supply change, moving to more or less productive jobs and wider impact from labour market changes. The Transport Analysis Guidance (TAG) by the UK's Department for Transport (DfT) is the most widely recognised approach to measuring such benefits (see, for example, DfT 2005; Graham 2007; Stopher and Stanley 2014).

In these studies all the impacts are modelled under partial rather than general equilibrium, which means that they construct before and after snapshots of the economy with and without a project. The difference between partial and general equilibrium lies mainly in the range of interactions included when constructing these snapshots. NIEIR's approach is more akin to a pair of videos which contrast the trajectory of the economy with and without the Project, charting an adjustment path which may take decades after which, theoretically, a general equilibrium would be reached – the point being that that time is so far ahead that it is beyond any meaningful planning horizon. The range of interactions included is on a par with general equilibrium analysis and also includes considerable geographic detail.

World Bank (2014) and Stopher and Stanley (2014) explain that the concept of agglomeration benefits from transport improvements, and its application to transport CBA, is founded on four main propositions:

(a) output per worker (and wages) is a function of effective density;

(b) effective density rises with transport improvements;

(c) there are positive externalities from transport improvements which increase output for some firms independently of their use of the transport network; and

(d) this increase in output is not included in the standard assessment of transport projects and can be added for a more comprehensive assessment of project merit.

Critical in measurement of agglomeration benefits is identifying a relevant measure for the elasticity of productivity with respect to changes in economic mass or economic density (i.e. how much, relative terms, productivity will increase as the scale of economic activity increases). Economic mass/density is usually measured by population and/or economic activity within a location's catchment, where that catchment is defined by generalised transport cost (time and money). Reducing transport cost increases catchment size and effective catchment density. Estimates of this elasticity tend to range between 0.02-0.1 but World Bank (2014) estimated the elasticity for China HSR at a relatively high 0.14. A productivity elasticity estimate of 0.14 implies that doubling of access to economic mass would increase productivity per labour hour by 10 per cent, which is very strong. Australian expectations would be lower. As seen above these are consistent with the Victorian estimates of this study.

Knowledge-based activities tend to have relatively high elasticities and World Bank (2014) notes that it is often such activities that benefit from HSR. They cite UK in this regard, looking at changes after the 1977 introduction of 200 km/h services operating on conventional track, reducing journey times by up 20-30 per cent and bringing many regional centres within the London commuting catchment. Most (not all) cities within a 2-hour train time to and from London benefitted and added population, with those having a good base in knowledge-intensive industries prominent. Towns not on the network generally had weaker local economic performance.

It is recognised that **regional economic impacts** of major transport projects can be either positive or negative. Vickerman (2018), for example, notes the core-periphery challenge, whereby major transport improvements tend to increase movement towards the core, or centre, and may increase regional inequalities. He points out, however, that this result mainly applies for small changes in inter-regional changes in transport costs and that larger transport cost changes, which make transport costs less relevant to location decisions, can benefit firms in the periphery, while negative externalities in the core, such as congestion, crime and air pollution, may act as an inhibitor of core growth. This is essentially the argument on which fast regional rail in Victoria depends for the possibility of wider economic benefits but the risk of intra-regional redistribution of activity also needs to be recognised. In this regard, World Bank (2014) notes that, in France and Spain, HSR benefitted intermediate sized areas (50,000 to 100,000+ people) but these tended to attract population from surrounding communities, such that the net impacts of HSR on the overall regional population can be modest. Overall, however, they concluded that regional incomes rise primarily because of higher wage gains by commuters working in higher paying jobs in larger centres.

World Bank (2014) look at a number of international HSR case studies, including the Paris-Lyon TGV, where before and after studies were available. They indicate that high-level service industries flourished. Trips from Paris increased by 52 per cent but trips by firms based in the Rhone-Alps area increased by 144 per cent. Other examples they note of regional centres, besides Lyon, where regional development has benefitted from HSR include Lille, on the crossroads between Paris, London and Brussels/Amsterdam, which World Bank (2014) notes has built up the largest university/medical complex in Europe and substantial regional banking and insurance activities. Le Mans and Rheims also benefitted. World Bank (2014) also notes some examples where there are few positive and some negative impacts around HSR stations, such as Le Creusot, Montceau, and Montchanin, which were declining mining areas and experienced no measurable regional development impact. Mâcon set up business areas to attract activities needing fast connections to Paris and Geneva but had limited success. Small towns without TGV stations in the northeast of France sometimes lost services to larger centres with stations.

World Bank (2014, p. 30) concludes from this that *success is not guaranteed and that active local policies are essential to promote HSR-related development*. In similar vein, and looking at the UK experience with HS1, which provides fast service to London for a number of Kent towns, Vickerman (2018, p. 31) concludes that *transport infrastructure by itself is unlikely to be transformative but, coupled with other interventions it can contribute to such an effect.*

From its review of Spanish HSR experience, World Bank (2014) provides some examples of relevant complementary elements: the station should be located close to the city centre and established business activities; land should be available for mixed-use development; there should be good integration between the HSR service and transport hub that connects with good local, sub-regional and regional services; architecture that focusses on image and sense of place; a mixture of public and private sector investment; and a development corporation or similar organisation that undertakes collaborative public-private real estate development in the station precincts. This seems particularly appropriate to longer distance HSR but, except for perhaps the delivery model in the final point, also seems relevant for fast rail between regions and Melbourne.

Two Scandinavian examples

Øresund Bridge

The Øresund Region comprises Copenhagen (Denmark; 2 million people), Malmö (Sweden's third largest city; 320,000 people) and their surrounds, with a total regional population of around 4 million. The economic centre of gravity of the Region is clearly on the Danish side, with over two-thirds of regional residents. The commuting flow is largely from Sweden to Denmark in the morning and the reverse in the evening, with over 90 per cent of commuters across the Øresund Bridge living in Sweden and working in Denmark (Øresundsbron 2015). The respective parts of the Øresund Region account for almost half of the Danish economy but only 11 per cent of the Swedish economy (Nauwelaers et, Maguire and Marsan 2013).

Building the Øresund Bridge, which opened in July 2000, was about expanding the regional labour market catchment, to capture the synergies and opportunities that this was expected to unleash, and also opening up road and rail transport options from Sweden to Denmark and well beyond. Developing cross-border clusters has been a focus, with Medicon Valley (a life sciences and medical technology cluster) being the most internationally known brand (Nauwelaers et al. 2013). The Region is a technology hub and accounts for a large share of total Swedish and Danish R&D. In the knowledge-based sectors, for example, life sciences/medical technology employs 40,000 and ICT employs 100,000 (Nauwelaers et al. 2013). For a relatively small city, Malmö demonstrates considerable entrepreneurial flair, with a focus in the knowledge and creative sectors (Stanley, Stanley and Hansen 2017).

Prior to the opening of the road and rail bridge, around 1500 people moved back and forth between Malmö and Copenhagen on a daily basis (Øresundsbron 2015). Hydrofoil and ferries were the main means of travel. Over the period 2000-2007, road traffic increased 10-17 per cent per annum, mainly driven by cheaper house prices on the Swedish side and the need for labour in Copenhagen (Øresundsbron 2015). Rapidly increasing house prices on the Copenhagen side during the 2000-2005 period saw up to 2,000-3,000 Danes annually move residence to Malmö or surrounds and commute back. Traffic growth slowed with the Global Financial Crisis in 2008 and the end of the Danish housing bubble. House prices were similar in both places by 2010, ending the outflow from Copenhagen to Malmö and surrounds and leading to net flows of those seeking housing in the other direction.

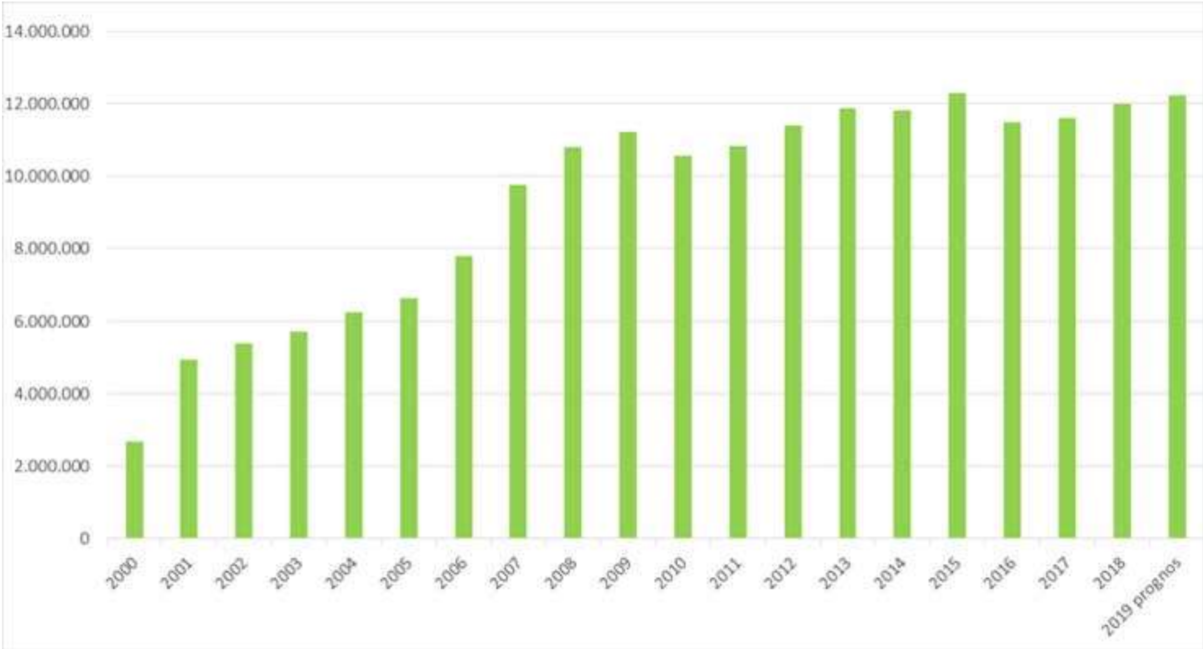
From a zero base, between 2001 and 2009, the number of train passengers on the 35-minute trip across the bridge more than doubled from just under 5 million to over 11 million but increases since then have been only modest. Rail passenger growth has been assisted by the opening of two new stations in the Malmo area (Triangeln and Hyllie), improving access to the service and reducing travel times for many. About 60 per cent of the passengers across Øresund are commuters. Three out of four train passengers live in Sweden (Øresundsbron 2015). The number of annual passenger train movements has been in the range of 45,000-60,000 most of the time, rail traffic alternating between high frequency passenger traffic and international freight. This traffic diversity limits peak passenger services to about 10 trains per hour in each direction.

High quality transport infrastructure connections are essential to creating larger functional market areas. Many of the initiatives in the Øresund Region, of which the Bridge is the most apparent, have been about creating networks and collaborative platforms, which support agglomeration economies, assisted by the opening of the bridge. Growth Commission (n.d., p.11.) points out, however, that:

> *The Øresund example shows that the benefits of improved connectivity have their limits in terms of labour market catchments, commuting, and capturing the benefits of offering a more diverse range of business and residential locations.*

Transport infrastructure improvements on their own will not maximise the potential benefits from creating larger functional economies, with wide governmental, private sector, university and community buy-in, needed to drive a regional collaboration platform.

Figure A.1: Rail passengers across Øresund Bridge



Source: https://www.Øresund sbron.com/en/info/railwaystatistics-on-Øresund –bridge.

Finest Link (Helsinki to Tallinn)

Whereas the Øresund Bridge is an in-place major transport infrastructure improvement, an undersea rail tunnel (the FinEst project) connecting Helsinki-Vantaa airport (Finland) and Ülemiste airport in Tallinn (Estonia) and then on to Rail Baltica and onwards to the Central and Eastern European railway network is an idea that is yet to be implemented. Metropolitan Helsinki's population is around 1.4 million and Tallinn is 440,000 and population and jobs in Helsinki and Tallinn are projected to grow by 40 per cent by 2050. The tunnel is expected to reduce travel time of passengers (and freight) between Helsinki and Tallinn from between 2 or more hours by sea, depending on the weather, to ~30 minutes for the 100 kilometre or so tunnel trip between these two capital cities[2]. Estimated project cost, including railways, terminals and stations, is €15 billion.

Approximately 9 million passengers travelled between these destinations in 2016, across the Gulf of Bothnia, two-thirds being Finns, one sixth Estonians and the remainder being other nationalities. Evaluation of the FinEst link includes the following passenger transport scenarios: 9 million in 2017; 14 million in 2050 without the rail tunnel; 23 million in 2050 with the tunnel, including an estimated 12.5 million passengers in tunnel and 10.5 million on ferries (EU and Interreg Central Baltic 2018). Freight will also use the tunnel.

Nikjou (2018) argues that:

> *… the cities are two of the most advanced and entrepreneurial in Europe, although with very similar cultures (the language and traditions of Estonia and Finland have a very strong connection), however, they do not share a land border which has hindered the development.*

The Project is seen as a way of improving bilateral collaboration across all sectors.

A standard model of transport cost-benefit analysis set out in the Project Feasibility Study (EU and Interreg Central Baltic 2018) demonstrates low economic feasibility of the tunnel, producing a benefit-cost ratio of 0.45 at a discount rate of 3.5 per cent, not surprising in view of project expected cost. This is a low discount rate in Australian terms but common in Europe (and methodologically more correct than the Australian way of choosing a discount rate - Stopher and Stanley 2014). Increasing the discount rate would make the standard CBA result even worse.

However, adding projected wider economic impacts, using the UK approach, brings in the expected growth benefits for the national economies of Finland and Estonia and on macro-regional development. EU and Interreg Central Baltic (2018, p. 59) reports that:

> *… the estimated discounted value for 30 years of the total productivity impact [agglomeration benefits] of Fixed Link will be about 1 800–3 600 M€ depending on the assumption concerning the agglomeration elasticity. The most significant impact will be in Tallinn region, 800–1 700 M€ (44% of total impact) and slightly smaller in Helsinki region, 500–1 100 M€ (29%). Significant impacts will also be allocated to rest of Finland, 360–710 M€, rest of Estonia, 80–150 M€ and Riga, 30–50 M€.*

Adding labour market, work relocation and competition benefits (further components of wider economic benefits), the scale of total wider economic benefits is projected to double, ranging between 4000-6900 M€ in present value terms. These wider economic benefits at the high end are sufficient to offset the negative net present value from the standard transport CBA.

Longer term, the Project value proposition is as a European Gateway. As the Feasibility Study says (EU and Interreg Central Baltic 2018):

> *Helsinki-Tallinn railway tunnel and Rail Baltica together form a European Gateway. For the vision of Helsinki-Tallinn tunnel Rail Baltica is a pre-requisite. Together the two transport connections form European Gateway that connects an intensive cross-border area between two capitals separated by the Gulf of Bothnia. Improved connectivity is a necessity to enable their full metropolitan growth. The European Gateway provides people and companies with better accessibility between the core of EU's transport network, High North, Black Sea area and Asia.*

[2] https://www.forbes.com/sites/kayvannikjou/2018/11/13/this-is-the-e15-billion-tunnel-connecting-helsinki-to-tallinn/#85c3d4c3c379.

Conclusions

This short overview suggests that fast/high speed rail can be used to spur growth in regional economies, with the generation of what have become known as wider economic benefits being likely to be critical to the economic case. The Scandinavian examples are perhaps the closest to a Victorian context, in terms of distances/travel times, but differ in terms of the scale of the core region relative to the scale of the periphery: Melbourne is much bigger than both Copenhagen and Helsinki and the Victorian regional centres individually are smaller than both the Tallinn and Malmö regions. The core-periphery scales are much more heavily weighted in favour of the core in the Melbourne case than in either of the two Scandinavian examples. This may mean that there is a greater risk that Melbourne will syphon off a very large share of the benefits from fast rail between there and the major Victorian regional cities. Given its scale and proximity to Melbourne, Geelong may have the best chance of capturing benefits from faster rail.

Some of the European and UK examples, however, hold out the promise that cities of the size of Geelong, Bendigo and Ballarat can gain from fast rail to the capital city. However, some of this benefit may come at the expense of other parts of their region, as the regional central place (i.e. Bendigo, Ballarat, etc.) draws in people from elsewhere in the region.

All examples suggest that maximising potential wider economic benefits and ensuring they are equitably shared will depend on rail upgrade being integrated into a comprehensive regional development strategy, which is multi-dimensional in scope and multi-stakeholder in buy-in. At the end of the day, these are empirical questions and the evidence base is scarce, particularly for examples like the Victorian inter-regional fast rail. Careful economic analysis to explore the likelihood, potential scale and means of optimising wider economic benefits is crucial to the prospect of success.

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Appendix B: Constant terms of equations in Table 4.2

Equation 1: CONST1(j)

SA2	Estimated coefficient	t-statistic
1	-6.8E-04	-0.6
2	-1.0E-03	-0.9
3	-9.6E-04	-0.8
4	-9.6E-04	-0.8
5	-8.7E-04	-0.7
6	-7.4E-04	-0.6
7	-6.6E-04	-0.6
8	-1.0E-03	-0.8
9	-1.2E-03	-1.0
10	5.6E-05	0.0
11	3.1E-04	0.2
12	-1.3E-03	-1.1
13	6.9E-04	0.6
14	7.7E-04	0.6
15	-6.6E-04	-0.6
16	1.5E-03	1.1
17	1.5E-03	1.1
18	-1.3E-03	-1.1
19	-1.2E-03	-1.0
20	-1.2E-03	-1.0
21	-1.3E-03	-1.0
22	-1.2E-03	-1.0
23	-9.8E-04	-0.8
24	-8.8E-04	-0.7
25	-1.0E-03	-0.8
26	-1.1E-03	-0.9
27	-1.4E-03	-1.1
28	-1.4E-03	-1.1
29	-1.2E-03	-1.0
30	-2.1E-04	-0.2
31	-2.1E-04	-0.2
32	-1.1E-03	-0.9
33	1.1E-03	0.8
34	-3.4E-04	-0.3
35	-6.4E-04	-0.6
36	-5.0E-04	-0.4
37	-9.2E-04	-0.8
38	-9.2E-04	-0.8
39	-9.0E-04	-0.8
40	-8.9E-04	-0.7
41	-6.6E-04	-0.6
42	-7.3E-04	-0.6
43	-7.2E-04	-0.6
44	-6.3E-04	-0.5
45	-8.9E-04	-0.7
46	-9.0E-04	-0.8
47	-8.9E-04	-0.7
48	-7.5E-04	-0.6
49	-5.5E-04	-0.5
50	-6.9E-04	-0.6
51	-7.7E-04	-0.6
52	-1.2E-04	-0.1
53	-2.7E-04	-0.2
54	1.3E-03	1.1
55	9.0E-04	0.7
56	-1.5E-03	-1.3
57	2.2E-03	1.8
58	1.0E-03	0.8

SA2	Estimated coefficient	t-statistic
59	-1.7E-03	-1.5
60	-1.7E-03	-1.5
61	-7.4E-04	-0.6
62	1.3E-03	1.1
63	-2.1E-05	0.0
64	-2.0E-05	0.0
65	-1.3E-03	-1.1
66	6.7E-04	0.5
67	6.6E-04	0.5
68	-1.3E-03	-1.1
69	2.3E-04	0.2
70	-1.3E-03	-1.1
71	4.3E-04	0.3
72	4.6E-05	0.0
73	1.2E-04	0.1
74	7.6E-05	0.1
75	-1.3E-03	-1.0
76	1.2E-04	0.1
77	-1.0E-04	-0.1
78	-1.6E-05	0.0
79	4.4E-05	0.0
80	8.5E-03	3.2
81	2.3E-03	1.8
82	2.2E-03	1.7
83	0.0E+00	0.0
84	2.4E-03	1.8
85	2.2E-03	1.7
86	2.4E-03	1.8
87	3.7E-04	0.3
88	9.7E-04	1.1
89	4.2E-04	0.3
90	4.0E-04	0.3
91	1.4E-03	1.1
92	3.4E-04	0.3
93	1.3E-03	1.0
94	-6.0E-04	-0.5
95	-6.2E-04	-0.5
96	-6.2E-04	-0.5
97	-5.1E-04	-0.4
98	-5.9E-04	-0.5
99	-1.3E-03	-1.1
100	-1.3E-03	-1.0
101	-1.3E-03	-1.0
102	-1.3E-03	-1.1
103	-1.3E-03	-1.1
104	-1.4E-03	-1.1
105	-2.7E-03	-2.5
106	-2.6E-03	-2.4
107	-2.8E-03	-2.5
108	-2.8E-03	-2.5
109	-2.8E-03	-2.5
110	-2.2E-03	-2.0
111	-2.2E-03	-2.0
112	-2.2E-03	-2.0
113	-1.1E-03	-1.0
114	-1.1E-03	-1.0
115	-1.1E-03	-1.0
116	-1.1E-03	-1.0

SA2	Estimated coefficient	t-statistic
117	-4.7E-03	-5.6
118	-2.9E-03	-3.3
119	-4.9E-03	-5.7
120	-3.6E-03	-3.9
121	-4.9E-03	-5.7
122	-4.0E-03	-4.7
123	-4.8E-03	-5.6
124	-5.0E-03	-5.8
125	-5.0E-03	-5.9
126	-3.5E-03	-4.1
127	-1.8E-03	-0.8
128	-1.3E-03	-1.4
129	-1.4E-03	-1.5
130	-1.2E-03	-1.3
131	-3.4E-05	0.0
132	-1.2E-03	-1.3
133	-1.3E-03	-1.4
134	-1.4E-03	-1.5
135	-1.8E-03	-1.8
136	-1.8E-03	-1.7
137	-1.7E-03	-1.6
138	-1.8E-03	-1.8
139	-1.5E-03	-1.6
140	-1.7E-03	-1.9
141	-1.6E-03	-1.7
142	-1.7E-03	-1.8
143	-1.8E-03	-1.9
144	-1.7E-03	-1.8
145	-1.7E-03	-1.8
146	-2.2E-03	-2.0
147	-2.2E-03	-2.0
148	-2.2E-03	-2.0
149	-2.2E-03	-2.0
150	-2.2E-03	-2.0
151	-2.2E-03	-1.9
152	-2.2E-03	-1.9
153	-2.2E-03	-2.0
154	-2.2E-03	-2.0
155	-2.3E-03	-2.0
156	3.6E-03	3.2
157	3.7E-03	3.3
158	3.6E-03	3.2
159	3.6E-03	3.2
160	-9.3E-04	-0.8
161	-9.7E-04	-0.8
162	-8.7E-04	-0.8
163	-9.4E-04	-0.8
164	-8.4E-04	-0.7
165	-1.0E-03	-0.9
166	-9.5E-04	-0.8
167	-1.2E-03	-1.0
168	-1.2E-03	-1.0
169	-1.2E-03	-1.0
170	-1.2E-03	-1.0
171	-1.2E-03	-1.0
172	-1.2E-03	-1.0
173	-2.4E-03	-2.1
174	-2.4E-03	-2.1

SA2	Estimated coefficient	t-statistic
175	-2.4E-03	-2.1
176	-2.4E-03	-2.1
177	-2.4E-03	-2.1
178	5.0E-04	0.5
179	-2.4E-03	-2.1
180	-2.4E-03	-2.1
181	-1.2E-04	-0.1
182	-1.3E-04	-0.1
183	-4.4E-04	-0.4
184	-4.9E-04	-0.4
185	-4.8E-04	-0.4
186	-5.1E-04	-0.4
187	-5.1E-04	-0.4
188	-5.1E-04	-0.4
189	-4.6E-04	-0.4
190	0.0E+00	0.0
191	-4.8E-04	-0.4
192	-1.8E-03	-1.8
193	-1.8E-03	-1.8
194	7.2E-05	0.1
195	4.7E-05	0.0
196	1.0E-04	0.1
197	6.8E-05	0.1
198	1.0E-04	0.1
199	6.1E-05	0.1
200	6.0E-05	0.1
201	6.0E-05	0.1
202	8.3E-06	0.0
203	-2.0E-03	-1.8
204	-2.2E-03	-2.0
205	-2.3E-03	-2.1
206	-1.3E-04	-0.1
207	-1.1E-04	-0.1
208	1.4E-03	1.2
209	-1.1E-04	-0.1
210	-2.0E-05	0.0
211	-1.4E-04	-0.1
212	-3.4E-05	0.0
213	7.2E-04	0.7
214	1.3E-04	0.1
215	1.8E-04	0.2
216	2.9E-04	0.3
217	1.8E-04	0.2
218	1.2E-04	0.1
219	-1.3E-03	-1.1
220	3.3E-04	0.3
221	-1.2E-03	-1.1
222	0.0E+00	0.0
223	-2.8E-04	-0.3
224	-1.2E-03	-1.1
225	-1.1E-03	-1.0
226	-1.2E-03	-1.0
227	-8.6E-05	-0.1
228	-2.7E-04	-0.2
229	-1.4E-04	-0.1
230	-1.4E-04	-0.1
231	-2.8E-03	-2.5
232	-2.8E-03	-2.5

SA2	Estimated coefficient	t-statistic
233	-2.7E-03	-2.5
234	-1.1E-03	-1.0
235	-1.1E-03	-1.0
236	-1.2E-03	-1.1
237	-1.2E-03	-1.1
238	-1.2E-03	-1.1
239	-8.4E-04	-0.8
240	-1.1E-03	-1.0
241	-1.2E-03	-1.1
242	-2.8E-04	-0.3
243	-1.3E-03	-1.1
244	-9.8E-04	-0.9
245	-9.5E-04	-0.9
246	-7.8E-04	-0.7
247	-9.6E-04	-0.9
248	-5.6E-04	-0.5
249	-6.8E-04	-0.6
250	-1.0E-03	-0.9
251	-9.9E-04	-0.9
252	3.7E-03	3.3
253	3.6E-03	3.2
254	6.7E-05	0.1
255	6.8E-05	0.1
256	2.4E-05	0.0
257	2.0E-05	0.0
258	6.7E-06	0.0
259	-9.5E-04	-0.8
260	-9.4E-04	-0.8
261	-8.4E-04	-0.7
262	-9.4E-04	-0.8
263	-1.0E-03	-0.9
264	-8.4E-04	-0.7
265	-6.7E-04	-0.6
266	-7.3E-04	-0.6
267	-7.9E-04	-0.7
268	-6.6E-04	-0.6
269	-8.2E-04	-0.7
270	-7.9E-04	-0.7
271	-7.5E-04	-0.7
272	-8.2E-04	-0.7
273	-7.7E-04	-0.7
274	-8.3E-04	-0.7
275	-7.4E-04	-0.7
276	-7.9E-04	-0.7
277	-1.2E-03	-1.0
278	-1.7E-03	-1.5
279	-1.7E-03	-1.5
280	-1.6E-03	-1.4
281	-1.2E-03	-1.0
282	-1.2E-03	-1.0
283	-1.2E-03	-1.0
284	-7.6E-04	-0.7
285	-1.4E-03	-1.2
286	-1.2E-03	-1.1
287	-1.1E-03	-1.0
288	-1.3E-03	-1.2
289	-3.3E-04	-0.3
290	-9.3E-04	-0.8

SA2	Estimated coefficient	t-statistic
291	-1.1E-03	-1.0
292	-3.8E-04	-0.3
293	-1.2E-03	-1.1
294	-5.9E-05	-0.1
295	-1.4E-03	-1.2
296	-6.0E-04	-0.5
297	-5.5E-04	-0.5
298	-4.7E-04	-0.4
299	-6.1E-04	-0.6
300	-5.7E-04	-0.5
301	-4.4E-04	-0.4
302	-6.6E-04	-0.6
303	-5.5E-04	-0.5
304	-5.7E-04	-0.5
305	5.1E-04	0.5
306	6.2E-04	0.6
307	3.8E-04	0.4
308	4.8E-04	0.4
309	4.2E-04	0.4
310	4.5E-04	0.4
311	4.4E-04	0.4
312	4.6E-04	0.4
313	3.6E-04	0.3
314	-2.0E-04	-0.2
315	1.7E-03	1.5
316	-1.7E-05	0.0
317	1.3E-04	0.1
318	-2.7E-04	-0.3
319	-3.0E-04	-0.3
320	-2.3E-04	-0.2
321	-2.2E-04	-0.2
322	-1.9E-04	-0.2
323	-1.9E-04	-0.2
324	-2.0E-04	-0.2
325	4.1E-04	0.4
326	2.3E-05	0.0
327	-5.3E-04	-0.5
328	-4.4E-04	-0.4
329	-5.5E-04	-0.5
330	-4.9E-04	-0.4
331	-2.6E-04	-0.2
332	-4.2E-04	-0.4
333	-4.9E-03	-4.7
334	-4.9E-03	-4.7
335	-4.8E-03	-4.5
336	-5.0E-03	-4.8
337	-5.0E-03	-4.7
338	-5.0E-03	-4.7
339	-1.1E-03	-1.0
340	-1.4E-03	-1.2
341	-2.2E-03	-2.0
342	-2.1E-03	-1.9
343	-2.0E-03	-1.9
344	-1.8E-03	-1.6
345	-6.1E-04	-0.6
346	-1.0E-03	-0.9
347	-1.2E-03	-1.1
348	-7.8E-04	-0.7

SA2	Estimated coefficient	t-statistic
349	2.8E-05	0.0
350	5.1E-04	0.5
351	-1.1E-03	-1.0
352	-8.4E-04	-0.8
353	-7.6E-04	-0.7
354	-9.8E-04	-0.9
355	-1.0E-03	-0.9
356	-9.2E-04	-0.8
357	-8.1E-04	-0.7
358	-9.9E-04	-0.9
359	-2.7E-04	-0.2
360	3.3E-04	0.3
361	1.8E-04	0.1
362	2.4E-04	0.2
363	2.9E-04	0.2
364	1.7E-04	0.1
365	4.0E-04	0.3
366	2.0E-04	0.2
367	2.2E-04	0.2
368	2.2E-04	0.2
369	-5.7E-04	-0.5
370	-5.7E-04	-0.5
371	2.5E-04	0.2
372	1.8E-04	0.1
373	-6.3E-04	-0.5
374	-1.6E-04	-0.1
375	-7.7E-05	-0.1
376	1.0E-03	0.8
377	-2.2E-04	-0.2
378	-4.6E-04	-0.4
379	-4.9E-04	-0.4
380	-6.4E-04	-0.5
381	-4.9E-04	-0.4
382	1.3E-03	1.0
383	1.8E-03	1.3
384	1.8E-03	1.4
385	-1.8E-03	-1.4
386	-1.8E-03	-1.4
387	-1.8E-03	-1.5
388	4.6E-04	0.4
389	3.7E-04	0.3
390	3.6E-04	0.3
391	3.9E-04	0.3
392	3.3E-04	0.3
393	9.3E-04	0.7
394	8.7E-04	0.7
395	8.6E-04	0.7
396	1.0E-03	0.8
397	-2.3E-04	-0.2
398	-2.2E-04	-0.2
399	-1.8E-04	-0.1
400	-3.2E-04	-0.3
401	-2.7E-04	-0.2
402	-3.9E-04	-0.3
403	-4.6E-04	-0.4
404	-3.3E-04	-0.3
405	-5.2E-04	-0.4
406	3.6E-03	3.2

SA2	Estimated coefficient	t-statistic
407	3.7E-03	3.3
408	-2.4E-03	-2.1
409	-2.4E-03	-2.1
410	-2.2E-03	-2.0
411	-2.3E-03	-2.0
412	1.6E-03	1.5
413	3.5E-04	0.3
414	2.4E-04	0.2
415	1.2E-03	1.1
416	1.4E-03	1.3
417	1.4E-03	1.2
418	6.5E-04	0.6
419	1.4E-03	1.3
420	-2.8E-03	-2.5
421	-2.3E-03	-2.1
422	-2.8E-03	-2.6
423	-1.0E-03	-0.9
424	3.3E-04	0.3
425	-8.6E-04	-0.8
426	6.9E-04	0.6
427	-3.8E-04	-0.3
428	-9.9E-04	-0.9
429	-1.0E-03	-0.9
430	-1.0E-03	-0.9
431	-1.0E-03	-0.9
432	8.1E-05	0.1
433	9.3E-05	0.1
434	1.9E-05	0.0
435	-1.4E-03	-1.2
436	-1.4E-03	-1.3
437	-1.2E-03	-1.1
438	-1.2E-03	-1.1
439	-3.2E-04	-0.3
440	-3.5E-04	-0.3
441	-5.3E-04	-0.5
442	-5.7E-04	-0.5
443	-6.9E-04	-0.6
444	8.6E-04	0.8
445	-3.7E-04	-0.3
446	-4.4E-05	0.0
447	-5.6E-05	-0.1
448	9.3E-04	0.8
449	-1.1E-03	-1.0
450	-1.1E-03	-1.0
451	-4.3E-04	-0.4
452	-3.3E-04	-0.3
453	5.7E-05	0.0
454	-1.1E-03	-0.9
455	-1.2E-03	-0.9
456	1.7E-05	0.0
457	2.6E-05	0.0
458	-1.1E-03	-0.9
459	-8.2E-04	-0.7
460	-7.6E-04	-0.6
461	-5.3E-04	-0.4
462	-6.6E-04	-0.5

Equation 2: CONST2(j)

SA2	Estimated coefficient	t-statistic
1	0.04889	3.8
2	0.04871	3.8
3	0.047904	3.7
4	0.048266	3.7
5	0.047742	3.7
6	0.048597	3.7
7	0.048566	3.7
8	0.049017	3.8
9	0.018814	1.5
10	0.048521	3.7
11	0.030086	2.3
12	0.044171	3.4
13	0.040898	3.1
14	0.044708	3.4
15	0.049336	3.8
16	0.041763	3.3
17	0.038752	3.0
18	0.038842	3.0
19	0.039129	3.0
20	0.039198	3.0
21	0.038267	2.9
22	0.037518	2.9
23	0.037994	2.9
24	0.039257	3.0
25	0.039201	3.0
26	0.037313	2.9
27	0.031485	2.4
28	0.033194	2.6
29	0.039846	3.1
30	0.03005	2.3
31	0.025334	1.9
32	0.039867	3.0
33	0.043257	3.2
34	0.037756	2.8
35	0.045255	3.5
36	0.025824	2.0
37	0.032829	2.4
38	0.036353	2.7
39	0.032949	2.4
40	0.034557	2.6
41	0.032451	2.4
42	0.033389	2.5
43	0.035727	2.7
44	0.031543	2.3
45	0.032336	2.4
46	0.033359	2.5
47	0.035011	2.6
48	0.02999	2.2
49	0.025142	1.8
50	0.030166	2.2
51	0.02455	1.9
52	0.024881	1.9
53	0.030474	2.3
54	0.033667	2.5
55	0.02305	1.7
56	0.026613	2.1
57	0.029251	2.2
58	0.03255	2.5
59	0.045905	3.2
60	0.049766	3.5
61	0.027913	2.2
62	0.033565	2.6
63	0.036881	2.8

SA2	Estimated coefficient	t-statistic
64	0.036577	2.8
65	0.030753	2.3
66	0.033813	2.6
67	0.036044	2.8
68	0.039566	2.9
69	9.85E-03	0.7
70	0.040896	3.1
71	0.036263	2.5
72	0.033015	2.5
73	0.043718	3.3
74	0.043834	3.3
75	0.044974	3.3
76	0.033197	2.5
77	0.024043	1.9
78	0.021553	1.5
79	0.036813	2.7
80	0	0.0
81	0.034132	2.6
82	0.050439	3.8
83	0.031319	2.4
84	0.029405	2.3
85	0.097297	7.3
86	0.043034	3.1
87	0.03289	2.5
88	0.040114	2.9
89	0.035025	2.6
90	0.037232	2.7
91	0.036988	2.7
92	-0.041414	-3.7
93	0.02769	2.1
94	1.52E-03	0.1
95	4.10E-03	0.3
96	-1.81E-03	-0.1
97	-2.59E-04	0.0
98	-5.67E-03	-0.4
99	0.145624	5.7
100	0.044848	3.1
101	0.027778	2.1
102	-9.64E-04	-0.1
103	0.048672	3.4
104	0.027617	1.9
105	0.042505	3.1
106	0.038849	2.9
107	0.043417	3.2
108	0.040158	3.0
109	0.039347	2.9
110	0.041102	3.0
111	0.042141	3.1
112	0.03825	2.9
113	0.043086	3.1
114	0.041024	3.0
115	0.041941	3.1
116	0.042251	3.1
117	0.042542	3.1
118	0.042091	3.0
119	0.04216	3.1
120	0.042684	3.1
121	0.041516	3.0
122	0.042004	3.0
123	0.042428	3.1
124	0.038976	2.9
125	0.042002	3.0
126	0.041995	3.0

SA2	Estimated coefficient	t-statistic
127	0.041983	3.0
128	0.042154	3.1
129	0.038438	2.8
130	0.042117	3.0
131	0.039638	2.9
132	0.041829	3.0
133	0.037911	2.8
134	0.039152	2.9
135	0.043303	3.1
136	0.042478	3.1
137	0.042162	3.1
138	0.042782	3.1
139	0.042937	3.1
140	0.044108	3.2
141	0.043012	3.1
142	0.043388	3.1
143	0.043809	3.2
144	0.042389	3.1
145	0.041748	3.0
146	0.040021	3.0
147	0.041038	3.0
148	0.040355	3.0
149	0.041388	3.0
150	0.041163	3.0
151	0.042625	3.1
152	0.042541	3.1
153	0.042298	3.1
154	0.04134	3.0
155	0.040643	3.0
156	0.039167	2.9
157	0.038388	2.9
158	0.038748	2.9
159	0.03822	2.9
160	0.038626	2.9
161	0.038233	2.9
162	0.038696	2.9
163	0.03864	2.9
164	0.039085	2.9
165	0.038402	2.9
166	0.03878	2.9
167	0.038321	2.9
168	0.04252	3.1
169	0.042117	3.1
170	0.039684	2.9
171	0.040498	3.0
172	0.039715	2.9
173	0.040863	3.0
174	0.041951	3.1
175	0.04258	3.1
176	0.043034	3.1
177	0.042797	3.1
178	0.040486	3.0
179	0.041271	3.0
180	0.042082	3.1
181	0.037984	2.8
182	0.037916	2.8
183	0.037961	2.9
184	0.0373	2.8
185	0.038313	2.9
186	0.037799	2.8
187	0.038235	2.9
188	0.037968	2.8
189	0.038338	2.9

SA2	Estimated coefficient	t-statistic
190	0.037383	2.8
191	0.037685	2.8
192	0.042693	3.1
193	0.042213	3.1
194	0.037865	2.8
195	0.037693	2.8
196	0.036251	2.7
197	0.037834	2.8
198	0.039929	2.9
199	0.038558	2.8
200	0.036277	2.7
201	0.036304	2.7
202	0.037622	2.8
203	0.035575	2.7
204	0.0378	2.8
205	0.039064	2.9
206	0.03501	2.6
207	0.02995	2.3
208	0.020614	1.6
209	0.022843	1.8
210	0.037578	2.8
211	0.034516	2.6
212	0.036484	2.7
213	0.038928	2.9
214	0.038614	2.9
215	0.039625	3.0
216	0.039443	3.0
217	0.039149	2.9
218	0.039676	3.0
219	0.041864	3.1
220	0.028502	2.2
221	0.045357	3.3
222	0.045175	3.3
223	0.039531	3.0
224	0.0449	3.3
225	0.045038	3.3
226	0.045123	3.3
227	8.52E-03	0.7
228	0.012612	1.0
229	8.72E-03	0.7
230	0.013564	1.2
231	0.038724	2.9
232	0.040231	3.0
233	0.040201	3.0
234	0.030435	2.4
235	0.033577	2.6
236	0.040549	3.0
237	0.040415	3.0
238	0.039417	3.0
239	0.039417	3.0
240	0.041145	3.1
241	0.042747	3.2
242	0.041178	3.1
243	0.040205	3.0
244	0.038789	2.9
245	0.038061	2.8
246	0.038927	2.9
247	0.038441	2.9
248	0.038332	2.9
249	0.038323	2.9
250	0.037347	2.8
251	0.037419	2.8
252	0.039216	2.9

SA2	Estimated coefficient	t-statistic
253	0.038601	2.9
254	0.039732	3.0
255	0.039146	2.9
256	0.037823	2.8
257	0.039282	2.9
258	0.039457	3.0
259	0.038924	2.9
260	0.038873	2.9
261	0.038667	2.9
262	0.038237	2.9
263	0.038214	2.9
264	0.039761	3.0
265	0.038235	2.9
266	0.026237	1.9
267	0.039919	3.0
268	0.033919	2.5
269	0.037156	2.8
270	0.039536	3.0
271	0.03929	2.9
272	0.03837	2.9
273	0.037938	2.8
274	0.039278	2.9
275	0.029696	2.2
276	0.022533	1.8
277	0.037793	2.8
278	0.033529	2.5
279	0.033385	2.5
280	0.033807	2.5
281	0.03333	2.5
282	0.034548	2.6
283	0.038772	2.9
284	0.038536	2.9
285	0.039278	2.9
286	0.039377	2.9
287	0.039617	3.0
288	0.038241	2.9
289	0.037755	2.8
290	0.038458	2.9
291	0.037244	2.8
292	0.03741	2.8
293	0.038926	2.9
294	0.038603	2.9
295	0.034435	2.6
296	0.041335	3.0
297	0.039251	2.9
298	0.039107	2.9
299	0.038401	2.9
300	0.040198	3.0
301	0.039021	2.9
302	0.038659	2.9
303	0.03917	2.9
304	0.039078	2.9
305	0.041786	3.1

SA2	Estimated coefficient	t-statistic
306	0.040588	3.0
307	0.038889	2.9
308	0.039469	2.9
309	0.040702	3.0
310	0.041239	3.0
311	0.039462	2.9
312	0.041224	3.0
313	0.039183	2.9
314	0.043957	3.2
315	0.042249	3.1
316	0.043404	3.2
317	0.039924	3.0
318	0.042369	3.1
319	0.041214	3.0
320	0.041909	3.1
321	0.042801	3.1
322	0.044681	3.2
323	0.044489	3.2
324	0.045023	3.3
325	0.038223	2.9
326	0.038438	2.9
327	0.041243	3.0
328	0.039657	2.9
329	0.043994	3.2
330	0.042037	3.1
331	0.039084	2.9
332	0.042305	3.1
333	0.04375	3.2
334	0.04227	3.1
335	0.043234	3.1
336	0.042125	3.1
337	0.042999	3.1
338	0.042154	3.1
339	0.025072	1.9
340	0.043546	3.2
341	0.04079	3.0
342	0.043282	3.2
343	0.044087	3.2
344	0.038697	2.9
345	0.039686	3.0
346	0.036459	2.7
347	0.037764	2.8
348	0.042828	3.1
349	0.036973	2.8
350	0.040284	3.0
351	0.038979	2.9
352	0.045398	3.3
353	0.037984	2.8
354	0.038582	2.9
355	0.039801	3.0
356	0.038219	2.9
357	0.040376	3.0
358	0.038922	2.9

SA2	Estimated coefficient	t-statistic
359	0.040167	3.0
360	0.036719	2.7
361	0.025179	1.8
362	0.038552	2.8
363	0.037123	2.8
364	0.038471	2.9
365	0.040772	3.0
366	0.016363	1.2
367	0.017749	1.3
368	0.040775	3.0
369	0.038932	3.0
370	0.045935	3.5
371	0.037446	2.8
372	0.036735	2.8
373	0.040584	3.0
374	0.044283	3.4
375	0.04777	3.6
376	0.033985	2.4
377	0.033657	2.4
378	0.031239	2.4
379	0.030601	2.4
380	0.090763	5.8
381	0.030717	2.4
382	0.038392	2.8
383	0.030525	2.2
384	0.030763	2.3
385	0.066302	4.4
386	0.011809	0.9
387	0.070993	5.1
388	0.031805	2.4
389	0.03694	2.7
390	0.028392	2.2
391	0.034498	2.6
392	0.062567	4.5
393	0.041625	3.0
394	0.029104	2.2
395	0.044606	3.3
396	0.027947	2.1
397	0.036601	2.8
398	0.036596	2.8
399	0.036099	2.7
400	0.033704	2.6
401	0.036313	2.7
402	0.07382	5.4
403	0.051892	3.9
404	0.041783	3.2
405	0.053756	4.0
406	0.03914	2.9
407	0.037545	2.8
408	0.040903	3.0
409	0.03837	2.9
410	0.034798	2.6
411	0.035981	2.7

SA2	Estimated coefficient	t-statistic
412	0.035378	2.7
413	0.040192	3.0
414	0.038756	2.9
415	0.039416	3.0
416	0.041018	3.1
417	0.041263	3.1
418	0.040042	3.0
419	0.039963	3.0
420	0.040973	3.1
421	0.039021	2.9
422	0.03942	3.0
423	0.038999	3.0
424	0.041133	3.1
425	0.039291	3.0
426	0.041173	3.1
427	0.052409	3.7
428	0.038848	2.9
429	0.038688	2.9
430	0.038945	2.9
431	0.038751	2.9
432	0.03978	3.0
433	0.037952	2.8
434	0.038309	2.9
435	0.039135	2.9
436	0.038757	2.9
437	0.038544	2.9
438	0.037542	2.8
439	0.036853	2.8
440	0.037167	2.8
441	0.03884	2.9
442	0.038857	2.9
443	0.038481	2.9
444	0.037443	2.8
445	0.03867	2.9
446	0.039472	2.9
447	0.036114	2.7
448	0.038139	2.9
449	0.037578	2.8
450	0.035853	2.7
451	0.031484	2.4
452	0.031087	2.4
453	0.048214	3.5
454	0.045482	3.4
455	0.049044	3.5
456	0.050801	3.6
457	0.043931	3.3
458	0.023491	1.9
459	0.052646	3.7
460	9.97E-03	0.8
461	0.039243	2.9
462	0.040083	2.9

Equation 3: CONST3(j)

SA2	Estimated coefficient	t-statistic
1	0.824867	18.9
2	0.931409	22.1
3	0.966982	23.4
4	0.968522	23.3
5	1.00475	24.5
6	0.878618	20.5
7	0.86111	20.0
8	0.867317	20.2
9	1.74479	45.1
10	0.905461	20.6
11	1.93657	46.6
12	1.19349	30.4
13	2.16896	40.9
14	1.82462	35.8
15	1.27164	28.2
16	1.85715	37.6
17	1.86894	37.2
18	0.522475	10.3
19	0.523841	10.3
20	0.520951	10.3
21	0.52629	10.5
22	0.529086	10.6
23	0.528203	10.5
24	0.53413	10.7
25	0.515729	10.1
26	0.548583	11.1
27	1.245	27.6
28	1.06959	23.2
29	1.49125	31.3
30	2.0073	48.2
31	2.07974	51.8
32	0.621174	12.0
33	1.79524	32.3
34	1.01075	25.4
35	2.03212	45.5
36	1.58432	35.4
37	0.857851	22.0
38	0.999921	26.4
39	0.895744	23.3
40	0.892541	23.0
41	0.818099	20.5
42	0.82891	21.0
43	1.30024	34.4
44	0.998035	26.4
45	0.928328	24.4
46	0.874518	22.6
47	0.927187	24.2
48	1.33347	35.6
49	2.0302	41.9
50	0.982367	25.4
51	1.82367	47.0
52	1.60681	41.4
53	0.889641	21.0
54	2.56431	57.4
55	2.29687	42.3
56	2.02749	49.5
57	1.46383	23.2
58	2.16843	42.9
59	2.4804	56.4
60	2.44716	56.4
61	4.40785	93.4
62	2.65147	62.5
63	1.52437	27.4

SA2	Estimated coefficient	t-statistic
64	1.44086	25.9
65	1.57368	28.2
66	1.08575	19.6
67	1.22119	22.0
68	0.937191	17.0
69	1.40014	22.5
70	0.845019	15.1
71	2.24006	35.9
72	1.63919	25.9
73	0.706143	12.4
74	0.690768	12.1
75	0.827026	14.6
76	1.52458	39.4
77	2.49725	55.2
78	1.35953	31.9
79	1.53676	37.7
80	0	0.0
81	0.978591	16.2
82	1.75022	27.1
83	0.818989	13.3
84	1.03207	16.4
85	1.09271	14.5
86	1.11846	19.0
87	1.59975	32.0
88	1.25382	34.6
89	1.53147	37.6
90	1.47979	33.1
91	2.00816	50.7
92	0	0.0
93	1.9084	45.4
94	1.04967	22.0
95	1.144	25.6
96	1.01894	21.7
97	0.947917	19.2
98	1.01045	20.9
99	9.83036	167.8
100	1.32843	24.1
101	1.59661	29.6
102	0.946891	18.4
103	1.30254	24.4
104	2.01084	38.1
105	0.177326	7.5
106	0.128248	3.8
107	0.185695	7.4
108	0.159026	5.0
109	0.102828	3.2
110	0.227631	12.0
111	0.206979	8.9
112	0.218687	7.1
113	0.179889	9.0
114	0.165963	6.7
115	0.154164	6.8
116	0.178315	6.6
117	0.09279	6.0
118	0.079645	5.3
119	0.079569	5.2
120	0.191148	10.0
121	0.160202	7.1
122	0.07443	4.9
123	0.082866	5.4
124	0.111957	3.8
125	0.067353	4.3
126	0.075241	4.9

SA2	Estimated coefficient	t-statistic
127	0.161753	7.9
128	0.084585	5.4
129	0.184606	7.3
130	0.088015	5.7
131	0.160116	5.9
132	0.077906	4.9
133	0.120462	4.2
134	0.121055	4.4
135	0.040692	2.5
136	0.050262	3.3
137	0.060774	3.9
138	0.051971	3.4
139	0.101397	6.5
140	0.115394	7.5
141	0.103723	6.7
142	0.11313	7.4
143	0.163498	9.1
144	0.080531	5.1
145	0.161336	8.0
146	-0.075612	-2.3
147	-0.043309	-1.5
148	-0.047401	-1.5
149	-0.035215	-1.2
150	-0.039106	-1.3
151	-0.05327	-3.2
152	-0.016922	-0.8
153	-0.017143	-0.9
154	-2.40E-03	-0.1
155	-0.057691	-1.9
156	-0.064176	-1.9
157	-0.135786	-3.9
158	-0.057252	-1.6
159	-0.112511	-3.2
160	-0.10793	-3.1
161	-0.133924	-3.8
162	-0.110127	-3.2
163	-0.123454	-3.6
164	-0.116965	-3.4
165	-0.131908	-3.8
166	-0.11422	-3.4
167	-0.036375	-1.0
168	0.054079	2.8
169	0.038327	1.7
170	-8.04E-03	-0.2
171	0.02686	0.9
172	0.018234	0.6
173	0.017582	0.6
174	0.016223	0.7
175	0.011047	0.7
176	0.031488	1.8
177	0.029868	1.9
178	-0.017064	-0.6
179	-5.29E-04	0.0
180	0.026695	1.2
181	-1.70E-03	0.0
182	-0.04342	-1.2
183	0.113202	3.3
184	0.068985	2.0
185	0.068407	2.0
186	-0.093107	-2.7
187	0.028763	0.8
188	-0.063861	-1.8
189	-0.083588	-2.4

SA2	Estimated coefficient	t-statistic
190	-0.081718	-2.3
191	-0.041194	-1.2
192	7.45E-05	0.0
193	6.99E-03	0.3
194	0.369292	10.6
195	0.490933	14.2
196	0.308888	9.0
197	0.364699	11.4
198	0.269995	11.0
199	0.219812	7.3
200	0.413532	11.9
201	0.36968	10.7
202	0.442876	12.7
203	0.457053	13.0
204	0.287678	8.3
205	0.208819	6.0
206	0.5067	14.6
207	0.916455	25.5
208	1.7488	45.0
209	1.1275	30.5
210	0.581534	16.7
211	0.558904	16.0
212	0.657448	18.8
213	0.391597	11.2
214	0.366002	10.5
215	0.273016	7.9
216	0.433819	12.4
217	0.37254	10.7
218	0.26587	7.7
219	1.68248	66.2
220	1.29234	35.1
221	0.0317	1.8
222	0.023066	1.4
223	0.045282	1.3
224	0.028616	1.5
225	0.023522	1.3
226	0.014134	0.9
227	1.07713	26.8
228	1.32143	31.9
229	1.08468	26.8
230	1.38889	32.9
231	0.100136	2.9
232	0.156362	4.5
233	0.102163	3.0
234	0.673968	18.6
235	0.494261	14.0
236	0.146343	4.2
237	0.217263	6.3
238	0.143007	4.2
239	0.316646	9.3
240	0.29815	8.6
241	0.361728	11.3
242	0.398804	11.4
243	0.083671	2.4
244	-0.016232	-0.5
245	-0.099161	-2.9
246	-8.94E-03	-0.3
247	-0.078496	-2.3
248	-0.052924	-1.5
249	-0.081906	-2.4
250	-0.076182	-2.2
251	-0.099785	-2.9
252	-0.056796	-1.6

SA2	Estimated coefficient	t-statistic
253	0.128051	3.7
254	0.043396	1.3
255	0.096252	2.8
256	-0.037126	-1.1
257	-0.03059	-0.9
258	-0.017749	-0.5
259	-0.094666	-2.7
260	-0.09959	-2.9
261	-0.122783	-3.5
262	-0.105912	-3.0
263	-0.11585	-3.3
264	0.098788	2.9
265	0.268669	7.8
266	1.77837	46.4
267	0.106457	3.1
268	0.597812	17.2
269	0.439094	12.7
270	0.157247	4.6
271	0.180975	5.3
272	0.150342	4.4
273	0.304731	8.8
274	0.058294	1.7
275	0.760156	21.6
276	2.2109	53.0
277	0.424021	12.4
278	1.69429	46.1
279	0.953764	26.6
280	1.45117	38.4
281	0.705426	20.2
282	0.896966	25.6
283	0.21898	6.4
284	0.284837	8.3
285	-0.044276	-1.3
286	0.021056	0.6
287	0.097754	2.9
288	0.261822	7.7
289	0.363395	10.6
290	0.217462	6.4
291	0.4746	13.8
292	0.197796	5.8
293	0.069351	2.0
294	0.108911	3.2
295	0.716266	20.5
296	-0.051907	-2.0
297	-0.098487	-3.0
298	6.53E-03	0.2
299	-0.114061	-3.3
300	-0.062483	-1.9
301	-0.067628	-2.0
302	-0.112803	-3.3
303	-0.132644	-3.8
304	-0.126186	-3.6
305	-0.048372	-2.2

SA2	Estimated coefficient	t-statistic
306	-0.06799	-2.4
307	-0.072971	-2.3
308	-0.070612	-2.3
309	-0.049045	-1.9
310	-0.050907	-2.1
311	-0.082344	-2.5
312	-0.063063	-2.4
313	-0.07759	-2.4
314	0.207296	11.6
315	0.219877	9.1
316	0.213728	10.6
317	0.173672	5.4
318	0.173779	7.2
319	0.213401	7.5
320	0.193007	7.5
321	0.201711	9.0
322	0.15408	10.4
323	0.164759	10.4
324	0.175203	11.8
325	0.092259	2.7
326	0.084837	2.5
327	0.235422	11.9
328	0.264365	9.3
329	0.149187	10.0
330	0.103462	6.9
331	0.236367	7.4
332	0.125338	8.4
333	0.107808	7.0
334	0.077664	5.1
335	0.096118	6.3
336	0.090409	5.9
337	0.112319	7.5
338	0.093866	6.2
339	1.80781	46.0
340	0.42265	14.4
341	1.00262	27.6
342	0.959677	26.7
343	1.26935	34.4
344	0.282611	8.2
345	0.171472	5.2
346	0.207988	6.1
347	0.276271	8.0
348	0.222966	10.5
349	0.327555	9.5
350	0.253824	8.8
351	0.663563	18.9
352	1.0266	30.5
353	0.037368	1.1
354	0.305177	8.9
355	0.117804	3.4
356	0.378088	11.0
357	0.27016	7.9
358	0.058403	1.7

SA2	Estimated coefficient	t-statistic
359	0.092093	2.7
360	1.24148	33.5
361	1.68694	42.9
362	1.04091	28.6
363	0.459145	13.2
364	0.290764	8.4
365	0.875633	24.6
366	2.14046	52.3
367	1.81898	45.6
368	0.618929	17.7
369	1.47388	26.5
370	1.68546	29.5
371	0.834574	13.0
372	0.795889	12.3
373	1.09114	15.4
374	1.98111	32.4
375	1.3769	22.7
376	1.53289	21.1
377	1.26799	18.7
378	0.473158	7.8
379	0.465639	7.7
380	2.0667	30.0
381	0.479485	7.9
382	1.31773	19.9
383	1.08527	16.5
384	1.04248	15.6
385	2.65985	41.8
386	0.962789	14.6
387	1.58933	23.9
388	0.910767	16.5
389	0.961862	18.1
390	1.21292	21.7
391	0.996086	18.9
392	2.23759	43.9
393	1.61142	29.6
394	1.65882	31.5
395	1.49316	27.9
396	1.60321	29.9
397	0.634951	12.2
398	0.632235	12.1
399	0.620741	12.0
400	0.662081	12.7
401	0.594245	11.4
402	1.62478	25.8
403	1.01633	16.9
404	1.15637	18.5
405	0.918868	14.3
406	-0.067556	-1.9
407	-0.082283	-2.4
408	3.06E-03	0.1
409	-0.092872	-2.7
410	0.166683	4.8
411	0.118274	3.4

SA2	Estimated coefficient	t-statistic
412	0.942266	26.2
413	0.535096	15.3
414	0.339633	9.8
415	0.54424	15.4
416	0.765227	21.6
417	0.668296	19.0
418	0.52709	15.1
419	0.683834	19.2
420	0.149236	4.3
421	0.018487	0.5
422	0.088085	2.6
423	0.489588	13.9
424	0.648665	18.2
425	0.510443	14.4
426	0.662649	18.4
427	0.270948	4.6
428	5.95E-03	0.2
429	-0.013039	-0.4
430	5.24E-03	0.2
431	0.087875	2.6
432	0.064415	1.9
433	0.127122	3.7
434	0.07783	2.3
435	-0.070615	-2.0
436	-0.081704	-2.4
437	0.055545	1.6
438	0.054003	1.6
439	0.152195	4.5
440	0.08964	2.6
441	-0.121467	-3.5
442	-0.141299	-4.1
443	0.112599	3.3
444	0.076099	2.2
445	0.172959	5.1
446	0.292819	9.3
447	0.141859	4.1
448	0.23532	6.9
449	0.379655	11.0
450	0.983169	27.1
451	0.468372	7.7
452	0.47122	7.8
453	1.44001	26.8
454	1.59447	32.3
455	1.77142	36.6
456	2.17863	42.6
457	1.27715	22.5
458	1.45817	26.7
459	1.50142	26.7
460	1.16947	20.6
461	0.809911	14.0
462	0.870884	15.1

Equation 4: CONST4(j)

SA2	Estimated coefficient	t-statistic
1	-1.67E-04	0.0
2	-4.85E-04	-0.1
3	-4.37E-04	-0.1
4	-5.27E-04	-0.1
5	-5.30E-04	-0.1
6	-3.27E-04	-0.1
7	-2.64E-04	-0.1
8	-3.94E-04	-0.1
9	-3.50E-03	-0.8
10	2.87E-04	0.1
11	3.17E-03	0.7
12	-6.03E-05	0.0
13	0.015908	3.7
14	4.47E-03	1.0
15	-5.99E-04	-0.1
16	0.013293	3.1
17	0.01403	3.2
18	2.52E-03	0.6
19	2.45E-03	0.6
20	2.41E-03	0.6
21	2.62E-03	0.6
22	2.79E-03	0.6
23	2.68E-03	0.6
24	2.38E-03	0.6
25	2.37E-03	0.5
26	2.92E-03	0.7
27	3.85E-03	0.9
28	3.98E-03	0.9
29	3.45E-04	0.1
30	3.81E-03	0.9
31	9.05E-04	0.2
32	2.32E-03	0.5
33	0.020488	4.7
34	-6.51E-05	0.0
35	4.25E-05	0.0
36	3.38E-04	0.1
37	-1.33E-03	-0.3
38	-4.91E-04	-0.1
39	-1.17E-03	-0.3
40	-1.19E-03	-0.3
41	-1.38E-03	-0.3
42	-1.38E-03	-0.3
43	-1.30E-04	0.0
44	-7.07E-04	-0.2
45	-9.42E-04	-0.2
46	-1.29E-03	-0.3
47	-1.03E-03	-0.2
48	-7.04E-04	-0.2
49	6.10E-03	1.4
50	-1.21E-03	-0.3
51	-2.47E-03	-0.6
52	-1.36E-03	-0.3
53	-1.71E-03	-0.4
54	0.010727	2.5
55	0.014923	3.4
56	-5.97E-03	-1.4
57	4.31E-04	0.1
58	0.01147	2.6
59	0.013198	3.0
60	9.82E-03	2.3
61	0.017887	4.1
62	4.29E-03	1.0
63	0.011494	2.6

SA2	Estimated coefficient	t-statistic
64	0.011565	2.7
65	9.84E-03	2.3
66	0.011749	2.7
67	0.011875	2.7
68	6.77E-03	1.6
69	2.66E-03	0.6
70	5.32E-03	1.2
71	0.0178	4.1
72	0.020542	4.7
73	4.40E-03	1.0
74	4.28E-03	1.0
75	5.08E-03	1.2
76	-1.09E-04	0.0
77	0.011737	2.7
78	9.15E-04	0.2
79	2.77E-03	0.6
80	0	0.0
81	0.011228	2.6
82	0.014544	3.3
83	0.011288	2.6
84	0.012038	2.8
85	0.02197	4.9
86	7.82E-03	1.8
87	7.10E-03	1.6
88	-4.78E-03	-1.1
89	2.23E-03	0.5
90	4.12E-03	1.0
91	2.33E-03	0.5
92	0	0.0
93	2.57E-03	0.6
94	5.83E-03	1.3
95	4.41E-03	1.0
96	5.99E-03	1.4
97	7.97E-03	1.8
98	6.61E-03	1.5
99	-0.047491	-10.8
100	-4.56E-04	-0.1
101	1.61E-03	0.4
102	8.26E-03	1.9
103	7.29E-04	0.2
104	0.010665	2.4
105	9.90E-04	0.2
106	3.02E-03	0.7
107	9.31E-04	0.2
108	2.33E-03	0.5
109	1.47E-03	0.3
110	1.97E-03	0.5
111	1.43E-03	0.3
112	3.24E-03	0.8
113	2.21E-04	0.1
114	9.12E-04	0.2
115	3.89E-04	0.1
116	1.15E-03	0.3
117	5.20E-05	0.0
118	-3.70E-04	-0.1
119	3.33E-04	0.1
120	-7.35E-05	0.0
121	2.41E-04	0.1
122	-2.76E-05	0.0
123	-3.06E-04	-0.1
124	1.30E-03	0.3
125	1.51E-04	0.0
126	1.90E-05	0.0

SA2	Estimated coefficient	t-statistic
127	-3.77E-04	-0.1
128	-2.91E-04	-0.1
129	1.91E-03	0.4
130	-8.15E-04	-0.2
131	-1.01E-04	0.0
132	-3.16E-04	-0.1
133	1.55E-03	0.4
134	1.83E-03	0.4
135	7.54E-04	0.2
136	3.41E-04	0.1
137	3.65E-04	0.1
138	6.82E-04	0.2
139	3.69E-04	0.1
140	-2.31E-04	-0.1
141	2.51E-04	0.1
142	-1.43E-04	0.0
143	4.61E-04	0.1
144	2.99E-04	0.1
145	1.22E-03	0.3
146	4.28E-03	1.0
147	4.04E-03	0.9
148	4.49E-03	1.0
149	3.83E-03	0.9
150	3.82E-03	0.9
151	2.30E-03	0.5
152	2.96E-03	0.7
153	2.76E-03	0.6
154	3.64E-03	0.8
155	4.21E-03	1.0
156	5.13E-03	1.2
157	5.64E-03	1.3
158	6.13E-03	1.4
159	5.73E-03	1.3
160	5.55E-03	1.3
161	5.63E-03	1.3
162	5.15E-03	1.2
163	5.35E-03	1.2
164	4.88E-03	1.1
165	5.67E-03	1.3
166	4.96E-03	1.1
167	4.13E-03	1.0
168	1.46E-03	0.3
169	1.86E-03	0.4
170	3.49E-03	0.8
171	2.63E-03	0.6
172	3.16E-03	0.7
173	2.67E-03	0.6
174	2.44E-03	0.6
175	1.51E-03	0.4
176	1.59E-03	0.4
177	1.33E-03	0.3
178	3.35E-03	0.8
179	2.85E-03	0.7
180	2.22E-03	0.5
181	4.48E-03	1.0
182	4.55E-03	1.1
183	4.65E-03	1.1
184	4.22E-03	1.0
185	4.95E-03	1.1
186	4.24E-03	1.0
187	4.29E-03	1.0
188	4.17E-03	1.0
189	4.20E-03	1.0

SA2	Estimated coefficient	t-statistic
190	4.56E-03	1.1
191	4.36E-03	1.0
192	1.78E-03	0.4
193	2.50E-03	0.6
194	5.60E-03	1.3
195	7.90E-03	1.8
196	5.66E-03	1.3
197	4.56E-03	1.1
198	2.91E-03	0.7
199	3.86E-03	0.9
200	8.85E-03	2.1
201	6.78E-03	1.6
202	6.89E-03	1.6
203	7.39E-03	1.7
204	4.93E-03	1.1
205	3.64E-03	0.8
206	9.03E-03	2.1
207	7.85E-03	1.8
208	9.83E-03	2.3
209	6.92E-03	1.6
210	8.10E-03	1.9
211	0.010014	2.3
212	8.97E-03	2.1
213	5.28E-03	1.2
214	5.24E-03	1.2
215	2.56E-03	0.6
216	4.49E-03	1.0
217	4.36E-03	1.0
218	3.56E-03	0.8
219	-0.011918	-2.8
220	-4.03E-03	-0.9
221	-2.05E-03	-0.5
222	-1.64E-03	-0.4
223	3.49E-04	0.1
224	-2.21E-03	-0.5
225	-1.81E-03	-0.4
226	-1.33E-03	-0.3
227	4.09E-03	0.9
228	4.33E-03	1.0
229	5.32E-03	1.2
230	5.61E-03	1.3
231	3.09E-03	0.7
232	2.63E-03	0.6
233	1.38E-03	0.3
234	-2.15E-03	-0.5
235	-1.66E-03	-0.4
236	1.41E-03	0.3
237	1.61E-03	0.4
238	1.26E-03	0.3
239	-3.60E-05	0.0
240	8.53E-04	0.2
241	-6.20E-04	-0.1
242	1.45E-03	0.3
243	8.24E-04	0.2
244	6.44E-03	1.5
245	5.76E-03	1.3
246	6.46E-03	1.5
247	5.93E-03	1.4
248	6.30E-03	1.5
249	5.83E-03	1.4
250	5.90E-03	1.4
251	5.79E-03	1.3
252	5.56E-03	1.3

SA2	Estimated coefficient	t-statistic
253	6.94E-03	1.6
254	7.05E-03	1.6
255	7.01E-03	1.6
256	5.96E-03	1.4
257	5.99E-03	1.4
258	5.82E-03	1.3
259	4.85E-03	1.1
260	5.37E-03	1.2
261	5.14E-03	1.2
262	5.45E-03	1.3
263	5.33E-03	1.2
264	6.54E-03	1.5
265	8.61E-03	2.0
266	0.010836	2.5
267	7.82E-03	1.8
268	0.010253	2.4
269	8.10E-03	1.9
270	8.41E-03	1.9
271	8.33E-03	1.9
272	7.99E-03	1.9
273	9.27E-03	2.1
274	7.20E-03	1.7
275	0.010964	2.5
276	0.015872	3.7
277	3.29E-03	0.8
278	-2.62E-04	-0.1
279	6.89E-03	1.6
280	-3.75E-03	-0.9
281	2.69E-03	0.6
282	-1.91E-04	0.0
283	4.26E-03	1.0
284	3.52E-03	0.8
285	5.12E-03	1.2
286	4.72E-03	1.1
287	4.71E-03	1.1
288	3.07E-03	0.7
289	2.50E-03	0.6
290	3.67E-03	0.8
291	1.18E-03	0.3
292	3.25E-03	0.8
293	4.33E-03	1.0
294	4.01E-03	0.9
295	2.19E-04	0.1
296	3.23E-03	0.7
297	4.38E-03	1.0
298	4.47E-03	1.0
299	5.33E-03	1.2
300	3.88E-03	0.9
301	4.70E-03	1.1
302	5.18E-03	1.2
303	4.92E-03	1.1
304	4.81E-03	1.1
305	2.93E-03	0.7

SA2	Estimated coefficient	t-statistic
306	3.69E-03	0.9
307	4.54E-03	1.1
308	4.15E-03	1.0
309	3.43E-03	0.8
310	3.31E-03	0.8
311	4.58E-03	1.1
312	3.25E-03	0.8
313	4.67E-03	1.1
314	-2.13E-03	-0.5
315	-1.75E-03	-0.4
316	-2.36E-03	-0.5
317	-8.66E-04	-0.2
318	-1.50E-03	-0.3
319	-1.32E-03	-0.3
320	-1.38E-03	-0.3
321	-1.59E-03	-0.4
322	-2.40E-03	-0.6
323	-2.04E-03	-0.5
324	-2.59E-03	-0.6
325	-3.86E-04	-0.1
326	1.50E-04	0.0
327	-2.29E-03	-0.5
328	-2.01E-03	-0.5
329	-2.65E-03	-0.6
330	-1.87E-03	-0.4
331	-1.71E-03	-0.4
332	-1.75E-03	-0.4
333	-2.21E-03	-0.5
334	-1.41E-03	-0.3
335	-1.66E-03	-0.4
336	-1.69E-03	-0.4
337	-2.31E-03	-0.5
338	-1.84E-03	-0.4
339	6.79E-04	0.2
340	-1.80E-03	-0.4
341	-9.89E-05	0.0
342	-2.60E-03	-0.6
343	-2.31E-03	-0.5
344	-1.29E-03	-0.3
345	-1.16E-03	-0.3
346	-1.60E-03	-0.4
347	-1.78E-03	-0.4
348	-2.30E-03	-0.5
349	-2.29E-03	-0.5
350	-2.13E-03	-0.5
351	-2.69E-03	-0.6
352	-3.88E-03	-0.9
353	5.55E-03	1.3
354	3.53E-03	0.8
355	4.71E-03	1.1
356	2.87E-03	0.7
357	2.90E-03	0.7
358	5.46E-03	1.3

SA2	Estimated coefficient	t-statistic
359	4.87E-03	1.1
360	-3.62E-04	-0.1
361	-1.15E-04	0.0
362	-1.29E-03	-0.3
363	3.91E-03	0.9
364	4.10E-03	1.0
365	7.71E-04	0.2
366	3.46E-03	0.8
367	3.01E-04	0.1
368	-6.47E-04	-0.1
369	0.016647	3.8
370	0.018781	4.3
371	0.012444	2.8
372	0.012269	2.8
373	0.027001	5.9
374	0.019453	4.3
375	0.014801	3.3
376	0.029983	6.7
377	0.029452	6.4
378	6.51E-03	1.5
379	6.36E-03	1.5
380	0.027389	6.2
381	6.51E-03	1.5
382	0.02826	6.1
383	0.021482	4.8
384	0.021381	4.7
385	0.011637	2.7
386	0.013932	3.1
387	0.020642	4.6
388	9.23E-03	2.1
389	9.33E-03	2.1
390	9.52E-03	2.2
391	8.67E-03	2.0
392	0.013651	3.1
393	0.011693	2.7
394	9.37E-03	2.2
395	0.013592	3.1
396	9.34E-03	2.1
397	6.92E-03	1.6
398	6.99E-03	1.6
399	7.03E-03	1.6
400	6.43E-03	1.5
401	7.01E-03	1.6
402	0.018571	4.1
403	0.022152	5.0
404	0.016184	3.7
405	0.023049	5.2
406	6.16E-03	1.4
407	6.76E-03	1.6
408	2.89E-03	0.7
409	3.98E-03	0.9
410	4.26E-03	1.0
411	4.00E-03	0.9

SA2	Estimated coefficient	t-statistic
412	3.86E-03	0.9
413	4.52E-03	1.0
414	3.27E-03	0.8
415	2.58E-03	0.6
416	4.68E-03	1.1
417	5.41E-03	1.3
418	5.70E-03	1.3
419	2.29E-03	0.5
420	1.42E-03	0.3
421	9.19E-04	0.2
422	2.58E-03	0.6
423	2.68E-03	0.6
424	2.73E-03	0.6
425	2.10E-03	0.5
426	1.85E-03	0.4
427	-5.41E-03	-1.3
428	6.99E-03	1.6
429	6.87E-03	1.6
430	6.98E-03	1.6
431	7.76E-03	1.8
432	7.06E-03	1.6
433	8.37E-03	1.9
434	7.88E-03	1.8
435	5.44E-03	1.3
436	4.56E-03	1.1
437	4.81E-03	1.1
438	4.27E-03	1.0
439	3.89E-03	0.9
440	4.01E-03	0.9
441	5.07E-03	1.2
442	4.38E-03	1.0
443	-7.35E-04	-0.2
444	-5.15E-04	-0.1
445	-8.48E-04	-0.2
446	-1.58E-03	-0.4
447	-9.95E-04	-0.2
448	-1.13E-03	-0.3
449	-2.17E-03	-0.5
450	-2.85E-03	-0.7
451	6.45E-03	1.5
452	6.50E-03	1.5
453	9.87E-03	2.3
454	0.011201	2.6
455	0.010703	2.5
456	8.29E-03	1.9
457	0.011392	2.6
458	0.011605	2.7
459	6.22E-03	1.4
460	0.013259	3.0
461	6.73E-03	1.5
462	5.97E-03	1.4

Equation 5: CONST5(j)

SA2	Estimated coefficient	t-statistic
1	2.10266	22.7
2	1.96105	20.7
3	1.90981	20.0
4	1.9099	20.0
5	1.86334	19.4
6	2.03187	21.7
7	2.05555	22.1
8	2.04667	21.9
9	1.05299	10.1
10	2.02497	21.9
11	0.930512	9.4
12	1.62119	16.4
13	0.968737	11.6
14	1.22853	14.3
15	1.64238	17.9
16	1.18046	13.5
17	1.18546	13.7
18	2.54402	29.8
19	2.5478	30.0
20	2.54591	29.8
21	2.53438	29.5
22	2.52936	29.4
23	2.53685	29.7
24	2.52569	29.4
25	2.56045	30.2
26	2.50693	29.0
27	1.70604	18.6
28	1.89808	21.0
29	1.4672	16.4
30	0.861856	8.7
31	0.742532	7.2
32	2.44649	29.0
33	1.38649	17.2
34	1.86847	19.2
35	0.881238	9.4
36	1.3915	15.0
37	2.04668	20.9
38	1.85653	18.6
39	1.99359	20.2
40	2.00036	20.4
41	2.11355	21.9
42	2.08892	21.5
43	1.47696	14.5
44	1.87247	18.7
45	1.95088	19.6
46	2.02145	20.6
47	1.95095	19.7
48	1.49197	14.5
49	1.00875	11.4
50	1.92272	19.4
51	0.969644	9.2
52	1.23293	12.0
53	2.10249	22.4
54	0.411113	4.3
55	0.897002	10.9
56	0.802866	7.9
57	1.88105	25.2
58	0.920184	10.7
59	0.439689	4.6
60	0.450744	4.7
61	-1.15822	-10.7
62	0.242083	2.4
63	1.60873	19.7

SA2	Estimated coefficient	t-statistic
64	1.69225	20.8
65	1.57204	19.3
66	2.04377	25.0
67	1.91576	23.6
68	2.19646	26.9
69	1.95121	25.9
70	2.30552	28.4
71	1.04305	13.8
72	1.66218	22.4
73	2.4651	30.7
74	2.48427	31.0
75	2.33701	29.1
76	1.29511	12.8
77	0.542934	5.8
78	1.68734	18.1
79	1.36785	14.1
80	0	0.0
81	2.23762	28.8
82	1.5508	21.5
83	2.42082	31.7
84	2.22181	29.4
85	2.36985	36.7
86	2.11289	27.0
87	1.48215	17.2
88	1.53091	14.8
89	1.35957	14.0
90	1.52899	16.7
91	0.803968	8.0
92	0	0.0
93	0.993551	10.3
94	2.1676	24.9
95	2.00575	22.2
96	2.19378	25.0
97	2.30423	26.9
98	2.21112	25.4
99	0	0.0
100	1.93646	24.0
101	1.60336	19.2
102	2.27519	26.7
103	1.9302	23.5
104	1.18432	14.2
105	2.71755	25.8
106	2.81072	26.6
107	2.71852	25.9
108	2.77599	26.4
109	2.84997	27.1
110	2.62255	24.8
111	2.68408	25.4
112	2.7033	25.6
113	2.69905	25.6
114	2.74666	26.1
115	2.75235	26.1
116	2.74706	26.1
117	2.73891	25.9
118	2.74129	26.0
119	2.75308	26.0
120	2.6778	25.4
121	2.74151	26.0
122	2.7421	26.0
123	2.74527	26.0
124	2.82902	26.8
125	2.77329	26.3
126	2.76055	26.1

SA2	Estimated coefficient	t-statistic
127	2.72834	25.9
128	2.75652	26.1
129	2.73291	26.0
130	2.74798	26.1
131	2.76741	26.3
132	2.76771	26.2
133	2.82023	26.8
134	2.81873	26.8
135	2.75421	26.1
136	2.76966	26.2
137	2.77942	26.3
138	2.78799	26.4
139	2.73822	26.0
140	2.71023	25.7
141	2.72706	25.8
142	2.71245	25.8
143	2.69482	25.5
144	2.76593	26.2
145	2.71544	25.7
146	3.07761	29.1
147	3.03007	28.6
148	3.03715	28.6
149	3.02185	28.5
150	3.03083	28.6
151	2.93521	27.6
152	2.94712	27.8
153	2.92728	27.6
154	2.9547	27.8
155	3.05262	28.8
156	3.04814	28.7
157	3.11669	29.4
158	3.01808	28.5
159	3.08195	29.0
160	3.0999	29.3
161	3.12588	29.5
162	3.11364	29.4
163	3.11667	29.4
164	3.11962	29.5
165	3.12418	29.5
166	3.11592	29.4
167	2.99894	28.5
168	2.84555	26.9
169	2.89534	27.4
170	2.98938	28.4
171	2.94393	27.9
172	2.95787	28.1
173	2.95051	28.0
174	2.92589	27.7
175	2.83236	26.7
176	2.84923	26.9
177	2.81997	26.6
178	2.99926	28.4
179	2.96636	28.1
180	2.90744	27.5
181	2.95735	28.2
182	3.01171	28.7
183	2.82365	27.0
184	2.87313	27.5
185	2.87804	27.5
186	3.06641	29.1
187	2.9214	27.9
188	3.03385	28.9
189	3.06812	29.1

SA2	Estimated coefficient	t-statistic
190	3.05594	29.1
191	3.00632	28.6
192	2.85128	26.9
193	2.92867	27.7
194	2.5161	23.9
195	2.38179	22.5
196	2.6045	24.6
197	2.54417	24.1
198	2.61581	24.7
199	2.70446	25.5
200	2.4748	23.3
201	2.51658	23.7
202	2.43966	23.1
203	2.43363	23.2
204	2.6094	24.8
205	2.69162	25.6
206	2.36425	22.4
207	1.8926	18.1
208	1.04391	10.0
209	1.67203	16.1
210	2.28113	21.7
211	2.30216	21.8
212	2.18866	20.8
213	2.49019	23.7
214	2.52298	24.0
215	2.61298	24.9
216	2.4397	23.2
217	2.50755	23.9
218	2.62956	25.1
219	0.845342	8.0
220	1.4595	13.7
221	2.71981	25.7
222	2.75232	26.0
223	2.88393	27.5
224	2.7	25.5
225	2.73137	25.7
226	2.76433	26.0
227	1.80144	18.2
228	1.56627	16.1
229	1.78939	18.1
230	1.50578	15.5
231	2.81016	26.8
232	2.75318	26.2
233	2.83408	27.0
234	2.16983	21.0
235	2.35732	22.7
236	2.75708	26.4
237	2.67629	25.7
238	2.74822	25.8
239	2.52474	23.7
240	2.58159	24.8
241	2.5363	24.3
242	2.47174	23.8
243	2.83463	27.1
244	2.96617	28.0
245	3.07166	29.0
246	2.95693	28.1
247	3.04706	28.9
248	3.01585	28.6
249	3.04788	28.9
250	3.04228	28.7
251	3.07146	29.0
252	3.01568	28.4

SA2	Estimated coefficient	t-statistic
253	2.79017	26.3
254	2.89175	27.4
255	2.82851	26.7
256	2.98929	28.2
257	2.98296	28.1
258	2.96616	28.0
259	3.08369	29.0
260	3.07196	28.9
261	3.0989	29.1
262	3.08173	29.0
263	3.09639	29.2
264	2.81772	26.8
265	2.61731	24.8
266	1.01547	9.8
267	2.81503	26.7
268	2.23704	21.3
269	2.41307	23.1
270	2.75191	26.2
271	2.72336	25.8
272	2.76114	26.3
273	2.5757	24.6
274	2.87637	27.3
275	2.05493	19.7
276	0.642631	6.3
277	2.45046	23.4
278	1.10735	10.8
279	1.8238	17.5
280	1.34776	13.2
281	2.11912	20.3
282	1.91701	18.4
283	2.68777	25.6
284	2.61274	24.9
285	3.00761	28.5
286	2.92362	27.7
287	2.82864	26.9
288	2.64267	25.2
289	2.52166	24.1
290	2.69396	25.7
291	2.39267	22.9
292	2.71445	25.9
293	2.86622	27.2
294	2.82121	26.8
295	2.11233	20.3
296	3.02372	28.6
297	3.09879	29.3
298	2.94656	27.9
299	3.09388	29.3
300	3.05859	29.0
301	3.0389	28.8
302	3.10107	29.3
303	3.12884	29.6
304	3.11688	29.5
305	2.98731	28.1

SA2	Estimated coefficient	t-statistic
306	3.0521	28.8
307	3.06332	28.9
308	3.0582	28.8
309	3.01012	28.3
310	3.0082	28.4
311	3.07956	29.1
312	3.03393	28.6
313	3.07193	29.0
314	2.64513	25.0
315	2.679	25.4
316	2.6577	25.2
317	2.76493	26.2
318	2.73303	25.9
319	2.71195	25.8
320	2.71884	25.7
321	2.68825	25.4
322	2.63959	24.9
323	2.6671	25.2
324	2.63	24.8
325	2.82876	26.8
326	2.8338	26.9
327	2.62091	24.7
328	2.63992	25.0
329	2.63325	24.8
330	2.71234	25.5
331	2.68258	25.4
332	2.67535	25.1
333	2.66833	25.1
334	2.75174	25.9
335	2.73044	25.7
336	2.73746	25.7
337	2.69713	25.4
338	2.72565	25.6
339	1.03111	10.1
340	2.4724	23.7
341	1.81824	17.6
342	1.85837	17.9
343	1.53316	14.9
344	2.62124	25.0
345	2.76511	26.3
346	2.68803	25.5
347	2.61117	24.8
348	2.65308	25.1
349	2.55919	24.5
350	2.6591	25.3
351	2.16367	20.7
352	1.79012	17.3
353	2.90333	27.7
354	2.57446	24.6
355	2.80088	26.8
356	2.48731	23.8
357	2.61129	25.0
358	2.87632	27.4

SA2	Estimated coefficient	t-statistic
359	2.82962	27.0
360	1.57943	15.4
361	1.16376	11.6
362	1.77817	17.4
363	2.40415	23.2
364	2.59573	24.9
365	1.94472	18.8
366	0.733992	7.2
367	1.04491	10.4
368	2.22114	21.4
369	1.66535	20.5
370	1.49374	18.8
371	2.42193	32.7
372	2.46912	33.6
373	2.32218	34.2
374	1.30603	17.3
375	1.83096	23.9
376	1.93505	29.2
377	2.09876	29.7
378	2.79343	36.3
379	2.79916	36.4
380	1.29454	18.8
381	2.77934	36.0
382	2.01637	28.2
383	2.23412	30.9
384	2.29546	32.2
385	0.674344	9.2
386	2.32939	31.8
387	1.66069	23.7
388	2.23349	27.5
389	2.15167	25.9
390	1.93034	23.9
391	2.10779	25.3
392	0.834541	9.8
393	1.51757	18.5
394	1.44302	17.2
395	1.62181	19.6
396	1.516	18.3
397	2.47077	29.4
398	2.47306	29.4
399	2.48047	29.5
400	2.42805	28.9
401	2.51162	30.0
402	1.6486	22.3
403	2.1813	28.4
404	2.06088	27.2
405	2.34749	32.0
406	3.03523	28.7
407	3.05943	28.9
408	2.96641	28.1
409	3.09187	29.3
410	2.73796	25.9
411	2.79756	26.5

SA2	Estimated coefficient	t-statistic
412	1.84771	17.6
413	2.32276	22.2
414	2.54473	24.3
415	2.31551	22.2
416	2.05388	19.6
417	2.16826	20.7
418	2.32801	22.1
419	2.16017	20.7
420	2.76862	26.4
421	2.91805	27.8
422	2.82836	26.9
423	2.37759	22.8
424	2.20174	21.1
425	2.35661	22.7
426	2.19515	21.2
427	2.07469	19.8
428	2.93872	27.8
429	2.96323	28.1
430	2.94822	27.9
431	2.83932	26.9
432	2.86298	27.1
433	2.79696	26.4
434	2.85523	27.0
435	3.03619	28.8
436	3.04103	28.8
437	2.88097	27.4
438	2.8767	27.3
439	2.76359	26.3
440	2.8361	27.0
441	3.10518	29.4
442	3.12294	29.5
443	2.82073	26.7
444	2.84995	27.0
445	2.76065	26.3
446	2.61371	24.7
447	2.7583	26.1
448	2.6463	25.0
449	2.49241	23.8
450	1.79753	17.3
451	2.80031	36.4
452	2.79622	36.4
453	1.69717	20.6
454	1.43962	16.5
455	1.24599	14.1
456	0.919106	10.8
457	1.90749	24.0
458	1.66484	20.2
459	1.6541	20.6
460	2.01875	25.2
461	2.35621	29.7
462	2.28947	28.9

Equation 6: CONST6(j)

SA2	Estimated coefficient	t-statistic
1	-9.05E-03	-3.5
2	-9.12E-03	-3.5
3	-9.19E-03	-3.5
4	-9.15E-03	-3.5
5	-9.14E-03	-3.5
6	-9.19E-03	-3.5
7	-9.04E-03	-3.5
8	-8.98E-03	-3.4
9	-1.74E-03	-0.7
10	-8.82E-03	-3.4
11	-0.013062	-5.0
12	-9.05E-03	-3.5
13	-0.016758	-6.4
14	-4.35E-03	-1.7
15	-7.12E-03	-2.7
16	-0.017209	-6.6
17	-0.017112	-6.6
18	-1.71E-03	-0.7
19	-1.17E-03	-0.4
20	-1.95E-03	-0.7
21	-2.41E-03	-0.9
22	-2.46E-03	-0.9
23	-1.53E-03	-0.6
24	-2.60E-03	-1.0
25	-1.31E-03	-0.5
26	-2.92E-03	-1.1
27	-7.02E-03	-2.7
28	-6.26E-03	-2.4
29	-3.76E-03	-1.4
30	-0.011279	-4.3
31	-8.33E-03	-3.2
32	-1.20E-03	-0.5
33	-0.025489	-9.8
34	-0.011775	-4.5
35	-7.13E-03	-2.7
36	-5.65E-03	-2.2
37	-9.82E-03	-3.8
38	-0.011022	-4.2
39	-9.74E-03	-3.7
40	-0.010325	-4.0
41	-9.68E-03	-3.7
42	-9.91E-03	-3.8
43	-0.01083	-4.2
44	-8.94E-03	-3.4
45	-9.42E-03	-3.6
46	-9.94E-03	-3.8
47	-0.010427	-4.0
48	-7.58E-03	-2.9
49	-7.91E-03	-3.0
50	-8.48E-03	-3.2
51	-4.74E-03	-1.8
52	-6.89E-03	-2.6
53	-7.68E-03	-2.9
54	-0.019013	-7.3
55	-0.016087	-6.2
56	-4.22E-03	-1.6
57	-4.24E-03	-1.6
58	-0.026194	-10.0
59	-0.028297	-10.8
60	-0.025444	-9.7
61	-0.026219	-10.0
62	-0.012143	-4.7
63	-7.50E-03	-2.9

SA2	Estimated coefficient	t-statistic
64	-7.66E-03	-2.9
65	-0.010808	-4.1
66	-0.010216	-3.9
67	-9.68E-03	-3.7
68	-5.83E-03	-2.2
69	-0.010681	-4.1
70	-4.87E-03	-1.9
71	-0.01806	-6.9
72	-0.021706	-8.3
73	-4.10E-03	-1.6
74	-3.93E-03	-1.5
75	-4.36E-03	-1.7
76	-4.25E-03	-1.6
77	-0.024268	-9.3
78	-0.012882	-4.9
79	-0.011232	-4.3
80	0	0.0
81	-6.25E-03	-2.4
82	-0.011157	-4.3
83	-6.88E-03	-2.6
84	-8.00E-03	-3.1
85	-6.47E-03	-2.5
86	-4.49E-03	-1.7
87	-0.020395	-7.8
88	-4.19E-04	-0.2
89	-0.011365	-4.4
90	-0.017008	-6.5
91	-0.011148	-4.3
92	0	0.0
93	-0.012454	-4.8
94	-0.014278	-5.5
95	-0.016756	-6.4
96	-0.016114	-6.2
97	-9.61E-03	-3.7
98	-0.013576	-5.2
99	0	0.0
100	-1.03E-03	-0.4
101	-2.40E-03	-0.9
102	-6.43E-03	-2.5
103	-1.31E-03	-0.5
104	-9.64E-03	-3.7
105	-4.76E-03	-1.8
106	-7.03E-03	-2.7
107	-5.53E-03	-2.1
108	-7.38E-03	-2.8
109	-7.72E-03	-3.0
110	-5.20E-03	-2.0
111	-4.83E-03	-1.8
112	-7.37E-03	-2.8
113	-4.69E-03	-1.8
114	-5.95E-03	-2.3
115	-4.56E-03	-1.7
116	-5.78E-03	-2.2
117	-3.33E-03	-1.3
118	-3.36E-03	-1.3
119	-3.52E-03	-1.3
120	-4.44E-03	-1.7
121	-4.42E-03	-1.7
122	-3.40E-03	-1.3
123	-3.29E-03	-1.3
124	-5.17E-03	-2.0
125	-3.44E-03	-1.3
126	-3.51E-03	-1.3

SA2	Estimated coefficient	t-statistic
127	-3.70E-03	-1.4
128	-3.10E-03	-1.2
129	-5.55E-03	-2.1
130	-2.97E-03	-1.1
131	-4.24E-03	-1.6
132	-3.24E-03	-1.2
133	-5.19E-03	-2.0
134	-5.29E-03	-2.0
135	-3.62E-03	-1.4
136	-3.43E-03	-1.3
137	-3.53E-03	-1.4
138	-3.65E-03	-1.4
139	-3.02E-03	-1.2
140	-2.80E-03	-1.1
141	-2.93E-03	-1.1
142	-2.52E-03	-1.0
143	-3.49E-03	-1.3
144	-2.90E-03	-1.1
145	-4.14E-03	-1.6
146	-8.33E-03	-3.2
147	-8.09E-03	-3.1
148	-8.64E-03	-3.3
149	-7.87E-03	-3.0
150	-7.86E-03	-3.0
151	-6.17E-03	-2.4
152	-6.86E-03	-2.6
153	-6.69E-03	-2.6
154	-7.74E-03	-3.0
155	-8.28E-03	-3.2
156	-9.37E-03	-3.6
157	-9.69E-03	-3.7
158	-0.010177	-3.9
159	-9.82E-03	-3.8
160	-9.53E-03	-3.6
161	-9.58E-03	-3.7
162	-9.19E-03	-3.5
163	-9.41E-03	-3.6
164	-8.88E-03	-3.4
165	-9.62E-03	-3.7
166	-9.03E-03	-3.5
167	-8.57E-03	-3.3
168	-5.23E-03	-2.0
169	-5.58E-03	-2.1
170	-7.64E-03	-2.9
171	-6.65E-03	-2.5
172	-7.40E-03	-2.8
173	-6.44E-03	-2.5
174	-5.94E-03	-2.3
175	-4.99E-03	-1.9
176	-5.07E-03	-1.9
177	-4.90E-03	-1.9
178	-6.98E-03	-2.7
179	-6.39E-03	-2.4
180	-5.78E-03	-2.2
181	-8.87E-03	-3.4
182	-8.89E-03	-3.4
183	-9.41E-03	-3.6
184	-8.96E-03	-3.4
185	-9.56E-03	-3.7
186	-8.31E-03	-3.2
187	-8.86E-03	-3.4
188	-8.44E-03	-3.2
189	-8.21E-03	-3.1

SA2	Estimated coefficient	t-statistic
190	-8.74E-03	-3.3
191	-8.71E-03	-3.3
192	-5.14E-03	-2.0
193	-5.90E-03	-2.3
194	-0.011011	-4.2
195	-0.013646	-5.2
196	-9.89E-03	-3.8
197	-8.65E-03	-3.3
198	-6.54E-03	-2.5
199	-7.49E-03	-2.9
200	-0.014467	-5.5
201	-0.011953	-4.6
202	-0.012559	-4.8
203	-0.011858	-4.5
204	-9.95E-03	-3.8
205	-8.61E-03	-3.3
206	-0.014123	-5.4
207	-0.012126	-4.6
208	-0.013296	-5.1
209	-0.010613	-4.1
210	-0.013487	-5.2
211	-0.014978	-5.7
212	-0.014068	-5.4
213	-0.01067	-4.1
214	-0.010477	-4.0
215	-8.04E-03	-3.1
216	-9.96E-03	-3.8
217	-9.79E-03	-3.8
218	-8.92E-03	-3.4
219	6.86E-03	2.6
220	-1.95E-03	-0.7
221	-3.71E-03	-1.4
222	-4.00E-03	-1.5
223	-7.29E-03	-2.8
224	-3.45E-03	-1.3
225	-3.79E-03	-1.5
226	-4.23E-03	-1.6
227	-0.017222	-6.6
228	-0.018138	-6.9
229	-0.01889	-7.2
230	-0.020995	-8.0
231	-7.95E-03	-3.0
232	-8.33E-03	-3.2
233	-7.34E-03	-2.8
234	-6.64E-03	-2.5
235	-6.80E-03	-2.6
236	-7.69E-03	-2.9
237	-7.82E-03	-3.0
238	-5.85E-03	-2.2
239	-5.25E-03	-2.0
240	-6.74E-03	-2.6
241	-5.00E-03	-1.9
242	-7.68E-03	-2.9
243	-7.28E-03	-2.8
244	-0.011009	-4.2
245	-0.010305	-3.9
246	-0.010578	-4.1
247	-0.010226	-3.9
248	-0.010629	-4.1
249	-0.010089	-3.9
250	-0.010687	-4.1
251	-0.010507	-4.0
252	-0.010374	-4.0

SA2	Estimated coefficient	t-statistic
253	-0.011598	-4.4
254	-0.011542	-4.4
255	-0.011622	-4.5
256	-0.010593	-4.1
257	-0.010575	-4.1
258	-0.010484	-4.0
259	-9.91E-03	-3.8
260	-0.010176	-3.9
261	-0.010019	-3.8
262	-0.010351	-4.0
263	-0.010325	-4.0
264	-0.010303	-3.9
265	-0.013147	-5.0
266	-0.014743	-5.6
267	-0.012307	-4.7
268	-0.014595	-5.6
269	-0.012105	-4.6
270	-0.012819	-4.9
271	-0.012863	-4.9
272	-0.012194	-4.7
273	-0.013625	-5.2
274	-0.011347	-4.3
275	-0.015408	-5.9
276	-0.022313	-8.5
277	-7.37E-03	-2.8
278	-3.43E-03	-1.3
279	-0.012022	-4.6
280	-7.83E-04	-0.3
281	-6.77E-03	-2.6
282	-3.60E-03	-1.4
283	-8.32E-03	-3.2
284	-7.69E-03	-2.9
285	-9.38E-03	-3.6
286	-8.73E-03	-3.3
287	-8.67E-03	-3.3
288	-7.48E-03	-2.9
289	-6.74E-03	-2.6
290	-7.92E-03	-3.0
291	-5.63E-03	-2.2
292	-7.64E-03	-2.9
293	-8.50E-03	-3.3
294	-8.20E-03	-3.1
295	-5.42E-03	-2.1
296	-8.09E-03	-3.1
297	-9.45E-03	-3.6
298	-8.73E-03	-3.3
299	-9.98E-03	-3.8
300	-8.92E-03	-3.4
301	-9.27E-03	-3.5
302	-0.010025	-3.8
303	-9.82E-03	-3.8
304	-9.78E-03	-3.7
305	-7.40E-03	-2.8

SA2	Estimated coefficient	t-statistic
306	-8.55E-03	-3.3
307	-9.38E-03	-3.6
308	-8.96E-03	-3.4
309	-8.01E-03	-3.1
310	-7.97E-03	-3.1
311	-9.53E-03	-3.7
312	-7.98E-03	-3.1
313	-9.58E-03	-3.7
314	-3.44E-03	-1.3
315	-4.16E-03	-1.6
316	-3.29E-03	-1.3
317	-5.52E-03	-2.1
318	-4.52E-03	-1.7
319	-4.92E-03	-1.9
320	-4.66E-03	-1.8
321	-4.21E-03	-1.6
322	-2.86E-03	-1.1
323	-3.42E-03	-1.3
324	-2.68E-03	-1.0
325	-6.09E-03	-2.3
326	-6.49E-03	-2.5
327	-3.10E-03	-1.2
328	-3.68E-03	-1.4
329	-2.44E-03	-0.9
330	-3.12E-03	-1.2
331	-4.06E-03	-1.6
332	-3.25E-03	-1.2
333	-2.98E-03	-1.1
334	-3.70E-03	-1.4
335	-3.56E-03	-1.4
336	-3.37E-03	-1.3
337	-2.79E-03	-1.1
338	-3.19E-03	-1.2
339	-9.88E-03	-3.8
340	-4.85E-03	-1.9
341	-7.97E-03	-3.1
342	-4.70E-03	-1.8
343	-5.78E-03	-2.2
344	-5.06E-03	-1.9
345	-5.40E-03	-2.1
346	-4.42E-03	-1.7
347	-4.16E-03	-1.6
348	-3.19E-03	-1.2
349	-3.95E-03	-1.5
350	-3.87E-03	-1.5
351	-2.46E-03	-0.9
352	-3.09E-03	-1.2
353	-9.36E-03	-3.6
354	-7.40E-03	-2.8
355	-8.63E-03	-3.3
356	-6.81E-03	-2.6
357	-6.68E-03	-2.6
358	-9.47E-03	-3.6

SA2	Estimated coefficient	t-statistic
359	-8.67E-03	-3.3
360	-4.76E-03	-1.8
361	-6.11E-03	-2.3
362	-3.48E-03	-1.3
363	-7.97E-03	-3.1
364	-8.08E-03	-3.1
365	-5.11E-03	-2.0
366	-0.010265	-3.9
367	-7.79E-03	-3.0
368	-3.11E-03	-1.2
369	-0.012539	-4.8
370	-0.014717	-5.6
371	-5.56E-04	-0.2
372	-1.25E-03	-0.5
373	-0.011945	-4.6
374	-9.80E-03	-3.8
375	-4.67E-03	-1.8
376	-0.02258	-8.7
377	-0.012712	-4.9
378	-7.85E-03	-3.0
379	-7.88E-03	-3.0
380	-0.026682	-10.2
381	-7.47E-03	-2.9
382	-0.011762	-4.5
383	-8.19E-03	-3.1
384	-8.52E-03	-3.3
385	-0.010328	-4.0
386	-5.53E-04	-0.2
387	-0.011422	-4.4
388	-4.72E-03	-1.8
389	-5.50E-03	-2.1
390	-5.11E-03	-2.0
391	-7.24E-03	-2.8
392	-0.015254	-5.8
393	-7.89E-03	-3.0
394	-5.04E-03	-1.9
395	-0.010286	-3.9
396	-5.75E-03	-2.2
397	-2.19E-03	-0.8
398	-2.20E-03	-0.8
399	-2.30E-03	-0.9
400	-1.55E-03	-0.6
401	-2.50E-03	-1.0
402	-7.59E-03	-2.9
403	-0.013695	-5.2
404	-0.010271	-3.9
405	-0.01128	-4.3
406	-0.010227	-3.9
407	-0.010871	-4.2
408	-6.51E-03	-2.5
409	-7.81E-03	-3.0
410	-8.46E-03	-3.2
411	-7.74E-03	-3.0

SA2	Estimated coefficient	t-statistic
412	-7.70E-03	-2.9
413	-9.70E-03	-3.7
414	-8.51E-03	-3.3
415	-8.39E-03	-3.2
416	-9.17E-03	-3.5
417	-0.011118	-4.3
418	-0.010731	-4.1
419	-7.57E-03	-2.9
420	-7.27E-03	-2.8
421	-6.99E-03	-2.7
422	-7.78E-03	-3.0
423	-8.76E-03	-3.4
424	-8.83E-03	-3.4
425	-8.17E-03	-3.1
426	-7.89E-03	-3.0
427	-7.59E-04	-0.3
428	-0.011468	-4.4
429	-0.011226	-4.3
430	-0.011514	-4.4
431	-0.012252	-4.7
432	-0.011577	-4.4
433	-0.013498	-5.2
434	-0.012938	-5.0
435	-9.78E-03	-3.7
436	-8.72E-03	-3.3
437	-8.93E-03	-3.4
438	-8.42E-03	-3.2
439	-8.18E-03	-3.1
440	-8.30E-03	-3.2
441	-9.72E-03	-3.7
442	-8.99E-03	-3.4
443	-5.47E-03	-2.1
444	-5.78E-03	-2.2
445	-5.62E-03	-2.2
446	-4.13E-03	-1.6
447	-4.81E-03	-1.8
448	-4.40E-03	-1.7
449	-3.68E-03	-1.4
450	-3.11E-03	-1.2
451	-8.06E-03	-3.1
452	-7.88E-03	-3.0
453	-0.0112	-4.3
454	-0.013729	-5.3
455	-0.013474	-5.2
456	-0.012055	-4.6
457	-8.79E-03	-3.4
458	-0.012165	-4.7
459	-5.54E-04	-0.2
460	-7.43E-03	-2.8
461	-9.32E-05	0.0
462	8.45E-04	0.3

Equation 7: CONST7(j)

SA2	Estimated coefficient	t-statistic
1	0.114929	2.9
2	0.136924	3.8
3	0.108825	3.2
4	0.120357	3.5
5	0.116171	3.5
6	0.132085	3.5
7	0.038746	1.0
8	0.140837	3.7
9	0.015487	1.0
10	0.078957	2.0
11	0.040888	1.4
12	0.053572	2.0
13	0.116169	2.1
14	0.12826	2.5
15	0.079216	1.9
16	0.144214	3.0
17	0.098764	2.0
18	0.164064	3.3
19	0.158332	3.1
20	0.17077	3.4
21	0.171995	3.5
22	0.154641	3.2
23	0.135004	2.7
24	0.1184	2.4
25	0.142535	2.8
26	0.102499	2.1
27	0.092285	2.3
28	0.087365	2.1
29	0.070803	1.6
30	0.084019	2.9
31	0.012131	0.6
32	0.156638	3.0
33	0.13409	2.3
34	0.044136	1.7
35	0.04702	1.5
36	0.093457	2.7
37	0.09789	4.0
38	0.078593	3.6
39	0.099838	4.3
40	0.106806	4.4
41	0.101317	3.8
42	0.092482	3.5
43	0.019186	1.0
44	0.082646	3.9
45	0.083337	3.7
46	0.101821	4.2
47	0.095091	4.1
48	0.060196	3.3
49	0.083461	1.9
50	0.053096	2.3
51	0.026504	1.9
52	0.045468	2.5
53	0.080059	2.6
54	0.043919	1.2
55	0.141635	2.5
56	0.044752	2.2
57	0.175647	2.5
58	0.095893	1.9
59	0.044115	1.2
60	9.51E-03	0.3
61	0.051436	1.7
62	0.053083	2.4
63	0.168454	2.9

SA2	Estimated coefficient	t-statistic
64	0.152402	2.7
65	0.162139	2.8
66	0.157722	2.8
67	0.103616	1.8
68	0.163566	2.9
69	0.149099	2.2
70	0.158884	2.8
71	0.216829	3.1
72	0.198527	2.8
73	0.203479	3.5
74	0.177951	3.0
75	0.161755	2.8
76	0.053653	2.4
77	0.075642	2.1
78	0.110495	2.9
79	0.090063	3.0
80	0	0.0
81	0.196613	3.1
82	0.199586	2.7
83	0	0.0
84	0.182187	2.7
85	0.220883	2.5
86	0.166389	2.7
87	0.133062	2.6
88	0	0.0
89	0.080395	2.6
90	0.121923	3.0
91	0.045191	1.9
92	0	0.0
93	0.067419	2.2
94	0.096811	2.0
95	0.131247	3.0
96	0.158994	3.3
97	0.145848	2.8
98	0.153258	3.1
99	0	0.0
100	0.120433	2.1
101	0.153365	2.8
102	0.163404	3.1
103	0.160074	2.8
104	0.118463	2.1
105	0.097637	8.0
106	0.093401	7.9
107	0.083316	6.8
108	0.078501	6.5
109	0.071467	6.0
110	0.071202	6.2
111	0.080406	6.9
112	0.079733	6.8
113	0.079578	6.7
114	0.070475	6.0
115	0.102653	8.5
116	0.07674	6.5
117	0.159084	12.1
118	0.173985	14.5
119	0.102842	8.7
120	0	0.0
121	0.102056	8.5
122	0.262814	16.5
123	0.136056	10.9
124	0.113472	9.3
125	0.105979	8.8
126	0.18931	14.2

SA2	Estimated coefficient	t-statistic
127	0	0.0
128	0.098063	8.2
129	0.099819	8.2
130	0.101565	8.5
131	-6.93E-03	-0.6
132	0.115856	9.5
133	0.118321	9.6
134	0.103742	8.6
135	0.081002	7.0
136	0.103933	8.7
137	0.117249	9.7
138	0.060524	5.4
139	0.100436	8.4
140	0.095633	7.8
141	0.11725	9.5
142	0.119775	9.5
143	0.092991	7.8
144	0.114164	9.3
145	0.079436	6.9
146	0.057332	5.2
147	0.057059	5.2
148	0.052788	4.9
149	0.057452	5.3
150	0.058923	5.4
151	0.077819	7.1
152	0.075814	6.9
153	0.056969	5.3
154	0.056522	5.2
155	0.057102	5.2
156	0.05087	4.7
157	0.055869	5.1
158	0.029347	2.6
159	0.052092	4.7
160	0.058635	5.3
161	0.061829	5.5
162	0.070344	6.3
163	0.05937	5.4
164	0.062988	5.7
165	0.060461	5.3
166	0.057559	5.2
167	0.063403	5.4
168	0.057965	5.2
169	0.059389	5.3
170	0.067205	5.8
171	0.066411	5.8
172	0.065952	5.7
173	0.068786	6.1
174	0.079583	7.0
175	0.068492	6.2
176	0.068049	6.1
177	0.072617	6.5
178	0.066128	5.9
179	0.068955	6.2
180	0.075253	6.7
181	0.06279	5.1
182	0	0.0
183	0.06752	5.3
184	0.074079	5.9
185	0.06815	5.4
186	0.067049	5.8
187	0.070143	5.7
188	0.068448	5.8
189	0.067673	5.9

SA2	Estimated coefficient	t-statistic
190	0	0.0
191	0.069497	5.8
192	0.066614	6.1
193	0.06415	5.8
194	0.063076	5.2
195	0.051079	4.3
196	0.056357	4.9
197	0.0614	5.2
198	0.057648	5.1
199	0.044619	4.0
200	0.033841	3.0
201	0.047573	4.1
202	0.054888	4.6
203	0.074446	5.9
204	0.070606	5.8
205	0.065201	5.3
206	0.040021	3.2
207	0.056637	4.0
208	2.84E-04	0.0
209	0.114772	7.1
210	6.70E-03	0.5
211	0.017105	1.3
212	0.040757	3.1
213	0.075139	5.8
214	0.066671	5.3
215	0.070523	5.5
216	0.070189	5.4
217	0.069982	5.4
218	0.069032	5.4
219	1.36E-04	0.0
220	0.025367	2.1
221	0.058781	5.2
222	0	0.0
223	0.055084	4.3
224	0.055925	4.9
225	0.058954	5.3
226	0.057315	5.1
227	9.26E-03	0.4
228	0.038942	1.4
229	0.016346	0.7
230	0.067136	2.4
231	0.071414	5.8
232	0.071362	5.8
233	0.071937	6.0
234	0.03109	2.1
235	0.05835	4.0
236	0.072316	5.6
237	0.073182	5.5
238	0.056103	5.0
239	0.027012	2.4
240	0.085475	6.2
241	0	0.0
242	0.092338	6.7
243	0.067557	5.3
244	0.053764	4.7
245	0.051807	4.5
246	0.041875	3.5
247	0.058255	4.9
248	0.06446	5.4
249	0.061568	5.2
250	0.049091	4.4
251	0.056336	5.0
252	0.012414	1.1

SA2	Estimated coefficient	t-statistic
253	0.017631	1.5
254	0.042813	3.6
255	0.04649	4.0
256	0.054283	4.9
257	0.046716	4.2
258	0.045825	4.1
259	0.054806	5.0
260	0.056713	5.1
261	0.056919	5.2
262	0.051595	4.7
263	0.049779	4.5
264	9.18E-03	0.7
265	0.025931	2.1
266	0.026562	1.6
267	0.043489	3.6
268	0.03936	3.0
269	0.041908	3.0
270	0.022332	1.8
271	0.048678	4.0
272	-0.010387	-0.8
273	0.020747	1.6
274	0.027685	2.3
275	0.05831	4.0
276	0.049985	2.6
277	0.02352	1.8
278	0.03384	2.0
279	0.012558	0.9
280	0.011266	0.6
281	0.050491	3.7
282	0.057588	4.0
283	0.047823	3.9
284	0.066536	5.2
285	0.063267	5.4
286	0.059681	5.0
287	3.63E-03	0.3
288	0.054233	4.3
289	0.046904	3.6
290	0.062118	4.9
291	-6.23E-03	-0.5
292	0.039259	3.2
293	0.059686	4.9
294	0.075192	6.2
295	2.28E-03	0.2
296	0.060592	5.5
297	0.066677	6.0
298	0.076873	6.5
299	0.063337	5.5
300	0.054769	4.9
301	0.060158	5.3
302	0.061537	5.4
303	0.068922	6.1
304	0.068164	6.0
305	0.056837	5.3
306	0.076192	6.9
307	0.053614	4.9
308	0.056273	5.2
309	0.050311	4.7
310	0.051839	4.8
311	0.053081	4.8
312	0.059033	5.4
313	0.049229	4.5
314	0.055266	4.9
315	0.104897	9.1
316	0.059856	5.2
317	0.075578	6.3
318	0.056043	4.8
319	0.068371	5.7
320	0.061114	5.3
321	0.065759	5.7
322	0.05982	5.3
323	0.057379	5.1
324	0.054689	4.8
325	0.075429	6.3
326	0.058972	5.0
327	0.056547	5.0
328	0.065008	5.7
329	0.05637	5.0
330	0.063707	5.8
331	0.072002	6.2
332	0.070765	6.4
333	0.067804	6.1
334	0.08572	7.7
335	0.074977	6.8
336	0.080615	7.2
337	0.078298	6.9
338	0.072131	6.5
339	0.027817	1.6
340	0.067728	5.4
341	0.042125	2.8
342	0.022247	1.5
343	0.058787	3.7
344	0.044885	3.6
345	0.07833	6.5
346	0.056634	4.7
347	0.065544	5.3
348	0.020609	1.8
349	0.046424	3.7
350	0.074255	6.4
351	0.057348	4.5
352	0.048639	3.4
353	0.064893	5.0
354	0.063279	4.7
355	0.06429	4.8
356	0.041575	3.1
357	0.027859	2.1
358	0.059256	4.6
359	0.067373	5.2
360	0.043483	2.4
361	0.034292	1.6
362	0.031179	1.7
363	0.059297	4.0
364	0.032711	2.3
365	0.044853	2.8
366	0.025953	1.3
367	0.059908	2.9
368	0.032731	2.2
369	0.181219	3.1
370	0.115713	1.9
371	0.194672	2.9
372	0.221071	3.2
373	0.237298	3.0
374	0.176189	2.6
375	0.176815	2.7
376	0.215528	2.6
377	0.202582	2.7
378	0.206014	3.2
379	0.221828	3.5
380	0.179384	2.2
381	0.218097	3.4
382	0.19152	2.7
383	0.196826	2.8
384	0.213919	3.0
385	0.218026	2.9
386	0.207679	3.0
387	0.190288	2.6
388	0.167385	3.0
389	0.161743	3.1
390	0.221075	3.8
391	0.158385	3.0
392	0.140809	2.8
393	0.172166	3.1
394	0.134558	2.6
395	0.170546	3.2
396	0.154349	2.9
397	0.152417	3.0
398	0.173011	3.4
399	0.156385	3.1
400	0.171633	3.4
401	0.152426	3.0
402	0.180238	2.6
403	0.145792	2.3
404	0.200198	3.1
405	0.171358	2.5
406	0.052437	4.6
407	0.059759	5.3
408	0.064849	5.7
409	0.064535	5.7
410	0.075664	6.4
411	0.073646	6.2
412	0.064471	4.4
413	0.062822	4.7
414	0.071794	5.5
415	0.048386	3.6
416	0.050984	3.6
417	0.066776	5.0
418	0.062524	4.8
419	0.019933	1.4
420	0.073753	5.9
421	0.063001	5.0
422	0.068408	5.5
423	0.075996	5.4
424	0.08831	6.2
425	0.056317	3.9
426	0.086589	5.8
427	7.94E-03	0.6
428	0.050419	4.3
429	0.049708	4.2
430	0.046788	4.0
431	0.043178	3.6
432	0.051222	4.4
433	0.043081	3.7
434	0.04864	4.2
435	0.045011	3.9
436	0.0593	5.1
437	0.066025	5.4
438	0.060825	5.0
439	0.072025	5.7
440	0.071963	5.9
441	0.06707	5.9
442	0.070832	6.3
443	0.090805	7.8
444	0.14735	11.2
445	0.109353	9.1
446	0.043086	3.8
447	0.071336	6.2
448	0.078317	6.5
449	0.065616	5.2
450	0.017428	1.2
451	0.221204	3.4
452	0.219606	3.4
453	0.14487	2.6
454	0.144549	3.0
455	0.113019	2.4
456	0.103037	2.0
457	0.167826	2.9
458	0.133473	2.4
459	0.120061	2.1
460	0.13603	2.4
461	0.187687	3.2
462	0.186745	3.2

Equation 8: CONST8(j)

SA2	Estimated coefficient	t-statistic
1	0.618538	46.3
2	0.630188	46.2
3	0.637947	46.3
4	0.63294	46.0
5	0.635641	45.9
6	0.624717	46.3
7	0.619164	46.1
8	0.626011	46.5
9	0.4665	30.6
10	0.607666	45.6
11	0.651181	46.0
12	0.648971	45.4
13	0.429777	35.4
14	0.515221	41.5
15	0.594617	45.0
16	0.494523	39.1
17	0.472816	37.7
18	0.487545	39.0
19	0.485148	39.0
20	0.491292	39.3
21	0.491793	39.1
22	0.488512	38.8
23	0.482509	38.5
24	0.497127	39.6
25	0.487743	39.3
26	0.489279	38.7
27	0.581178	43.9
28	0.551082	42.1
29	0.593683	46.0
30	0.625061	44.1
31	0.476111	31.9
32	0.463342	37.3
33	0.414322	35.0
34	0.284067	19.7
35	0.269708	19.4
36	0.230017	16.7
37	0.275036	18.9
38	0.336458	22.7
39	0.298414	20.3
40	0.288713	19.8
41	0.241031	16.7
42	0.257444	17.8
43	0.351489	23.3
44	0.323283	21.7
45	0.311123	21.1
46	0.286847	19.6
47	0.309826	21.1
48	0.424714	28.1
49	0.405105	31.3
50	0.286912	19.5
51	0.381671	24.7
52	0.362348	24.0
53	0.164742	11.7
54	0.665843	48.9
55	0.44469	36.9
56	0.415269	27.9
57	0.390716	35.4
58	0.548053	44.2
59	0.664104	48.8
60	0.644578	46.7
61	0.642595	46.0
62	0.43552	29.6
63	0.416168	34.8

SA2	Estimated coefficient	t-statistic
64	0.41721	34.9
65	0.382112	31.9
66	0.429697	35.7
67	0.414999	34.6
68	0.415701	34.4
69	0.363277	32.4
70	0.405313	33.7
71	0.439081	39.8
72	0.388457	35.3
73	0.41178	34.5
74	0.413568	34.8
75	0.410437	34.4
76	0.617196	42.0
77	0.567967	41.9
78	0.538185	39.7
79	0.576561	40.9
80	0.523899	57.8
81	0.376995	32.9
82	0.496023	46.9
83	0.365187	32.3
84	0.355796	31.9
85	-0.218317	-22.9
86	0.362134	31.2
87	0.604373	48.3
88	0.571104	37.8
89	0.571901	40.6
90	0.537428	40.3
91	0.589904	40.2
92	0.399471	35.6
93	0.566137	40.3
94	0.559115	44.0
95	0.551066	41.8
96	0.573851	44.8
97	0.48323	38.5
98	0.542806	42.9
99	0.402979	36.3
100	0.381485	31.8
101	0.40472	33.3
102	0.431706	34.7
103	0.397913	32.7
104	0.414527	33.8
105	0.327114	20.7
106	0.347528	22.0
107	0.320514	20.3
108	0.329868	20.9
109	0.334981	21.2
110	0.343829	21.7
111	0.340764	21.5
112	0.34259	21.7
113	0.330961	20.9
114	0.326582	20.7
115	0.33573	21.2
116	0.331138	21.0
117	0.342227	21.6
118	0.333937	21.1
119	0.342881	21.6
120	0.330269	20.9
121	0.333021	21.0
122	0.337693	21.3
123	0.336702	21.2
124	0.341802	21.6
125	0.333679	21.0
126	0.334891	21.1

SA2	Estimated coefficient	t-statistic
127	0.33175	21.0
128	0.328521	20.7
129	0.318003	20.1
130	0.325278	20.5
131	0.322132	20.4
132	0.332029	20.9
133	0.326231	20.6
134	0.326281	20.6
135	0.335446	21.1
136	0.330813	20.8
137	0.335829	21.2
138	0.337597	21.3
139	0.342603	21.6
140	0.334015	21.1
141	0.34269	21.6
142	0.333813	21.1
143	0.339929	21.4
144	0.332519	21.0
145	0.343162	21.6
146	0.36997	23.3
147	0.380226	23.9
148	0.383396	24.1
149	0.375184	23.6
150	0.37274	23.4
151	0.380702	23.9
152	0.376285	23.6
153	0.379161	23.8
154	0.38012	23.9
155	0.377454	23.7
156	0.385897	24.3
157	0.389871	24.6
158	0.392621	24.8
159	0.39211	24.7
160	0.375401	23.7
161	0.377184	23.8
162	0.375848	23.7
163	0.383231	24.1
164	0.375744	23.7
165	0.37555	23.7
166	0.379173	23.9
167	0.324058	20.5
168	0.343925	21.7
169	0.342661	21.6
170	0.329812	20.9
171	0.334479	21.1
172	0.326515	20.7
173	0.342558	21.6
174	0.353681	22.3
175	0.35951	22.6
176	0.353611	22.2
177	0.35366	22.2
178	0.35189	22.2
179	0.352998	22.2
180	0.350355	22.0
181	0.335546	21.4
182	0.33315	21.2
183	0.331663	21.2
184	0.321503	20.5
185	0.336339	21.5
186	0.337224	21.3
187	0.322485	20.5
188	0.328277	20.8
189	0.340172	21.5

SA2	Estimated coefficient	t-statistic
190	0.335381	21.3
191	0.324086	20.6
192	0.36548	22.9
193	0.358674	22.6
194	0.377026	24.0
195	0.394412	25.0
196	0.361095	22.8
197	0.346328	21.9
198	0.351346	22.2
199	0.36261	22.9
200	0.399374	25.3
201	0.375737	23.8
202	0.377801	24.0
203	0.352935	22.5
204	0.353405	22.5
205	0.34261	21.8
206	0.411868	26.3
207	0.445962	28.8
208	0.44622	29.3
209	0.451301	29.5
210	0.402791	25.8
211	0.431557	27.6
212	0.425169	27.3
213	0.373321	23.9
214	0.37212	23.8
215	0.35465	22.7
216	0.375949	24.0
217	0.375665	24.0
218	0.358559	22.9
219	0.368508	23.7
220	0.428762	27.4
221	0.345372	21.8
222	0.352168	22.2
223	0.337122	21.6
224	0.34657	21.9
225	0.352232	22.2
226	0.356902	22.5
227	0.413957	28.6
228	0.452098	31.8
229	0.415125	28.6
230	0.423614	29.9
231	0.325349	20.7
232	0.325288	20.7
233	0.324635	20.6
234	0.319313	20.8
235	0.329253	21.3
236	0.318825	20.4
237	0.318565	20.4
238	0.41085	25.9
239	0.406721	25.7
240	0.333253	21.4
241	0.308076	19.7
242	0.328564	21.2
243	0.3337	21.3
244	0.39946	25.3
245	0.403875	25.6
246	0.412413	26.2
247	0.41048	26.0
248	0.410442	26.1
249	0.407047	25.8
250	0.400825	25.3
251	0.403202	25.5
252	0.402163	25.4

SA2	Estimated coefficient	t-statistic
253	0.411863	26.1
254	0.403732	25.6
255	0.405083	25.7
256	0.398932	25.2
257	0.399097	25.2
258	0.402129	25.4
259	0.391299	24.6
260	0.399179	25.1
261	0.397912	25.0
262	0.39675	25.0
263	0.394461	24.9
264	0.427501	27.4
265	0.394653	25.1
266	0.423214	27.8
267	0.402854	25.6
268	0.394441	25.3
269	0.431927	27.9
270	0.408404	26.1
271	0.395468	25.2
272	0.41982	26.9
273	0.411051	26.4
274	0.413238	26.3
275	0.423329	27.4
276	0.438874	29.4
277	0.395236	25.3
278	0.410893	27.1
279	0.396819	25.7
280	0.398163	26.3
281	0.403876	26.1
282	0.409058	26.5
283	0.391141	25.0
284	0.389506	24.9
285	0.379355	24.0
286	0.385499	24.5
287	0.391479	24.9
288	0.373761	23.9
289	0.383023	24.6
290	0.382846	24.5
291	0.378836	24.4
292	0.370511	23.7
293	0.380418	24.2
294	0.379877	24.2
295	0.377051	24.4
296	0.366011	23.0
297	0.366997	23.1
298	0.371556	23.6
299	0.37447	23.7
300	0.355325	22.4
301	0.369547	23.4
302	0.367532	23.2
303	0.369206	23.3
304	0.364681	23.0
305	0.380947	23.9

SA2	Estimated coefficient	t-statistic
306	0.369169	23.2
307	0.372919	23.5
308	0.374579	23.5
309	0.379944	23.8
310	0.374974	23.6
311	0.36654	23.1
312	0.373754	23.5
313	0.36871	23.2
314	0.34734	21.9
315	0.338229	21.4
316	0.336423	21.3
317	0.337709	21.4
318	0.343478	21.7
319	0.334743	21.2
320	0.342655	21.7
321	0.344821	21.8
322	0.354226	22.3
323	0.353696	22.3
324	0.350284	22.1
325	0.339212	21.6
326	0.342811	21.8
327	0.344151	21.7
328	0.339457	21.4
329	0.35202	22.2
330	0.361934	22.7
331	0.335042	21.2
332	0.360743	22.7
333	0.360875	22.7
334	0.368835	23.2
335	0.366346	23.0
336	0.36534	22.9
337	0.359627	22.6
338	0.363643	22.8
339	0.248	16.4
340	0.30361	19.4
341	0.286475	18.6
342	0.28201	18.3
343	0.281489	18.4
344	0.326051	20.8
345	0.329179	20.9
346	0.324542	20.7
347	0.315037	20.1
348	0.340256	21.5
349	0.309172	19.8
350	0.324713	20.6
351	0.294502	18.8
352	0.242858	15.7
353	0.415117	26.6
354	0.413652	26.6
355	0.415684	26.7
356	0.410862	26.5
357	0.416745	26.8
358	0.404305	25.9

SA2	Estimated coefficient	t-statistic
359	0.417486	26.8
360	0.417081	27.6
361	0.381091	25.6
362	0.407889	27.0
363	0.410402	26.7
364	0.41511	26.8
365	0.42231	27.6
366	0.356037	23.9
367	0.340308	22.8
368	0.411174	26.7
369	0.424418	35.7
370	0.438148	37.7
371	0.347358	31.3
372	0.351594	31.9
373	0.311894	30.3
374	0.387729	35.0
375	0.375849	33.2
376	0.383999	38.3
377	0.316128	29.6
378	0.332096	29.0
379	0.325743	28.5
380	0.572293	56.2
381	0.345122	30.1
382	0.314589	29.0
383	0.277939	25.3
384	0.277075	25.6
385	0.397751	37.2
386	0.288541	26.2
387	0.313365	29.3
388	0.419659	34.8
389	0.418178	33.9
390	0.407877	34.1
391	0.433968	35.2
392	0.465698	37.2
393	0.378546	31.1
394	0.39845	32.2
395	0.382077	31.1
396	0.388895	31.8
397	0.42002	33.7
398	0.411599	33.0
399	0.422271	33.9
400	0.41113	33.0
401	0.428447	34.4
402	0.307025	27.7
403	0.35075	30.5
404	0.228596	20.2
405	0.362337	32.9
406	0.386529	24.4
407	0.394493	24.9
408	0.346294	21.8
409	0.342319	21.6
410	0.349172	22.1
411	0.35074	22.3

SA2	Estimated coefficient	t-statistic
412	0.489446	31.8
413	0.39502	25.4
414	0.37426	24.0
415	0.352308	22.7
416	0.459197	29.7
417	0.380632	24.5
418	0.405905	26.0
419	0.414667	26.8
420	0.315979	20.1
421	0.377694	24.1
422	0.340724	21.7
423	0.367866	23.7
424	0.404035	26.2
425	0.378158	24.5
426	0.39094	25.4
427	0.287819	18.5
428	0.40499	25.7
429	0.40924	26.0
430	0.416127	26.4
431	0.428088	27.2
432	0.398469	25.3
433	0.408801	25.9
434	0.41032	26.0
435	0.379946	24.1
436	0.375445	23.8
437	0.386934	24.7
438	0.377381	24.0
439	0.37931	24.2
440	0.374427	23.9
441	0.371684	23.5
442	0.366649	23.1
443	0.340437	21.6
444	0.341202	21.6
445	0.327493	20.8
446	0.338163	21.4
447	0.343224	21.8
448	0.344013	21.8
449	0.307948	19.7
450	0.339583	22.1
451	0.322623	28.2
452	0.330904	28.9
453	0.468632	38.6
454	0.493981	38.9
455	0.504133	39.2
456	0.500461	40.2
457	0.426236	36.0
458	0.45036	37.4
459	0.410184	34.4
460	0.335207	28.2
461	0.343274	28.9
462	0.355188	29.9

Equation 9: CONST9(j)

SA2	Estimated coefficient	t-statistic
1	0.011383	1.1
2	0.01307	1.3
3	-0.03016	-2.9
4	-0.0255	-2.5
5	-0.04536	-4.4
6	0.040086	3.8
7	-0.037037	-3.6
8	0.033305	3.2
9	-0.011604	-1.1
10	9.25E-03	0.9
11	-5.58E-03	-0.5
12	-0.01926	-1.9
13	9.30E-03	0.9
14	-0.029164	-2.8
15	6.16E-03	0.6
16	-0.016635	-1.6
17	-8.24E-03	-0.8
18	0.03241	3.2
19	-0.036779	-3.6
20	-0.010318	-1.0
21	-0.052087	-5.0
22	7.06E-03	0.7
23	-0.033506	-3.3
24	-0.051255	-4.9
25	0.02016	2.0
26	-0.027905	-2.7
27	-7.09E-03	-0.7
28	-5.87E-03	-0.6
29	-1.30E-03	-0.1
30	0.026371	2.6
31	0.014206	1.4
32	0.033878	3.3
33	2.13E-03	0.2
34	8.28E-03	0.8
35	9.50E-03	0.9
36	0.014555	1.4
37	-0.034248	-3.3
38	-1.53E-03	-0.1
39	0.096376	9.0
40	-0.042815	-4.1
41	-0.029627	-2.9
42	-0.041607	-4.0
43	4.42E-03	0.4
44	-0.040552	-3.9
45	1.09E-03	0.1
46	-6.61E-03	-0.6
47	0.033607	3.3
48	-0.05462	-5.3
49	-0.045749	-4.4
50	-0.035407	-3.4
51	-0.068315	-6.5
52	-0.0226	-2.2
53	7.08E-03	0.7
54	8.84E-03	0.9
55	-4.75E-04	0.0
56	3.48E-03	0.3
57	6.77E-04	0.1
58	0.017481	1.7
59	0.021322	2.1
60	-8.54E-04	-0.1
61	-0.098238	-9.2
62	-9.11E-03	-0.9
63	-2.56E-03	-0.2

SA2	Estimated coefficient	t-statistic
64	-1.57E-03	-0.2
65	9.95E-03	1.0
66	-4.05E-03	-0.4
67	8.28E-03	0.8
68	-0.032791	-3.2
69	-0.020692	-2.0
70	-6.20E-03	-0.6
71	0.021623	2.1
72	6.12E-03	0.6
73	-0.013458	-1.3
74	1.44E-03	0.1
75	0.023049	2.2
76	-8.66E-03	-0.8
77	-7.68E-03	-0.7
78	-6.34E-03	-0.6
79	0.019263	1.9
80	0	0.0
81	0.035232	3.4
82	-5.10E-03	-0.5
83	0	0.0
84	-0.064196	-6.1
85	3.22E-03	0.3
86	-0.054484	-5.2
87	-9.64E-03	-0.9
88	0.018064	1.8
89	8.19E-03	0.8
90	0.017496	1.7
91	-7.55E-03	-0.7
92	0	0.0
93	-5.25E-04	-0.1
94	-5.73E-03	-0.6
95	-0.04717	-4.5
96	0.02107	2.1
97	-2.38E-03	-0.2
98	-0.037175	-3.6
99	0.036278	3.5
100	-0.011267	-1.1
101	-0.014327	-1.4
102	-7.20E-03	-0.7
103	8.66E-03	0.8
104	0.013077	1.3
105	0.020826	2.0
106	0.013984	1.4
107	-0.055925	-5.3
108	-0.010035	-1.0
109	-0.040102	-3.9
110	0.027988	2.7
111	-0.035165	-3.4
112	-0.032642	-3.2
113	-0.042401	-4.1
114	-0.016099	-1.6
115	-0.055676	-5.3
116	-2.94E-03	-0.3
117	-0.091825	-8.6
118	-0.016898	-1.5
119	-0.02975	-2.9
120	0.010449	0.9
121	-0.039936	-3.9
122	-0.047369	-4.6
123	-0.042424	-4.1
124	-0.087684	-8.2
125	-0.019434	-1.9
126	-0.039533	-3.8

SA2	Estimated coefficient	t-statistic
127	0.46612	8.7
128	-2.94E-03	-0.3
129	-0.042313	-4.1
130	-0.013293	-1.3
131	0.42613	19.8
132	0.045299	4.3
133	-0.012782	-1.2
134	-0.049339	-4.7
135	0.016138	1.6
136	4.34E-03	0.4
137	0.019933	1.9
138	-0.02447	-2.4
139	0.053112	5.1
140	-0.071645	-6.8
141	0.024484	2.4
142	-0.038877	-3.7
143	-0.05641	-5.4
144	0.029122	2.8
145	-0.024274	-2.4
146	-0.026127	-2.5
147	-0.022252	-2.2
148	-0.036464	-3.5
149	-0.013112	-1.3
150	-0.016847	-1.6
151	0.024552	2.4
152	0.0383	3.7
153	-7.73E-03	-0.8
154	-0.013869	-1.4
155	0.017496	1.7
156	8.22E-03	0.8
157	0.02046	2.0
158	-0.023676	-2.3
159	1.27E-03	0.1
160	-8.99E-03	-0.9
161	-0.050228	-4.8
162	0.021102	2.0
163	-0.042442	-4.1
164	0.024169	2.3
165	-0.036002	-3.5
166	-0.033624	-3.3
167	-0.020976	-2.0
168	-4.58E-03	-0.4
169	-0.030884	-3.0
170	0.077028	7.2
171	-0.030203	-2.9
172	-0.014891	-1.5
173	-4.79E-03	-0.5
174	-0.012875	-1.3
175	-0.029988	-2.9
176	-5.39E-03	-0.5
177	-0.01843	-1.8
178	-0.04756	-4.6
179	0.038841	3.8
180	-0.021108	-2.1
181	-0.036544	-3.5
182	0.445478	22.2
183	-0.039212	-3.8
184	-0.049029	-4.7
185	-0.023264	-2.3
186	-8.42E-03	-0.8
187	-0.043484	-4.2
188	-0.02273	-2.2
189	0.055752	5.3

SA2	Estimated coefficient	t-statistic
190	0	0.0
191	-0.018603	-1.8
192	0.01079	1.1
193	-1.78E-03	-0.2
194	0.015651	1.5
195	-0.018992	-1.8
196	0.012151	1.2
197	0.065019	6.2
198	-0.025824	-2.5
199	-0.035109	-3.4
200	-0.031383	-3.0
201	-0.033603	-3.3
202	-0.027274	-2.6
203	-0.032371	-3.2
204	-0.046721	-4.5
205	4.80E-03	0.5
206	9.33E-03	0.9
207	4.52E-03	0.4
208	-9.00E-03	-0.9
209	0.029679	2.9
210	-0.020712	-2.0
211	5.46E-03	0.5
212	-4.61E-04	0.0
213	4.83E-03	0.5
214	-0.047414	-4.6
215	-0.020203	-2.0
216	-0.031563	-3.1
217	-0.023329	-2.3
218	0.072375	7.0
219	-0.015261	-1.5
220	-0.03179	-3.1
221	0.091601	8.5
222	0	0.0
223	0.069742	6.6
224	-0.041423	-4.0
225	3.15E-03	0.3
226	-0.027528	-2.7
227	-2.63E-03	-0.3
228	9.00E-03	0.9
229	-0.029004	-2.8
230	-6.81E-03	-0.7
231	0.102749	9.5
232	-0.034008	-3.3
233	-0.02845	-2.8
234	-0.041325	-4.0
235	-0.040413	-3.9
236	-0.021976	-2.1
237	0.071044	6.8
238	-0.055103	-5.3
239	-9.89E-03	-1.0
240	-0.094615	-8.8
241	0.235452	17.7
242	-0.055321	-5.4
243	0.022048	2.1
244	0.07018	6.7
245	0.05481	5.2
246	-0.015119	-1.5
247	-0.028099	-2.7
248	1.48E-03	0.1
249	-0.033994	-3.3
250	-0.05136	-4.9
251	-0.017165	-1.7
252	-3.00E-06	0.0

SA2	Estimated coefficient	t-statistic
253	0.020933	2.0
254	0.066235	6.3
255	-0.021715	-2.1
256	0.023696	2.3
257	-0.049355	-4.7
258	-0.061157	-5.8
259	-0.016924	-1.6
260	6.03E-03	0.6
261	0.031437	3.0
262	-7.51E-03	-0.7
263	-0.03492	-3.4
264	-0.026451	-2.6
265	-5.56E-03	-0.5
266	-3.64E-03	-0.4
267	0.069171	6.6
268	0.026525	2.6
269	0.016169	1.6
270	-2.62E-03	-0.3
271	-0.03146	-3.0
272	-0.029512	-2.9
273	-0.023964	-2.3
274	-0.038978	-3.8
275	0.014978	1.5
276	-9.03E-03	-0.9
277	5.79E-03	0.6
278	-0.019767	-1.9
279	-0.011984	-1.2
280	6.92E-03	0.7
281	-0.025184	-2.5
282	0.02265	2.2
283	-0.021444	-2.1
284	-0.033843	-3.3
285	9.95E-03	1.0
286	0.135839	12.1
287	-0.022379	-2.2
288	-0.017826	-1.7
289	-0.011671	-1.1
290	-0.039229	-3.8
291	0.032189	3.1
292	-0.052617	-5.1
293	-0.047045	-4.5
294	-0.018138	-1.7
295	-6.29E-03	-0.6
296	-0.019851	-1.9
297	2.17E-04	0.0
298	0.037486	3.6
299	-0.076295	-7.2
300	-0.022394	-2.2
301	-0.020067	-2.0
302	-0.02355	-2.3
303	-0.019337	-1.9
304	-0.06525	-6.2
305	-0.030012	-2.9

SA2	Estimated coefficient	t-statistic
306	0.026834	2.6
307	-0.056845	-5.4
308	-0.033039	-3.2
309	-0.058191	-5.6
310	0.013418	1.3
311	0.04082	3.9
312	-3.88E-03	-0.4
313	-0.044075	-4.3
314	-1.95E-03	-0.2
315	-0.070794	-6.9
316	0.033109	3.2
317	-0.058284	-5.6
318	-0.07008	-6.7
319	-0.078537	-7.4
320	-0.05624	-5.4
321	-0.077207	-7.2
322	0.021675	2.1
323	0.017853	1.7
324	0.013984	1.4
325	-0.051109	-4.9
326	-0.033843	-3.3
327	9.79E-03	1.0
328	-0.043586	-4.2
329	0.051054	4.9
330	-8.32E-03	-0.8
331	-0.062775	-6.0
332	-5.84E-03	-0.6
333	-7.13E-03	-0.7
334	-5.76E-03	-0.6
335	-0.011586	-1.1
336	-0.051535	-5.0
337	0.037302	3.6
338	-9.16E-03	-0.9
339	4.70E-03	0.5
340	-0.039047	-3.8
341	0.02909	2.8
342	-0.028034	-2.7
343	-0.04648	-4.5
344	0.141673	12.3
345	-0.055227	-5.4
346	-3.57E-03	-0.3
347	-0.046789	-4.5
348	0.15431	13.5
349	-0.041577	-4.0
350	-5.27E-03	-0.5
351	-0.010664	-1.0
352	-0.034674	-3.4
353	0.0446	4.3
354	-0.024039	-2.3
355	-0.054354	-5.2
356	-0.019145	-1.9
357	-0.021706	-2.1
358	0.024954	2.4

SA2	Estimated coefficient	t-statistic
359	-0.027971	-2.7
360	-7.21E-03	-0.7
361	-0.015872	-1.5
362	0.02308	2.2
363	0.042909	4.1
364	-0.023558	-2.3
365	-0.035088	-3.4
366	-0.043604	-4.2
367	-0.041818	-4.0
368	0.012341	1.2
369	-0.012312	-1.2
370	0.02403	2.3
371	-1.94E-03	-0.2
372	5.74E-03	0.6
373	-1.26E-03	-0.1
374	3.45E-03	0.3
375	-2.29E-03	-0.2
376	0.011747	1.1
377	-1.89E-03	-0.2
378	4.17E-03	0.4
379	-0.030172	-2.9
380	0.023785	2.3
381	-0.030479	-3.0
382	6.92E-04	0.1
383	1.50E-03	0.1
384	-6.07E-03	-0.6
385	-8.42E-03	-0.8
386	2.48E-03	0.2
387	-0.012504	-1.2
388	7.89E-03	0.8
389	-0.015413	-1.5
390	-0.015858	-1.5
391	0.01164	1.1
392	7.87E-03	0.8
393	-6.60E-03	-0.6
394	0.017331	1.7
395	0.01369	1.3
396	-0.023016	-2.2
397	-0.041569	-4.0
398	0.021267	2.1
399	-0.017981	-1.8
400	0.015395	1.5
401	-0.010574	-1.0
402	-7.77E-04	-0.1
403	-1.62E-03	-0.2
404	-3.94E-03	-0.4
405	4.48E-03	0.4
406	-0.021197	-2.1
407	-0.048033	-4.6
408	0.034218	3.3
409	0.018884	1.8
410	0.054897	5.3
411	-0.049289	-4.7

SA2	Estimated coefficient	t-statistic
412	-0.038734	-3.8
413	-0.065777	-6.3
414	0.058964	5.7
415	-0.016363	-1.5
416	-0.039978	-3.9
417	-0.050832	-4.9
418	-0.042792	-4.1
419	-0.019246	-1.9
420	-0.038101	-3.7
421	-0.03014	-2.9
422	-0.048845	-4.7
423	-0.05292	-5.1
424	-0.048556	-4.7
425	0.013951	1.4
426	-0.03701	-3.5
427	-0.031728	-3.1
428	-0.021896	-2.1
429	-0.049045	-4.7
430	-0.022677	-2.2
431	-0.061588	-5.9
432	-0.010126	-1.0
433	-0.040179	-3.9
434	0.048958	4.7
435	-0.049811	-4.8
436	1.41E-03	0.1
437	-0.053346	-5.1
438	0.012984	1.3
439	-0.056648	-5.5
440	-0.069167	-6.7
441	-0.082502	-7.8
442	-0.061651	-5.9
443	-0.062903	-6.1
444	-0.118763	-11.5
445	-0.077445	-7.4
446	-0.026011	-2.5
447	-0.042463	-4.1
448	-0.033287	-3.2
449	-0.063766	-6.1
450	-0.02776	-2.7
451	0.020735	2.0
452	-0.025091	-2.4
453	-0.023609	-2.3
454	-3.66E-03	-0.4
455	0.028711	2.8
456	-1.62E-03	-0.2
457	0.024168	2.3
458	-0.028807	-2.8
459	0.010752	1.0
460	-3.09E-03	-0.3
461	-0.03584	-3.5
462	0.025148	2.4

Equation 10: CONST10(j)

SA2	Estimated coefficient	t-statistic
1	0.033868	6.1
2	0.087829	10.1
3	0.027261	4.8
4	0.052747	7.7
5	0.033947	6.2
6	0.02361	4.4
7	-0.018589	-3.6
8	0.027604	4.9
9	-0.044989	-8.1
10	-0.05511	-9.1
11	-8.05E-03	-1.6
12	-0.065791	-10.6
13	-0.012105	-2.3
14	-0.038954	-7.3
15	-0.060784	-10.0
16	0.073801	9.8
17	-0.019832	-3.7
18	0.094971	10.5
19	0.047927	7.4
20	0.059696	8.4
21	0.084782	9.8
22	0.075369	9.7
23	0.014643	2.8
24	0.047431	8.2
25	0.029486	5.3
26	-0.040752	-7.1
27	0.043762	6.9
28	-0.033271	-6.0
29	-0.044852	-7.5
30	7.39E-04	0.1
31	-8.97E-03	-1.7
32	-0.060783	-9.1
33	3.60E-03	0.7
34	-0.028655	-5.0
35	-0.036086	-6.6
36	-0.04014	-7.0
37	0.062924	8.2
38	-7.18E-04	-0.1
39	0.064497	9.0
40	0.012143	2.2
41	6.72E-03	1.3
42	0.019763	3.7
43	-0.025944	-4.8
44	-6.43E-03	-1.2
45	-3.43E-03	-0.7
46	0.057908	8.0
47	0.023568	4.2
48	-0.02034	-3.8
49	0.051349	7.8
50	-0.015741	-3.0
51	-0.037613	-6.8
52	-0.033803	-6.3
53	-3.98E-03	-0.8
54	4.58E-03	0.9
55	-3.81E-04	-0.1
56	-0.015732	-3.1
57	-1.94E-03	-0.4
58	-7.01E-03	-1.4
59	0.054971	8.4
60	-0.040814	-7.4
61	-0.031095	-5.6
62	-0.033769	-6.2
63	0.027821	5.0

SA2	Estimated coefficient	t-statistic
64	-0.035475	-6.3
65	-0.018449	-3.5
66	0.066629	9.3
67	-0.016539	-3.1
68	-0.016622	-3.2
69	6.34E-04	0.1
70	-0.04517	-8.0
71	9.87E-04	0.2
72	1.62E-03	0.3
73	0.012013	2.3
74	0.020725	3.8
75	-0.044752	-7.9
76	-9.68E-03	-1.9
77	-5.21E-03	-1.0
78	-0.032399	-6.0
79	0.01395	2.6
80	0	0.0
81	0.011409	2.2
82	-1.61E-03	-0.3
83	0	0.0
84	-4.51E-03	-0.9
85	5.98E-04	0.1
86	-0.013626	-2.6
87	-5.53E-03	-1.1
88	-0.082753	-13.1
89	-0.015701	-3.0
90	-3.93E-03	-0.8
91	0.011449	2.2
92	0	0.0
93	4.22E-04	0.1
94	-0.023306	-4.4
95	0.0201	3.8
96	0.03585	6.3
97	0.03401	5.9
98	-0.037209	-6.6
99	-0.018116	-3.5
100	-0.031971	-5.7
101	-7.11E-03	-1.4
102	-0.047042	-7.7
103	0.070087	9.5
104	-0.012491	-2.4
105	-0.013099	-2.5
106	3.19E-03	0.6
107	-6.25E-03	-1.2
108	-3.29E-03	-0.6
109	-8.33E-04	-0.2
110	-0.0217	-4.2
111	-5.05E-03	-1.0
112	-0.013247	-2.6
113	4.03E-03	0.8
114	0.011774	2.2
115	5.66E-03	1.1
116	0.012262	2.3
117	0.023244	4.3
118	0.020581	4.0
119	0.033203	5.8
120	-0.049102	-7.1
121	0.018259	3.2
122	0.036027	6.6
123	0.010524	2.0
124	0.032793	5.8
125	0.031357	5.4
126	0.038723	7.2

SA2	Estimated coefficient	t-statistic
127	-0.056194	-8.4
128	0.024398	4.3
129	0.022913	4.0
130	0.012541	2.4
131	-0.027661	-5.1
132	-9.03E-03	-1.8
133	0.01413	2.6
134	0.013836	2.5
135	-0.015691	-3.1
136	6.15E-03	1.2
137	4.45E-03	0.9
138	-8.94E-03	-1.7
139	-2.90E-03	-0.6
140	0.019029	3.4
141	-1.13E-03	-0.2
142	0.012565	2.4
143	1.38E-03	0.3
144	-2.74E-03	-0.5
145	-0.017847	-3.4
146	0.017131	3.1
147	5.49E-03	1.0
148	1.06E-03	0.2
149	0.013933	2.5
150	0.023401	4.1
151	1.74E-03	0.3
152	7.69E-03	1.4
153	-1.55E-03	-0.3
154	-0.01286	-2.5
155	8.82E-03	1.6
156	-6.36E-03	-1.2
157	4.20E-03	0.8
158	0.02908	5.0
159	5.19E-03	1.0
160	0.018197	3.3
161	0.031065	5.2
162	0.016639	3.1
163	0.022979	4.1
164	0.011286	2.2
165	0.01549	2.8
166	0.025547	4.4
167	9.64E-03	1.8
168	-4.66E-03	-0.9
169	9.22E-03	1.7
170	-6.02E-03	-1.2
171	-4.78E-03	-0.9
172	0.015498	2.8
173	3.33E-03	0.6
174	0.011606	2.2
175	1.73E-03	0.3
176	0.012059	2.3
177	2.52E-04	0.0
178	0.032261	5.4
179	0.019026	3.5
180	0.022936	4.2
181	0.012511	2.4
182	-0.018376	-3.5
183	0.035846	6.1
184	0.041908	6.5
185	2.11E-03	0.4
186	3.32E-03	0.6
187	0.028547	4.8
188	6.96E-03	1.3
189	-0.018868	-3.6

SA2	Estimated coefficient	t-statistic
190	-0.047578	-8.5
191	0.013906	2.6
192	2.57E-03	0.5
193	-6.84E-03	-1.3
194	-4.57E-03	-0.9
195	0.032922	5.5
196	6.70E-03	1.3
197	-0.019366	-3.8
198	-6.21E-03	-1.2
199	0.014906	2.7
200	0.042551	6.6
201	0.022642	4.0
202	0.022194	3.9
203	-0.0126	-2.4
204	6.49E-03	1.2
205	-0.01604	-3.1
206	7.67E-03	1.5
207	-0.036462	-6.6
208	-0.01376	-2.6
209	-0.062394	-9.7
210	-0.021472	-4.1
211	-0.041636	-7.2
212	-0.028467	-5.2
213	0.020646	3.9
214	-2.66E-03	-0.5
215	-0.02551	-5.0
216	0.023141	4.1
217	0.017161	2.8
218	-0.017843	-3.4
219	-0.028184	-5.4
220	-0.039248	-7.3
221	-1.08E-03	-0.2
222	-0.039416	-7.1
223	2.23E-03	0.4
224	0.010192	1.9
225	9.41E-03	1.8
226	-5.34E-03	-1.0
227	0.020127	3.8
228	3.43E-03	0.7
229	-0.015317	-2.9
230	-0.026405	-4.8
231	-0.025977	-4.9
232	-8.48E-03	-1.6
233	0.011138	2.1
234	-0.028993	-5.6
235	-0.015616	-3.0
236	-4.18E-03	-0.8
237	-0.022246	-4.2
238	0.011427	2.0
239	-0.040004	-6.7
240	0.029167	4.4
241	-0.044752	-7.3
242	0.016903	3.3
243	1.55E-03	0.3
244	3.82E-03	0.7
245	-2.58E-03	-0.5
246	-0.026225	-4.6
247	0.019955	3.6
248	0.035001	6.4
249	2.59E-03	0.5
250	0.01983	3.6
251	-8.52E-03	-1.7
252	-0.033051	-6.1

SA2	Estimated coefficient	t-statistic
253	-0.051589	-8.2
254	0.01036	2.0
255	0.032855	5.5
256	4.51E-03	0.9
257	0.029496	5.0
258	0.021747	3.8
259	0.018315	3.3
260	9.21E-03	1.7
261	-3.60E-03	-0.7
262	5.33E-03	1.0
263	3.07E-03	0.6
264	-0.042563	-7.7
265	-0.014299	-2.7
266	-0.02128	-4.0
267	-7.71E-03	-1.5
268	-0.024359	-4.5
269	-0.06971	-10.8
270	-0.022728	-4.4
271	9.58E-03	1.8
272	-0.025984	-5.0
273	-0.024715	-4.7
274	9.80E-03	1.8
275	-0.055269	-8.6
276	-8.14E-03	-1.6
277	-6.41E-03	-1.2
278	-0.038069	-7.1
279	-0.026037	-4.9
280	-0.034994	-6.5
281	4.63E-03	0.9
282	0.022456	4.3
283	0.010251	2.0
284	0.022296	4.3
285	-7.73E-03	-1.5
286	6.07E-03	1.2
287	-0.04412	-7.1
288	0.026119	4.7
289	3.11E-03	0.5
290	0.016707	3.2
291	-0.037812	-6.3
292	0.020435	3.9
293	-3.99E-03	-0.8
294	0.035249	6.8
295	-0.052469	-9.1
296	-0.021452	-4.2
297	-0.014297	-2.8
298	-7.68E-03	-1.5
299	0.019438	3.5
300	-0.02496	-4.8
301	-0.010786	-2.1
302	0.014487	2.7
303	6.87E-03	1.3
304	0.013753	2.6
305	0.012779	2.4

SA2	Estimated coefficient	t-statistic
306	0.014766	2.8
307	0.026877	4.6
308	0.010536	2.0
309	0.025227	4.3
310	9.44E-03	1.8
311	0.010101	1.9
312	2.41E-03	0.5
313	0.022723	4.0
314	-4.54E-03	-0.9
315	0.06363	12.2
316	-5.67E-03	-1.1
317	0.051077	8.4
318	4.70E-03	0.9
319	0.025482	4.1
320	0.025259	4.3
321	0.015756	2.9
322	8.77E-03	1.6
323	-0.020977	-4.0
324	-0.010187	-2.0
325	0.07204	11.2
326	0.010912	2.1
327	-0.027608	-5.3
328	0.028128	4.5
329	-0.034309	-6.6
330	-0.02151	-4.2
331	0.048812	7.5
332	-0.018648	-3.6
333	-3.97E-03	-0.8
334	2.75E-04	0.1
335	-0.015157	-2.9
336	0.043625	6.3
337	-0.025326	-4.9
338	-0.012492	-2.4
339	7.21E-03	1.4
340	-5.56E-03	-0.9
341	-0.01875	-3.6
342	-0.023173	-4.4
343	0.014367	2.7
344	-0.044062	-6.9
345	0.076145	14.0
346	8.95E-03	1.7
347	0.027945	4.4
348	-0.012934	-2.5
349	6.35E-03	1.1
350	-4.42E-03	-0.8
351	-0.014435	-2.8
352	-0.023985	-4.4
353	-4.26E-03	-0.8
354	0.037668	6.1
355	0.029463	5.1
356	0.056738	8.1
357	-3.13E-03	-0.6
358	0.012983	2.5

SA2	Estimated coefficient	t-statistic
359	6.47E-03	1.2
360	-0.01211	-2.3
361	-0.054626	-9.2
362	-0.012332	-2.4
363	0.022396	4.1
364	-5.96E-03	-1.2
365	0.011576	2.2
366	0.015605	2.9
367	0.062664	8.7
368	-0.041286	-7.3
369	0.050619	8.0
370	-0.027903	-5.2
371	0.07421	9.8
372	-0.044607	-7.8
373	2.81E-03	0.5
374	9.21E-04	0.2
375	-3.90E-03	-0.8
376	4.41E-03	0.9
377	3.47E-03	0.7
378	-0.01743	-3.3
379	-0.033376	-6.1
380	4.71E-03	0.9
381	-0.051837	-8.6
382	3.02E-03	0.6
383	-9.50E-03	-1.8
384	0.045847	7.6
385	-8.62E-04	-0.2
386	-1.54E-03	-0.3
387	1.16E-03	0.2
388	0.03922	6.7
389	-0.01793	-3.4
390	-0.042066	-7.5
391	-0.015539	-3.0
392	-6.74E-03	-1.3
393	0.03011	5.3
394	-0.037941	-6.9
395	-6.87E-03	-1.3
396	0.045728	7.5
397	0.031368	5.3
398	0.053509	8.2
399	0.036616	6.3
400	-0.061766	-9.9
401	-0.031703	-5.9
402	6.30E-04	0.1
403	0.062468	9.1
404	-2.36E-04	0.0
405	-0.030637	-5.5
406	0.028111	4.8
407	0.016953	3.1
408	7.08E-03	1.4
409	4.71E-03	0.9
410	-0.017139	-3.3
411	-4.98E-04	-0.1

SA2	Estimated coefficient	t-statistic
412	0.07541	12.9
413	8.22E-03	1.6
414	-0.01182	-2.3
415	0.025185	4.9
416	0.024308	4.6
417	0.034016	6.6
418	0.026916	5.1
419	-6.59E-03	-0.9
420	-7.34E-03	-1.4
421	0	0.0
422	0.014199	2.5
423	0.016816	3.1
424	0.05269	9.8
425	0.030767	5.6
426	0.053124	10.1
427	-0.039164	-5.5
428	0.015239	2.8
429	0.029532	5.2
430	0.01816	3.3
431	-0.018349	-3.5
432	0.020501	3.7
433	0.037089	6.2
434	3.72E-03	0.7
435	0.013488	2.4
436	4.67E-03	0.9
437	0.033749	5.7
438	0.014847	2.8
439	0.104561	15.1
440	0	0.0
441	0.03642	6.0
442	0.034986	5.8
443	0.060433	11.1
444	0.086892	15.2
445	0.063923	11.9
446	0.020283	3.6
447	0.055034	9.9
448	0.025448	4.4
449	0.036043	5.6
450	-0.033733	-6.4
451	0.060949	8.7
452	0.022919	4.3
453	0.037786	6.4
454	0.060134	8.8
455	-0.032662	-6.0
456	-0.011452	-2.2
457	-4.24E-03	-0.8
458	-9.30E-03	-1.8
459	-0.027367	-5.1
460	-5.86E-03	-1.1
461	0.045048	7.5
462	0.025017	4.4

Equation 11: CONST11(j)

SA2	Estimated coefficient	t-statistic
1	-0.026818	-3.7
2	-0.037899	-5.3
3	2.47E-03	0.3
4	-7.89E-03	-1.1
5	0.017357	2.5
6	-0.058281	-7.9
7	0.011221	1.6
8	-0.066404	-9.1
9	-0.020707	-2.9
10	-0.034593	-4.9
11	-0.017742	-2.5
12	-0.01437	-2.0
13	-0.047743	-6.6
14	-0.012097	-1.7
15	-0.036896	-5.2
16	-0.024837	-3.5
17	-0.031887	-4.5
18	-0.06269	-8.7
19	-2.98E-03	-0.4
20	-0.018958	-2.7
21	0.023196	3.3
22	-0.038103	-5.3
23	0.010591	1.5
24	0.02789	3.9
25	-0.038916	-5.4
26	4.68E-03	0.7
27	-0.027401	-3.9
28	-0.022125	-3.1
29	-0.042445	-5.9
30	-0.051139	-7.1
31	-0.038825	-5.4
32	-0.060048	-8.3
33	-0.037365	-5.2
34	-0.033149	-4.6
35	-0.03516	-4.9
36	-0.039285	-5.5
37	4.49E-03	0.6
38	-0.04797	-6.7
39	-0.109983	-14.4
40	0.016805	2.4
41	5.20E-03	0.7
42	0.014761	2.1
43	-0.029897	-4.2
44	0.010027	1.4
45	-0.035817	-5.0
46	-0.018148	-2.6
47	-0.065136	-9.0
48	0.017634	2.5
49	0.011934	1.7
50	9.02E-03	1.3
51	0.01383	2.0
52	-0.011669	-1.6
53	-0.029536	-4.1
54	-0.036883	-5.2
55	-0.027319	-3.8
56	-0.033041	-4.6
57	-0.030588	-4.3
58	-0.037282	-5.2
59	-0.060061	-8.3
60	-0.024684	-3.5
61	0.038134	5.4
62	-0.021311	-3.0
63	-0.03264	-4.6
64	-0.022528	-3.2

SA2	Estimated coefficient	t-statistic
65	-0.036453	-5.1
66	-0.028329	-4.0
67	-0.029092	-4.1
68	-2.13E-03	-0.3
69	-9.40E-03	-1.3
70	-0.019993	-2.8
71	-0.053504	-7.4
72	-0.034922	-4.9
73	-0.018154	-2.6
74	-0.03332	-4.7
75	-0.044281	-6.2
76	-0.020581	-2.9
77	-0.020443	-2.9
78	-0.021331	-3.0
79	-0.042366	-5.9
80	0	0.0
81	-0.059545	-8.2
82	-0.020939	-3.0
83	0	0.0
84	0.022147	3.1
85	-2.06E-04	0.0
86	0.011507	1.6
87	-0.021776	-3.1
88	-0.070153	-9.6
89	-0.030549	-4.3
90	-0.039542	-5.5
91	-0.020383	-2.9
92	0	0.0
93	-0.029564	-4.2
94	-0.026537	-3.7
95	2.90E-03	0.4
96	-0.066035	-9.0
97	-0.023211	-3.3
98	7.52E-03	1.1
99	-0.089057	-12.0
100	-0.030932	-4.3
101	-0.015051	-2.1
102	-0.029443	-4.1
103	-0.039805	-5.6
104	-0.047033	-6.6
105	-0.035197	-4.9
106	-0.025775	-3.6
107	0.026971	3.8
108	-0.01851	-2.6
109	7.38E-03	1.0
110	-0.047401	-6.6
111	0.011342	1.6
112	5.70E-03	0.8
113	0.01475	2.1
114	-7.51E-03	-1.1
115	0.019623	2.8
116	-0.019663	-2.8
117	0.01458	2.1
118	-0.028835	-3.4
119	-9.36E-03	-1.3
120	-0.089787	-10.9
121	3.82E-04	0.1
122	-0.010624	-1.5
123	-8.14E-03	-1.2
124	0.029638	4.2
125	-0.021413	-3.0
126	-0.023352	-3.2
127	0	0.0
128	-0.028602	-4.0
129	0.014815	2.1

SA2	Estimated coefficient	t-statistic
130	-0.016374	-2.3
131	0	0.0
132	-0.07064	-9.5
133	-0.012322	-1.7
134	0.021635	3.1
135	-0.040449	-5.7
136	-0.022341	-3.1
137	-0.035947	-5.0
138	-9.47E-03	-1.3
139	-0.06756	-9.1
140	0.040386	5.7
141	-0.048925	-6.8
142	3.01E-03	0.4
143	0.025121	3.5
144	-0.048478	-6.7
145	-3.68E-03	-0.5
146	-6.71E-03	-0.9
147	-0.014561	-2.1
148	-1.56E-05	0.0
149	-0.018084	-2.6
150	-0.01097	-1.6
151	-0.042896	-6.0
152	-0.056666	-7.8
153	-0.021362	-3.0
154	-0.017209	-2.4
155	-0.046551	-6.5
156	-0.03634	-5.1
157	-0.048508	-6.7
158	-6.93E-03	-1.0
159	-0.032441	-4.5
160	-0.020282	-2.9
161	0.012551	1.8
162	-0.050728	-7.0
163	9.20E-03	1.3
164	-0.06047	-8.2
165	-2.88E-03	-0.4
166	6.51E-03	0.9
167	-6.79E-03	-1.0
168	-0.023115	-3.3
169	4.60E-04	0.1
170	-0.093319	-12.3
171	1.48E-03	0.2
172	-0.011858	-1.7
173	-0.024685	-3.5
174	-0.014403	-2.0
175	-1.82E-03	-0.3
176	-0.02298	-3.2
177	-6.01E-03	-0.8
178	0.018574	2.6
179	-0.059134	-8.1
180	-4.13E-03	-0.6
181	6.14E-03	0.9
182	-0.521937	-28.6
183	0.013223	1.9
184	0.021161	3.0
185	-3.71E-03	-0.5
186	-0.016334	-2.3
187	0.017976	2.5
188	-4.37E-04	-0.1
189	-0.074966	-10.0
190	0	0.0
191	-3.23E-03	-0.5
192	-0.039866	-5.6
193	-0.031809	-4.5
194	-0.045774	-6.4

SA2	Estimated coefficient	t-statistic
195	-5.35E-03	-0.8
196	-0.036879	-5.1
197	-0.095037	-12.5
198	2.83E-03	0.4
199	7.86E-03	1.1
200	4.90E-03	0.7
201	4.07E-03	0.6
202	-5.61E-04	-0.1
203	-5.53E-03	-0.8
204	3.54E-03	0.5
205	-0.04385	-6.1
206	-0.030106	-4.2
207	-0.027254	-3.8
208	-0.014856	-2.1
209	-0.050005	-6.9
210	-1.61E-03	-0.2
211	-0.028098	-3.9
212	-0.018827	-2.7
213	-0.033654	-4.7
214	6.36E-03	0.9
215	-0.027894	-3.9
216	-3.34E-04	0.0
217	-0.010529	-1.5
218	-0.114077	-15.1
219	-9.91E-03	-1.4
220	-5.78E-04	-0.1
221	-0.114154	-14.7
222	0	0.0
223	-0.09272	-12.3
224	1.41E-03	0.2
225	-0.025934	-3.6
226	-3.68E-04	-0.1
227	-0.017746	-2.5
228	-0.029012	-4.1
229	0.010052	1.4
230	-0.014921	-2.1
231	-0.127096	-16.0
232	-0.020508	-2.9
233	-3.37E-03	-0.5
234	0.010707	1.5
235	0.011622	1.6
236	-0.040157	-5.6
237	-0.130852	-16.8
238	0.017748	2.5
239	-0.014629	-2.1
240	0.026158	3.7
241	-0.285304	-25.5
242	-6.34E-03	-0.9
243	-0.052766	-7.4
244	-0.094051	-12.4
245	-0.078157	-10.5
246	-6.22E-03	-0.9
247	-1.20E-04	0.0
248	-0.031965	-4.4
249	5.45E-03	0.8
250	0.017345	2.5
251	-0.013342	-1.9
252	-0.025408	-3.6
253	-0.039643	-5.5
254	-0.082752	-11.1
255	2.63E-04	0.0
256	-0.049289	-6.8
257	0.020318	2.9
258	0.031429	4.4
259	-0.016469	-2.3

SA2	Estimated coefficient	t-statistic
260	-0.029085	-4.1
261	-0.058764	-8.1
262	-0.021874	-3.1
263	-7.71E-04	-0.1
264	8.74E-04	0.1
265	-0.017248	-2.4
266	-0.026277	-3.7
267	-0.091688	-12.2
268	-0.048401	-6.7
269	-0.039757	-5.5
270	-0.022316	-3.1
271	5.19E-03	0.7
272	2.69E-03	0.4
273	-1.22E-03	-0.2
274	0.015636	2.2
275	-0.034394	-4.8
276	-0.023922	-3.4
277	-0.020607	-2.9
278	-0.010133	-1.4
279	-0.015046	-2.1
280	-0.033648	-4.7
281	-6.89E-03	-1.0
282	-0.053115	-7.2
283	-0.010031	-1.4
284	7.11E-03	1.0
285	-0.06173	-8.5
286	-0.16362	-19.7
287	-4.68E-03	-0.7
288	-0.01912	-2.7
289	-6.37E-03	-0.9
290	3.01E-03	0.4
291	-0.049986	-6.9
292	0.015181	2.1
293	1.78E-03	0.3
294	-3.56E-03	-0.5
295	-0.0202	-2.9
296	-0.012286	-1.7
297	-0.033475	-4.7
298	-0.083993	-11.1
299	0.026388	3.7
300	-2.10E-03	-0.3
301	-0.014381	-2.0
302	-0.019997	-2.8
303	-0.030217	-4.2
304	0.015859	2.2
305	-1.71E-03	-0.2
306	-0.068837	-9.2
307	0.015332	2.2
308	-4.15E-03	-0.6
309	0.021836	3.1
310	-0.04364	-6.1

SA2	Estimated coefficient	t-statistic
311	-0.06902	-9.4
312	-0.025522	-3.6
313	7.05E-03	1.0
314	-0.034914	-4.9
315	0.048073	6.8
316	-0.065526	-8.9
317	0.010231	1.4
318	0.030277	4.3
319	0.024329	3.4
320	2.06E-03	0.3
321	0.021785	3.1
322	-0.055971	-7.8
323	-0.061225	-8.4
324	-0.056867	-7.8
325	0.014339	2.0
326	5.60E-03	0.8
327	-0.037764	-5.3
328	8.81E-03	1.2
329	-0.085292	-11.4
330	-0.012662	-1.8
331	0.026403	3.7
332	-0.02136	-3.0
333	-0.036237	-5.1
334	-0.023957	-3.4
335	-0.014874	-2.1
336	0.021131	3.0
337	-0.064218	-8.8
338	-0.01587	-2.2
339	-0.034994	-4.9
340	7.33E-03	1.0
341	-0.066284	-9.2
342	-0.010226	-1.4
343	8.36E-03	1.2
344	-0.191925	-21.0
345	0.020633	2.9
346	-0.028889	-4.1
347	3.64E-03	0.5
348	-0.167549	-19.8
349	0.012043	1.7
350	-0.017285	-2.2
351	-0.021231	-3.0
352	3.69E-03	0.5
353	-0.070187	-9.5
354	-0.010949	-1.5
355	7.76E-03	1.1
356	-9.87E-03	-1.4
357	-1.50E-03	-0.2
358	-0.053751	-7.5
359	4.52E-03	0.6
360	-0.018851	-2.7
361	-8.34E-03	-1.2

SA2	Estimated coefficient	t-statistic
362	-0.048983	-6.8
363	-0.064014	-8.7
364	3.01E-04	0.0
365	0.01148	1.6
366	0.011942	1.7
367	2.60E-03	0.4
368	-0.026431	-3.7
369	-0.022625	-3.2
370	-0.044629	-6.2
371	-0.028135	-4.0
372	-0.02829	-4.0
373	-0.032988	-4.6
374	-0.02985	-4.2
375	-0.030012	-4.2
376	-0.039689	-5.5
377	-0.033583	-4.7
378	-0.025098	-3.5
379	-1.39E-03	-0.2
380	-0.048177	-6.7
381	-3.32E-03	-0.5
382	-0.035128	-4.9
383	-0.032414	-4.5
384	-0.033164	-4.6
385	-0.029536	-4.1
386	-0.03781	-5.3
387	-0.022362	-3.2
388	-0.038828	-5.4
389	-0.018371	-2.6
390	-0.012717	-1.8
391	-0.045214	-6.3
392	-0.042619	-5.9
393	-0.031117	-4.4
394	-0.039872	-5.6
395	-0.039656	-5.5
396	-0.01684	-2.4
397	1.82E-03	0.3
398	-0.050773	-7.0
399	-0.019745	-2.8
400	-0.037153	-5.2
401	-0.022282	-3.1
402	-0.028817	-4.0
403	-0.028919	-4.1
404	-0.028291	-4.0
405	-0.032194	-4.5
406	-6.70E-03	-0.9
407	0.011327	1.6
408	-0.06023	-8.3
409	-0.047666	-6.6
410	-0.081307	-10.9
411	0.015932	2.3
412	0.020655	2.9

SA2	Estimated coefficient	t-statistic
413	0.026022	3.7
414	-0.091195	-12.3
415	-9.13E-03	-1.2
416	0.017302	2.5
417	0.027588	3.9
418	0.011882	1.7
419	-4.31E-04	-0.1
420	-5.00E-03	-0.7
421	1.19E-03	0.2
422	-2.35E-03	-0.3
423	0.01196	1.7
424	0.022203	3.1
425	-0.043814	-6.1
426	0.013157	1.8
427	0.017661	2.5
428	-9.13E-03	-1.3
429	0.014675	2.1
430	-4.23E-03	-0.6
431	0.032307	4.6
432	-0.016833	-2.4
433	8.67E-03	1.2
434	-0.069276	-9.4
435	0.011733	1.7
436	-0.034689	-4.9
437	0.018338	2.6
438	-0.047033	-6.6
439	0.020418	2.9
440	0.025011	3.5
441	0.036673	5.2
442	0.011135	1.6
443	0.030089	4.2
444	0.096612	13.5
445	0.050388	6.9
446	3.85E-03	0.5
447	0.013766	1.9
448	0.017728	2.5
449	0.016473	2.3
450	-1.22E-03	-0.2
451	-0.054252	-7.5
452	-6.54E-03	-0.9
453	-0.014341	-2.0
454	-0.02642	-3.7
455	-0.046524	-6.5
456	-0.028685	-4.0
457	-0.048312	-6.7
458	2.41E-03	0.3
459	-0.040644	-5.7
460	-0.023932	-3.4
461	1.15E-04	0.0
462	-0.055729	-7.7

Equation 12: CONST12(j)

SA2	Estimated coefficient	t-statistic
1	-0.041914	-7.6
2	-0.041382	-7.6
3	-0.042228	-7.7
4	-0.041481	-7.6
5	-0.042002	-7.7
6	-0.041714	-7.6
7	-0.041935	-7.7
8	-0.041496	-7.6
9	-0.103327	-16.4
10	-0.046468	-8.4
11	-0.085	-13.9
12	-0.040799	-7.5
13	-0.102766	-14.8
14	-0.083091	-13.8
15	-0.037519	-6.9
16	-0.078038	-12.7
17	-0.078808	-12.8
18	-0.032234	-5.9
19	-0.031009	-5.7
20	-0.032667	-6.0
21	-0.033172	-6.1
22	-0.032973	-6.1
23	-0.031427	-5.8
24	-0.033296	-6.1
25	-0.030962	-5.7
26	-0.033593	-6.2
27	-0.060751	-10.6
28	-0.047556	-8.5
29	-0.037417	-6.8
30	-0.083453	-13.9
31	-0.079785	-13.2
32	-0.029468	-5.5
33	-0.137305	-18.7
34	-0.017745	-3.4
35	-0.044253	-8.0
36	-0.072928	-12.4
37	-0.025141	-4.8
38	-0.021268	-4.0
39	-0.025086	-4.8
40	-0.023623	-4.5
41	-0.027536	-5.2
42	-0.024566	-4.7
43	-0.019716	-3.8
44	-0.028991	-5.5
45	-0.025838	-4.9
46	-0.024891	-4.7
47	-0.023324	-4.4
48	-0.03313	-6.2
49	-0.112073	-16.6
50	-0.034946	-6.5
51	-0.049055	-8.8
52	-0.047562	-8.5
53	-0.041607	-7.6
54	-0.086798	-13.3
55	-0.10426	-16.2
56	-0.107795	-16.0
57	-0.106924	-14.5
58	-0.123802	-17.3
59	-0.125072	-17.0
60	-0.11651	-16.2
61	-0.109641	-16.9
62	-0.099437	-15.1
63	-0.081433	-13.7
64	-0.080137	-13.5

SA2	Estimated coefficient	t-statistic
65	-0.099808	-15.4
66	-0.06912	-11.9
67	-0.083324	-13.6
68	-0.076448	-12.6
69	-0.124737	-15.4
70	-0.078698	-12.8
71	-0.098289	-15.1
72	-0.096896	-14.9
73	-0.072069	-11.9
74	-0.071275	-11.9
75	-0.073059	-12.0
76	-0.087464	-14.2
77	-0.117414	-16.0
78	-0.090299	-14.1
79	-0.081729	-13.2
80	0	0.0
81	-0.091047	-15.1
82	-0.148889	-18.7
83	-0.093623	-15.4
84	-0.097719	-15.8
85	-0.126894	-18.4
86	-0.092236	-14.2
87	-0.105322	-15.5
88	-0.079204	-13.4
89	-0.082171	-13.5
90	-0.094085	-14.2
91	-0.115672	-16.7
92	0	0.0
93	-0.096006	-15.3
94	-0.103759	-15.5
95	-0.09995	-15.1
96	-0.102416	-15.3
97	-0.097491	-15.0
98	-0.084082	-13.6
99	0	0.0
100	-0.081913	-11.4
101	-0.08228	-13.1
102	-0.059482	-10.3
103	-0.084452	-11.7
104	-0.130575	-16.8
105	-5.61E-04	-0.1
106	-6.59E-03	-1.3
107	-1.67E-03	-0.3
108	-0.012626	-2.4
109	-0.016459	-3.1
110	-6.26E-04	-0.1
111	5.71E-04	0.1
112	-9.32E-03	-1.8
113	-8.22E-04	-0.2
114	-8.92E-03	-1.7
115	-2.25E-04	0.0
116	-4.86E-03	-0.9
117	2.15E-03	0.4
118	2.23E-03	0.4
119	2.06E-03	0.4
120	6.47E-05	0.0
121	3.66E-04	0.1
122	2.21E-03	0.4
123	1.97E-03	0.4
124	-3.35E-03	-0.6
125	2.53E-03	0.5
126	2.25E-03	0.4
127	1.02E-03	0.2
128	2.99E-03	0.6
129	-6.92E-03	-1.3

SA2	Estimated coefficient	t-statistic
130	3.15E-03	0.6
131	-6.79E-04	-0.1
132	2.84E-03	0.5
133	-3.88E-03	-0.7
134	-2.64E-03	-0.5
135	2.17E-03	0.4
136	2.61E-03	0.5
137	2.45E-03	0.5
138	2.23E-03	0.4
139	3.54E-03	0.7
140	3.58E-03	0.7
141	3.42E-03	0.7
142	3.97E-03	0.8
143	2.74E-03	0.5
144	3.81E-03	0.7
145	2.17E-03	0.4
146	-0.013448	-2.5
147	-9.14E-03	-1.7
148	-0.010822	-2.0
149	-9.04E-03	-1.7
150	-9.75E-03	-1.8
151	-2.82E-03	-0.5
152	-5.04E-03	-1.0
153	-3.58E-03	-0.7
154	-6.98E-03	-1.3
155	-0.010844	-2.1
156	-0.013549	-2.6
157	-0.018164	-3.4
158	-0.019243	-3.6
159	-0.017334	-3.3
160	-0.019716	-3.7
161	-0.021819	-4.1
162	-0.017453	-3.3
163	-0.017423	-3.3
164	-0.016803	-3.2
165	-0.022754	-4.3
166	-0.016035	-3.0
167	-0.01753	-3.3
168	-1.21E-03	-0.2
169	-2.84E-03	-0.5
170	-0.011839	-2.2
171	-7.01E-03	-1.3
172	-0.010665	-2.0
173	-5.81E-03	-1.1
174	-3.99E-03	-0.8
175	-4.14E-04	-0.1
176	-6.18E-04	-0.1
177	-1.81E-04	0.0
178	-8.47E-03	-1.6
179	-6.01E-03	-1.1
180	-3.13E-03	-0.6
181	-0.028324	-5.3
182	-0.024978	-4.7
183	-0.039638	-7.3
184	-0.035681	-6.6
185	-0.035933	-6.7
186	-0.017347	-3.3
187	-0.028252	-5.3
188	-0.018567	-3.5
189	-0.015894	-3.0
190	-0.02085	-3.9
191	-0.022306	-4.2
192	-9.17E-04	-0.2
193	-3.89E-03	-0.7
194	-0.030184	-5.6

SA2	Estimated coefficient	t-statistic
195	-0.040681	-7.5
196	-0.014198	-2.7
197	-0.011085	-2.1
198	-2.74E-03	-0.5
199	-4.72E-03	-0.9
200	-0.031873	-5.9
201	-0.024394	-4.6
202	-0.034342	-6.4
203	-0.033439	-6.2
204	-0.024081	-4.5
205	-0.021248	-4.0
206	-0.035984	-6.7
207	-0.052793	-9.5
208	-0.086828	-14.3
209	-0.071544	-12.2
210	-0.046536	-8.5
211	-0.041359	-7.6
212	-0.045752	-8.4
213	-0.03414	-6.3
214	-0.031494	-5.9
215	-0.026004	-4.9
216	-0.037357	-6.9
217	-0.03345	-6.2
218	-0.026305	-4.9
219	-0.02133	-4.0
220	-0.070375	-12.3
221	-4.15E-03	-0.8
222	-4.74E-03	-0.9
223	-0.022211	-4.2
224	-3.61E-03	-0.7
225	-4.33E-03	-0.8
226	-5.07E-03	-1.0
227	-0.08837	-14.5
228	-0.082935	-13.7
229	-0.08845	-14.4
230	-0.091973	-14.7
231	-0.019963	-3.8
232	-0.018995	-3.6
233	-0.014473	-2.7
234	-0.054853	-9.8
235	-0.039006	-7.2
236	-0.017941	-3.4
237	-0.020518	-3.9
238	-0.019199	-3.6
239	-0.017638	-3.3
240	-0.018939	-3.6
241	-9.15E-03	-1.7
242	-0.025826	-4.8
243	-0.019105	-3.6
244	-0.028112	-5.3
245	-0.027697	-5.2
246	-0.035217	-6.5
247	-0.030391	-5.7
248	-0.032139	-6.0
249	-0.030987	-5.8
250	-0.024395	-4.6
251	-0.025842	-4.8
252	-0.018202	-3.4
253	-0.021821	-4.1
254	-0.029828	-5.6
255	-0.024808	-4.7
256	-0.021207	-4.0
257	-0.023733	-4.5
258	-0.020798	-3.9
259	-0.017305	-3.3

SA2	Estimated coefficient	t-statistic
260	-0.0197	-3.7
261	-0.018219	-3.4
262	-0.021319	-4.0
263	-0.021403	-4.0
264	-0.036876	-6.8
265	-0.031191	-5.8
266	-0.070543	-12.2
267	-0.031922	-6.0
268	-0.039595	-7.3
269	-0.03856	-7.1
270	-0.034322	-6.4
271	-0.031741	-5.9
272	-0.036809	-6.8
273	-0.035388	-6.6
274	-0.036327	-6.7
275	-0.044155	-8.1
276	-0.106449	-16.4
277	-0.053027	-9.6
278	-0.081355	-13.6
279	-0.059645	-10.6
280	-0.084059	-13.9
281	-0.061745	-11.0
282	-0.066032	-11.6
283	-0.04378	-8.0
284	-0.048743	-8.9
285	-0.029753	-5.6
286	-0.0325	-6.0
287	-0.035838	-6.6
288	-0.046133	-8.4
289	-0.052121	-9.4
290	-0.044338	-8.1
291	-0.0558	-10.0
292	-0.042039	-7.7
293	-0.035357	-6.6
294	-0.036383	-6.7
295	-0.063509	-11.2
296	-9.72E-03	-1.8
297	-0.01753	-3.3
298	-0.03058	-5.7
299	-0.030467	-5.7
300	-0.015272	-2.9
301	-0.027048	-5.1
302	-0.026997	-5.1
303	-0.020605	-3.9
304	-0.02162	-4.1
305	-5.38E-03	-1.0
306	-0.011764	-2.2
307	-0.01506	-2.8
308	-0.012744	-2.4
309	-7.64E-03	-1.4
310	-8.10E-03	-1.5
311	-0.018813	-3.5

SA2	Estimated coefficient	t-statistic
312	-8.48E-03	-1.6
313	-0.018044	-3.4
314	-6.08E-03	-1.2
315	-9.21E-03	-1.7
316	-6.47E-03	-1.2
317	-0.0153	-2.9
318	-9.79E-03	-1.9
319	-0.011623	-2.2
320	-0.010671	-2.0
321	-8.70E-03	-1.7
322	-3.12E-03	-0.6
323	-4.79E-03	-0.9
324	-2.83E-03	-0.5
325	-0.021276	-4.0
326	-0.022611	-4.3
327	-4.23E-03	-0.8
328	-8.32E-03	-1.6
329	-1.35E-03	-0.3
330	-5.68E-04	-0.1
331	-0.011165	-2.1
332	1.37E-05	0.0
333	-2.83E-03	-0.5
334	-2.63E-03	-0.5
335	-3.01E-03	-0.6
336	-1.87E-03	-0.4
337	-1.92E-03	-0.4
338	-1.33E-03	-0.3
339	-0.09682	-15.5
340	-0.015317	-2.9
341	-0.037585	-6.9
342	-0.027521	-5.1
343	-0.03684	-6.8
344	-0.024343	-4.6
345	-0.015498	-2.9
346	-0.01631	-3.1
347	-0.015977	-3.0
348	-6.15E-03	-1.2
349	-0.02083	-3.9
350	-9.10E-03	-1.7
351	-0.010301	-2.0
352	-0.014349	-2.7
353	-0.040545	-7.5
354	-0.048858	-8.9
355	-0.042613	-7.8
356	-0.052853	-9.6
357	-0.044842	-8.2
358	-0.040146	-7.4
359	-0.040394	-7.5
360	-0.07172	-12.3
361	-0.101976	-15.5
362	-0.069258	-12.0
363	-0.04716	-8.6

SA2	Estimated coefficient	t-statistic
364	-0.044414	-8.1
365	-0.053374	-9.6
366	-0.109478	-16.5
367	-0.104335	-15.9
368	-0.057171	-10.3
369	-0.09659	-15.6
370	-0.104841	-16.4
371	-0.072747	-12.5
372	-0.072676	-12.5
373	-0.094817	-14.6
374	-0.080739	-13.5
375	-0.113088	-17.2
376	-0.111788	-16.4
377	-0.0982	-15.3
378	-0.08151	-13.3
379	-0.080118	-13.2
380	-0.138652	-17.9
381	-0.081062	-13.3
382	-0.120126	-17.6
383	-0.100504	-15.5
384	-0.100393	-15.5
385	-0.105463	-15.9
386	-0.048611	-8.8
387	-0.199199	-20.5
388	-0.077384	-13.0
389	-0.089958	-14.6
390	-0.079278	-13.2
391	-0.08006	-13.3
392	-0.152635	-19.9
393	-0.105567	-16.3
394	-0.098984	-15.7
395	-0.097143	-15.1
396	-0.102967	-16.0
397	-0.075732	-12.9
398	-0.07602	-12.9
399	-0.076055	-12.9
400	-0.067841	-11.8
401	-0.075093	-12.8
402	-0.114877	-16.5
403	-0.072588	-12.5
404	-0.045616	-8.3
405	-0.077148	-13.2
406	-0.020801	-3.9
407	-0.023782	-4.5
408	-6.40E-03	-1.2
409	-0.013323	-2.5
410	-0.017214	-3.2
411	-0.018178	-3.4
412	-0.05668	-10.2
413	-0.051807	-9.4
414	-0.035712	-6.6
415	-0.045177	-8.3

SA2	Estimated coefficient	t-statistic
416	-0.056755	-10.2
417	-0.052255	-9.5
418	-0.048473	-8.8
419	-0.057366	-10.4
420	-0.015508	-2.9
421	-0.023303	-4.4
422	-0.019769	-3.7
423	-0.044291	-8.1
424	-0.060495	-10.9
425	-0.045189	-8.3
426	-0.058368	-10.5
427	5.62E-03	1.1
428	-0.03182	-5.9
429	-0.033038	-6.2
430	-0.035765	-6.6
431	-0.035531	-6.6
432	-0.027688	-5.2
433	-0.032251	-6.0
434	-0.032796	-6.1
435	-0.029309	-5.5
436	-0.028952	-5.4
437	-0.036676	-6.8
438	-0.037993	-7.0
439	-0.046134	-8.4
440	-0.040623	-7.5
441	-0.02393	-4.5
442	-0.022278	-4.2
443	-0.020584	-3.9
444	-0.023134	-4.4
445	-0.017417	-3.3
446	-8.41E-03	-1.6
447	-0.018653	-3.5
448	-0.015139	-2.9
449	-0.017958	-3.4
450	-0.028687	-5.4
451	-0.081471	-13.3
452	-0.081504	-13.3
453	-0.109755	-16.3
454	-0.098831	-15.4
455	-0.098665	-15.4
456	-0.083387	-13.3
457	-0.129623	-18.2
458	-0.102165	-15.9
459	-0.096561	-15.2
460	-0.109817	-16.5
461	-0.071193	-12.3
462	-0.06923	-12.0

Equation 13: CONST13(j)

SA2	Estimated coefficient	t-statistic
1	-0.062056	-7.9
2	0.032174	4.2
3	-0.055603	-7.1
4	-0.090678	-11.1
5	0.080064	9.9
6	0.013713	1.8
7	-0.09842	-11.4
8	-0.04046	-5.3
9	-0.022172	-2.9
10	-0.036881	-4.8
11	-3.70E-03	-0.5
12	-0.100025	-11.7
13	-0.038476	-4.9
14	-0.060867	-7.7
15	-0.082866	-10.1
16	0.015165	2.0
17	-0.051699	-6.7
18	0.033113	4.3
19	-0.046022	-6.0
20	-0.046522	-6.0
21	0.020619	2.7
22	-0.014169	-1.9
23	-0.176526	-17.4
24	-0.072356	-8.9
25	-0.066113	-8.5
26	-0.13791	-15.2
27	-0.023075	-3.1
28	-0.09138	-11.1
29	-0.101483	-11.9
30	-9.90E-03	-1.3
31	0.028329	3.7
32	-0.208449	-19.9
33	-1.36E-03	-0.2
34	-0.097575	-11.0
35	-0.10379	-12.0
36	-0.066237	-8.1
37	-0.069065	-8.4
38	0.060246	7.7
39	8.95E-03	1.2
40	-0.035531	-4.6
41	-0.077653	-9.4
42	0.03922	5.2
43	-0.067275	-8.4
44	-0.112284	-12.7
45	-0.017573	-2.3
46	-0.056065	-7.1
47	-0.041609	-5.4
48	-0.09343	-10.9
49	-8.22E-03	-1.1
50	-0.063437	-7.9
51	-0.069412	-8.7
52	-0.090794	-10.9
53	-0.064894	-8.2
54	-7.41E-04	-0.1
55	4.69E-05	0.0
56	8.98E-03	1.2
57	-6.54E-03	-0.9
58	-0.040424	-5.2
59	0.038682	4.9
60	-0.086572	-10.4
61	0	0.0
62	-5.29E-03	-0.7
63	0.012894	1.7

SA2	Estimated coefficient	t-statistic
64	-0.130674	-13.7
65	-0.092011	-10.8
66	0.014932	2.0
67	-0.063089	-8.0
68	-0.044155	-5.8
69	-7.11E-03	-0.9
70	-0.051621	-6.6
71	-1.78E-03	-0.2
72	-1.55E-03	-0.2
73	5.91E-03	0.8
74	2.91E-03	0.4
75	-0.05315	-6.9
76	-0.0192	-2.5
77	-0.01097	-1.5
78	-0.037088	-4.8
79	0.024049	3.2
80	0	0.0
81	5.22E-03	0.7
82	-4.88E-03	-0.6
83	0	0.0
84	-0.03403	-4.4
85	-1.19E-03	-0.2
86	-5.02E-03	-0.7
87	-0.052125	-6.7
88	-0.124577	-12.9
89	3.69E-03	0.5
90	0.012599	1.7
91	-0.029626	-3.9
92	0	0.0
93	2.94E-03	0.4
94	-0.115165	-13.2
95	-6.55E-03	-0.9
96	0.043638	5.4
97	0.039508	5.1
98	-0.14933	-15.4
99	0	0.0
100	-0.09551	-11.2
101	-0.027958	-3.7
102	-0.073641	-9.3
103	0.039658	4.9
104	0.06276	7.7
105	-0.06968	-8.9
106	-0.078017	-9.7
107	-0.070536	-8.9
108	-0.035012	-4.6
109	0	0.0
110	-0.096565	-11.8
111	-0.060498	-7.8
112	-0.078088	-9.8
113	-0.065494	-8.2
114	-0.062692	-7.9
115	0	0.0
116	-0.060216	-7.7
117	-2.02E-03	-0.3
118	0.042977	5.5
119	-0.015724	-2.1
120	-0.134142	-14.0
121	-0.068626	-8.7
122	0.027233	3.6
123	-0.046876	-6.1
124	0.060228	7.6
125	0.014283	1.9
126	-0.043816	-5.5

SA2	Estimated coefficient	t-statistic
127	-0.265543	-9.2
128	-8.01E-03	-1.1
129	-0.043186	-5.6
130	-0.056553	-7.3
131	-0.031854	-4.2
132	9.26E-03	1.2
133	-0.021566	-2.8
134	-0.056056	-7.2
135	-0.093024	-11.3
136	-0.021782	-2.9
137	-0.01962	-2.6
138	-0.064254	-8.3
139	-0.022819	-3.0
140	-0.059441	-7.6
141	-0.046081	-5.9
142	6.49E-03	0.9
143	-0.066812	-8.4
144	-0.010403	-1.4
145	-0.052051	-6.7
146	0	0.0
147	-0.029322	-3.9
148	-0.042732	-5.6
149	-0.025467	-3.4
150	7.84E-03	1.0
151	5.00E-04	0.1
152	6.24E-03	0.8
153	-0.048826	-6.4
154	-0.022545	-3.0
155	-0.030827	-4.1
156	-0.062851	-8.1
157	-0.05819	-7.5
158	-0.054627	-7.0
159	-0.077496	-9.7
160	-0.022598	-3.0
161	0	0.0
162	7.62E-04	0.1
163	-0.052217	-6.7
164	0.019552	2.6
165	0	0.0
166	2.18E-03	0.3
167	0	0.0
168	-0.055897	-7.2
169	-0.058578	-7.5
170	-0.022194	-2.9
171	-0.033223	-4.4
172	-0.033656	-4.4
173	-0.051699	-6.7
174	-0.063055	-8.1
175	-0.025875	-3.4
176	-0.027877	-3.7
177	-0.017696	-2.3
178	-0.06657	-8.4
179	-0.058353	-4.0
180	0	0.0
181	-0.053694	-6.9
182	-0.010925	-1.4
183	-0.049165	-6.2
184	-0.053472	-6.8
185	-0.047453	-6.2
186	-0.057031	-7.3
187	-0.032338	-4.2
188	-0.056702	-7.2
189	-0.032641	-4.3

SA2	Estimated coefficient	t-statistic
190	0	0.0
191	-0.043862	-5.7
192	-0.021908	-2.9
193	-0.077874	-9.9
194	0	0.0
195	-0.029505	-3.9
196	0.031909	4.2
197	-0.044914	-5.9
198	-0.066093	-8.4
199	0	0.0
200	-0.046404	-6.0
201	-0.061958	-7.5
202	0	0.0
203	0.062451	7.9
204	0	0.0
205	-0.058919	-7.6
206	-0.027489	-3.6
207	-0.026848	-3.5
208	-0.025338	-3.3
209	1.26E-03	0.2
210	-0.054575	-6.9
211	0.016086	2.1
212	-0.056541	-7.2
213	0	0.0
214	0	0.0
215	-0.11176	-13.1
216	-0.080937	-9.8
217	0	0.0
218	-0.060543	-7.9
219	-0.103422	-12.5
220	-0.05302	-6.7
221	-0.064983	-8.4
222	0	0.0
223	-0.063017	-8.0
224	0	0.0
225	-0.071004	-8.9
226	-0.105803	-12.4
227	0.029866	3.9
228	-0.038677	-5.0
229	0.015134	2.0
230	-0.025033	-3.3
231	-0.082812	-10.5
232	0	0.0
233	0	0.0
234	-0.04263	-5.5
235	-0.067627	-8.5
236	-0.017583	-2.3
237	-0.025226	-3.3
238	-0.114032	-13.3
239	-0.136225	-15.2
240	0	0.0
241	-0.196434	-20.2
242	-0.078126	-9.9
243	-0.04821	-6.3
244	-0.034027	-4.5
245	-0.039514	-5.2
246	-0.038118	-5.0
247	0	0.0
248	-0.037199	-4.9
249	-0.034665	-4.5
250	0.026786	3.5
251	0.022376	2.9
252	-0.060093	-7.7

SA2	Estimated coefficient	t-statistic
253	-0.103167	-12.2
254	0.012342	1.6
255	0	0.0
256	-0.058364	-7.5
257	0.018721	2.5
258	-0.034768	-4.6
259	-0.022128	-2.9
260	-0.04999	-6.5
261	-0.069353	-8.8
262	0	0.0
263	0	0.0
264	-0.041338	-5.3
265	-0.048389	-6.3
266	-0.065382	-8.2
267	0.021707	2.9
268	-0.0487	-6.4
269	-0.022578	-3.0
270	-0.030587	-4.0
271	-0.067898	-8.5
272	-0.054754	-7.0
273	-0.091827	-11.3
274	0	0.0
275	-0.084906	-10.3
276	-3.27E-03	-0.4
277	-0.064738	-8.0
278	-0.063873	-8.0
279	-0.050265	-6.4
280	-0.060623	-7.7
281	-0.037712	-4.9
282	-0.019428	-2.6
283	2.07E-03	0.3
284	-0.08151	-9.9
285	0	0.0
286	-0.049799	-6.5
287	-0.092521	-11.3
288	-0.073896	-9.3
289	-0.07187	-9.0
290	-0.096904	-11.5
291	-0.11814	-13.3
292	-0.131943	-14.4
293	-0.082404	-10.3
294	-0.090877	-11.1
295	-0.096769	-11.6
296	-0.113524	-13.5
297	-0.063458	-8.2
298	-3.50E-03	-0.5
299	0	0.0
300	-0.084748	-10.5
301	-0.025394	-3.4
302	0.017894	2.4
303	-0.065955	-8.4
304	-0.117751	-13.3
305	0	0.0

SA2	Estimated coefficient	t-statistic
306	0.029456	3.9
307	-0.051171	-6.7
308	-0.025514	-3.4
309	-0.028955	-3.8
310	-0.040799	-5.3
311	-0.010197	-1.4
312	-0.039632	-5.2
313	-0.025231	-3.3
314	-0.113734	-13.7
315	-0.107995	-12.2
316	-0.09601	-11.9
317	0	0.0
318	-0.139438	-15.0
319	0	0.0
320	0	0.0
321	0.028399	3.7
322	-0.076489	-9.5
323	4.92E-03	0.6
324	-0.093384	-11.6
325	0	0.0
326	0	0.0
327	-0.049735	-6.6
328	0	0.0
329	-5.23E-03	-0.7
330	-0.03157	-4.2
331	0	0.0
332	-0.039605	-5.2
333	-0.066787	-8.7
334	-0.024178	-3.2
335	-0.093122	-11.5
336	-0.053774	-7.0
337	-0.057735	-7.6
338	-0.115547	-13.8
339	0.017653	2.3
340	-0.135975	-14.7
341	-0.057225	-7.5
342	-0.147073	-16.4
343	-0.099108	-11.9
344	-0.129036	-15.2
345	0	0.0
346	-0.165955	-17.8
347	0	0.0
348	-0.093463	-11.6
349	-0.073656	-9.2
350	-0.171192	-18.3
351	-0.041761	-5.4
352	-0.130574	-14.5
353	-0.020368	-2.7
354	0	0.0
355	-0.013657	-1.8
356	-0.037464	-4.9
357	-0.045157	-5.8
358	-0.030079	-4.0

SA2	Estimated coefficient	t-statistic
359	-0.029704	-3.9
360	-0.041664	-5.4
361	-0.103194	-12.1
362	-0.031219	-4.0
363	-0.019372	-2.6
364	-0.011952	-1.6
365	-0.038208	-5.0
366	-4.68E-03	-0.6
367	0.011429	1.5
368	-0.065021	-8.2
369	0.018258	2.4
370	-0.066244	-8.0
371	7.04E-03	0.9
372	-0.049054	-6.3
373	-1.87E-03	-0.2
374	7.16E-05	0.0
375	-7.74E-03	-1.0
376	-8.58E-04	-0.1
377	-1.39E-03	-0.2
378	-0.054138	-6.9
379	-0.065004	-8.2
380	-3.62E-03	-0.5
381	-0.107568	-12.1
382	-3.59E-04	0.0
383	-0.033264	-4.4
384	0.032735	4.3
385	-1.96E-03	-0.3
386	-6.85E-04	-0.1
387	-4.70E-03	-0.6
388	0.017796	2.4
389	3.03E-03	0.4
390	-0.137752	-14.7
391	-0.063406	-8.1
392	-0.014571	-1.9
393	-1.03E-03	-0.1
394	-0.122575	-13.0
395	-0.021172	-2.8
396	0.031009	4.0
397	-0.049644	-6.4
398	0.042802	5.6
399	-0.029531	-3.9
400	-0.111413	-13.1
401	-0.129329	-14.6
402	-2.35E-03	-0.3
403	0.01889	2.5
404	6.89E-04	0.1
405	-0.050167	-6.4
406	0	0.0
407	-0.029702	-3.9
408	0	0.0
409	0	0.0
410	-0.029685	-3.9
411	0	0.0

SA2	Estimated coefficient	t-statistic
412	-0.069841	-8.6
413	-0.114663	-12.9
414	-6.79E-03	-0.9
415	0	0.0
416	-0.095735	-11.2
417	-0.061448	-7.6
418	0	0.0
419	-0.076177	-9.2
420	-0.094334	-11.7
421	0	0.0
422	0	0.0
423	0	0.0
424	-0.106912	-12.2
425	-0.037625	-5.0
426	0	0.0
427	-0.250364	-21.6
428	0.02061	2.7
429	0	0.0
430	4.41E-04	0.1
431	-0.073508	-9.0
432	0	0.0
433	-0.041171	-5.3
434	-0.028228	-3.7
435	-0.092555	-11.2
436	0	0.0
437	0	0.0
438	-0.060054	-7.7
439	-0.044356	-5.7
440	-0.032269	-4.2
441	-0.067973	-8.5
442	-0.025456	-3.4
443	0	0.0
444	0	0.0
445	-0.061728	-7.8
446	-0.080962	-9.8
447	-0.071443	-8.9
448	-0.061604	-7.6
449	0	0.0
450	-0.132605	-14.5
451	0.028991	3.8
452	-0.052962	-6.9
453	0.05197	6.7
454	0.015695	2.1
455	-0.0795	-9.4
456	-0.016784	-2.2
457	-0.023104	-3.1
458	-0.058076	-7.4
459	-0.073815	-9.1
460	2.39E-03	0.3
461	-0.070505	-8.8
462	0.018456	2.4

Equation 14: CONST14(j)

SA2	Estimated coefficient	t-statistic
1	-0.301243	-20.4
2	-0.267067	-19.4
3	-0.324104	-20.0
4	-0.310807	-19.7
5	-0.311478	-20.6
6	-0.285303	-20.0
7	-0.297406	-19.5
8	-0.286755	-19.8
9	-0.302124	-20.2
10	-0.290614	-19.8
11	-0.289178	-19.9
12	-0.285366	-19.8
13	-0.285846	-20.0
14	-0.285974	-19.7
15	-0.283358	-19.4
16	-0.2897	-19.8
17	-0.304758	-19.9
18	-0.279992	-19.7
19	-0.309077	-19.9
20	-0.28954	-19.7
21	-0.310246	-19.7
22	-0.29775	-19.9
23	-0.323624	-20.8
24	-0.324081	-20.7
25	-0.29843	-20.2
26	-0.300806	-19.8
27	-0.272705	-19.5
28	-0.323861	-20.1
29	-0.288697	-20.0
30	-0.296355	-20.2
31	-0.279067	-19.5
32	-0.277198	-20.0
33	-0.291135	-19.8
34	-0.286369	-19.7
35	-0.27159	-19.5
36	-0.272202	-19.3
37	-0.292529	-19.2
38	-0.287707	-19.7
39	-0.277634	-19.9
40	-0.308319	-19.7
41	-0.308353	-20.1
42	-0.30611	-20.1
43	-0.297464	-19.8
44	-0.324532	-20.2
45	-0.292906	-19.6
46	-0.287907	-19.5
47	-0.274091	-19.4
48	-0.309986	-19.9
49	-0.289975	-19.8
50	-0.315403	-19.8
51	-0.302943	-19.6
52	-0.280707	-19.4
53	-0.276228	-19.0
54	-0.29423	-19.9
55	-0.291163	-19.8
56	-0.273837	-19.1
57	-0.286936	-19.5
58	-0.293935	-19.8
59	-0.297091	-19.8
60	-0.247422	-18.8
61	0	0.0
62	-0.264714	-19.5
63	-0.289786	-19.8
64	-0.300596	-19.9
65	-0.274138	-19.6
66	-0.288725	-19.7
67	-0.304473	-20.0
68	-0.286569	-19.6
69	-0.285446	-19.4
70	-0.308991	-19.7
71	-0.291379	-19.8
72	-0.292364	-19.9
73	-0.302634	-19.8
74	-0.286608	-19.8
75	-0.285349	-19.6
76	-0.3011	-19.8
77	-0.296844	-19.4
78	-0.287729	-18.5
79	-0.286612	-19.5
80	0	0.0
81	-0.283725	-19.8
82	-0.293575	-20.0
83	0	0.0
84	-0.307684	-20.0
85	-0.292046	-19.9
86	-0.325508	-19.7
87	-0.306394	-19.9
88	-0.379489	-24.0
89	-0.305027	-20.4
90	-0.282667	-19.9
91	-0.296056	-19.5
92	0	0.0
93	-0.2853	-19.6
94	-0.269911	-19.5
95	-0.293331	-20.2
96	-0.288067	-19.9
97	-0.292183	-19.4
98	-0.319184	-19.7
99	0	0.0
100	-0.252155	-19.5
101	-0.287026	-19.5
102	-0.294456	-20.2
103	-0.298497	-19.6
104	-0.31054	-20.4
105	-0.292142	-19.7
106	-0.300821	-20.2
107	-0.315647	-19.9
108	-0.28415	-19.5
109	-0.303393	-19.7
110	-0.292719	-19.9
111	-0.317001	-20.0
112	-0.304435	-19.9
113	-0.326494	-20.4
114	-0.304326	-20.4
115	-0.311165	-20.3
116	-0.291944	-20.3
117	-0.325694	-19.8
118	-0.263563	-20.5
119	-0.308749	-19.7
120	-0.257483	-20.5
121	-0.363872	-19.2
122	-0.263667	-20.1
123	-0.335235	-19.5
124	-0.324931	-19.8
125	-0.315546	-19.5
126	-0.319915	-21.0
127	-0.250934	-19.3
128	-0.296635	-20.2
129	-0.341917	-20.2
130	-0.316628	-20.4
131	-0.256731	-19.3
132	-0.268535	-19.8
133	-0.304689	-20.0
134	-0.335888	-20.1
135	-0.268736	-19.4
136	-0.307653	-20.0
137	-0.289397	-20.1
138	-0.280834	-19.5
139	-0.291616	-20.4
140	-0.331616	-19.8
141	-0.289139	-20.0
142	-0.303354	-20.3
143	-0.322626	-20.1
144	-0.298201	-20.1
145	-0.32173	-20.1
146	-0.30485	-20.0
147	-0.281986	-19.9
148	-0.30853	-20.0
149	-0.289682	-19.8
150	-0.286727	-19.8
151	-0.277619	-19.8
152	-0.278623	-19.9
153	-0.29342	-20.0
154	-0.290255	-19.9
155	-0.285537	-19.8
156	-0.302554	-19.9
157	-0.263543	-19.6
158	-0.295331	-19.7
159	-0.276699	-19.6
160	-0.299054	-19.8
161	-0.320404	-19.8
162	-0.280836	-19.8
163	-0.322751	-20.2
164	-0.279202	-20.0
165	-0.280627	-19.4
166	-0.298091	-19.6
167	-0.286532	-19.6
168	-0.271655	-19.5
169	-0.290773	-19.7
170	-0.27013	-19.6
171	-0.287247	-19.6
172	-0.285927	-19.6
173	-0.279621	-19.7
174	-0.293167	-19.7
175	-0.273581	-19.7
176	-0.291009	-19.8
177	-0.286975	-19.7
178	-0.340038	-20.1
179	-0.29855	-19.9
180	-0.294294	-19.9
181	-0.336204	-21.0
182	-0.26026	-19.7
183	-0.314324	-20.3
184	-0.32784	-20.0
185	-0.297922	-19.7
186	-0.306285	-20.1
187	-0.321961	-20.0
188	-0.303187	-20.2
189	-0.285123	-20.3
190	-0.256023	-19.1
191	-0.317758	-20.3
192	-0.299974	-20.0
193	-0.27771	-19.7
194	-0.289015	-19.9
195	-0.307653	-19.9
196	-0.26767	-20.0
197	-0.293038	-19.8
198	-0.303549	-20.2
199	-0.313917	-20.1
200	-0.31783	-19.9
201	-0.314378	-20.2
202	-0.328319	-20.1
203	-0.276267	-20.1
204	-0.317651	-20.0
205	-0.290278	-19.5
206	-0.29568	-20.1
207	-0.284951	-20.0
208	-0.29949	-20.5
209	-0.276761	-19.7
210	-0.290287	-20.0
211	-0.3159	-20.3
212	-0.285395	-20.0
213	-0.294722	-20.4
214	-0.277238	-18.8
215	-0.28904	-19.0
216	-0.311021	-19.5
217	-0.326436	-18.9
218	-0.26648	-19.4
219	-0.315846	-19.8
220	-0.289564	-18.8
221	-0.289244	-19.7
222	-0.231728	-19.4
223	-0.287503	-20.2
224	-0.313884	-20.1
225	-0.294785	-20.3
226	-0.304145	-20.2
227	-0.271759	-20.3
228	-0.295558	-20.0
229	-0.291039	-20.2
230	-0.273579	-20.1
231	-0.272031	-19.7
232	-0.277106	-19.6
233	-0.303905	-19.9
234	-0.336912	-19.6
235	-0.324697	-19.6
236	-0.288283	-19.9
237	-0.246181	-19.2
238	-0.322265	-19.2
239	-0.346592	-20.3
240	-0.342154	-19.2
241	-0.24933	-20.1
242	-0.312067	-21.1
243	-0.300619	-19.7
244	-0.270838	-19.7
245	-0.272212	-19.6
246	-0.329044	-20.4
247	-0.300054	-19.8
248	-0.315068	-20.8
249	-0.306857	-20.5
250	-0.309928	-20.0
251	-0.301535	-19.9
252	-0.289362	-19.7

SA2	Estimated coefficient	t-statistic
253	-0.286934	-19.8
254	-0.287129	-20.0
255	-0.327521	-19.9
256	-0.288732	-19.9
257	-0.305193	-19.9
258	-0.314178	-19.7
259	-0.290326	-19.6
260	-0.285114	-19.7
261	-0.28065	-19.2
262	-0.292739	-19.7
263	-0.297815	-19.6
264	-0.313623	-20.0
265	-0.30448	-20.4
266	-0.306643	-19.9
267	-0.281755	-20.0
268	-0.272645	-20.0
269	-0.262899	-19.4
270	-0.288223	-19.8
271	-0.306496	-20.1
272	-0.315404	-20.0
273	-0.289111	-19.7
274	-0.325097	-20.3
275	-0.282423	-20.1
276	-0.286731	-19.8
277	-0.280697	-20.4
278	-0.282325	-19.2
279	-0.306274	-19.7
280	-0.284337	-19.4
281	-0.286317	-20.3
282	-0.291443	-20.1
283	-0.284664	-19.4
284	-0.31376	-20.5
285	-0.27494	-19.2
286	-0.265201	-19.7
287	-0.293025	-19.7
288	-0.274825	-19.1
289	-0.307208	-21.7
290	-0.314572	-20.2
291	-0.296536	-19.8
292	-0.332156	-21.7
293	-0.298001	-19.3
294	-0.304701	-21.2
295	-0.287542	-19.0
296	-0.303283	-19.7
297	-0.290669	-20.1
298	-0.279251	-20.0
299	-0.363232	-20.4
300	-0.310679	-19.9
301	-0.326184	-20.6
302	-0.313062	-20.0
303	-0.30697	-20.4
304	-0.355861	-20.5
305	-0.327148	-20.3

SA2	Estimated coefficient	t-statistic
306	-0.284037	-20.4
307	-0.323509	-19.9
308	-0.296899	-19.7
309	-0.340133	-20.0
310	-0.28897	-19.8
311	-0.272925	-19.7
312	-0.305819	-19.8
313	-0.334756	-20.0
314	-0.316484	-20.3
315	-0.385689	-24.0
316	-0.299945	-20.5
317	-0.346477	-21.1
318	-0.325964	-20.2
319	-0.339542	-20.2
320	-0.321562	-20.4
321	-0.298021	-20.2
322	-0.308697	-20.3
323	-0.29173	-20.3
324	-0.30282	-20.3
325	-0.345288	-21.6
326	-0.318129	-20.7
327	-0.290677	-20.4
328	-0.334704	-20.7
329	-0.267485	-20.1
330	-0.330854	-20.9
331	-0.354286	-21.1
332	-0.311078	-20.9
333	-0.310003	-20.0
334	-0.285961	-19.8
335	-0.299277	-20.4
336	-0.331347	-19.7
337	-0.290183	-19.3
338	-0.307449	-19.6
339	-0.295844	-20.3
340	-0.336768	-21.3
341	-0.280754	-19.2
342	-0.296231	-19.2
343	-0.291797	-19.6
344	-0.263627	-19.7
345	-0.32675	-22.3
346	-0.281458	-19.0
347	-0.287848	-18.5
348	-0.262786	-20.0
349	-0.329893	-21.6
350	-0.287782	-21.8
351	-0.295672	-20.0
352	-0.333248	-20.1
353	-0.286522	-20.1
354	-0.275339	-19.4
355	-0.3111	-20.0
356	-0.313559	-19.8
357	-0.300454	-20.0
358	-0.300838	-19.9

SA2	Estimated coefficient	t-statistic
359	-0.35808	-21.5
360	-0.284949	-19.8
361	-0.262337	-19.2
362	-0.282065	-19.8
363	-0.288806	-20.3
364	-0.290619	-19.8
365	-0.314137	-20.3
366	-0.299002	-19.9
367	-0.28996	-19.7
368	-0.287936	-19.9
369	-0.291792	-19.8
370	-0.286745	-19.6
371	-0.290787	-19.8
372	-0.293816	-19.6
373	-0.291498	-19.8
374	-0.290018	-19.7
375	-0.291725	-19.9
376	-0.290998	-19.8
377	-0.291361	-19.8
378	-0.282785	-19.6
379	-0.287222	-19.5
380	-0.291851	-19.9
381	-0.27151	-19.4
382	-0.290839	-19.8
383	-0.290525	-19.8
384	-0.292032	-19.8
385	-0.291333	-19.8
386	-0.291132	-19.8
387	-0.293004	-19.9
388	-0.298124	-19.8
389	-0.279034	-19.7
390	-0.292849	-19.6
391	-0.266838	-19.5
392	-0.304803	-20.0
393	-0.278977	-19.7
394	-0.301551	-19.9
395	-0.29554	-19.9
396	-0.300883	-19.9
397	-0.309195	-19.6
398	-0.284268	-19.8
399	-0.307975	-20.0
400	-0.267817	-19.1
401	-0.27421	-19.3
402	-0.290842	-19.8
403	-0.298076	-19.9
404	-0.29038	-19.8
405	-0.26939	-19.6
406	-0.303096	-19.7
407	-0.281247	-19.6
408	-0.28735	-19.9
409	-0.28973	-19.6
410	-0.279472	-19.7
411	-0.298559	-19.8

SA2	Estimated coefficient	t-statistic
412	-0.335058	-21.4
413	-0.317817	-19.8
414	-0.261042	-19.3
415	-0.311843	-21.3
416	-0.334829	-21.2
417	-0.363631	-21.1
418	-0.296407	-20.1
419	-0.329923	-23.2
420	-0.289026	-19.0
421	-0.335301	-20.9
422	-0.269707	-19.2
423	-0.315816	-19.2
424	-0.371262	-23.9
425	-0.318743	-20.3
426	-0.360568	-21.8
427	-0.339116	-21.5
428	-0.301766	-19.9
429	-0.330094	-20.2
430	-0.29912	-19.8
431	-0.354181	-20.2
432	-0.298392	-19.7
433	-0.308115	-20.0
434	-0.276416	-19.6
435	-0.302155	-19.3
436	-0.302398	-19.5
437	-0.310673	-19.6
438	-0.288418	-19.6
439	-0.323058	-21.4
440	-0.335323	-20.7
441	-0.35161	-20.2
442	-0.3597	-20.4
443	-0.341197	-21.0
444	-0.331371	-21.9
445	-0.304907	-21.8
446	-0.345823	-21.8
447	-0.319417	-21.0
448	-0.353812	-22.6
449	-0.313057	-19.2
450	-0.334484	-19.6
451	-0.284442	-19.6
452	-0.313839	-20.3
453	-0.292498	-19.6
454	-0.282527	-19.8
455	-0.306789	-19.9
456	-0.280424	-19.8
457	-0.289623	-19.7
458	-0.321157	-20.0
459	-0.282776	-20.0
460	-0.290859	-19.8
461	-0.309185	-20.2
462	-0.281656	-19.5

Appendix C: SA2 region names

SA2 Model No.	SA2 ID	SA2 Name
1	21001	Alfredton
2	21002	Ballarat
3	21003	Ballarat - North
4	21004	Ballarat - South
5	21005	Buninyong
6	21006	Delacombe
7	21007	Smythes Creek
8	21008	Wendouree - Miners Rest
9	21009	Bacchus Marsh Region
10	21010	Creswick - Clunes
11	21011	Daylesford
12	21012	Gordon (Vic.)
13	21013	Avoca
14	21014	Beaufort
15	21015	Golden Plains - North
16	21016	Maryborough (Vic.)
17	21017	Maryborough Region
18	21018	Bendigo
19	21019	California Gully - Eaglehawk
20	21020	East Bendigo - Kennington
21	21021	Flora Hill - Spring Gully
22	21022	Kangaroo Flat - Golden Square
23	21023	Maiden Gully
24	21024	Strathfieldsaye
25	21025	White Hills - Ascot
26	21026	Bendigo Region - South
27	21027	Castlemaine
28	21028	Castlemaine Region
29	21029	Heathcote
30	21030	Kyneton
31	21031	Woodend
32	21032	Bendigo Region - North
33	21033	Loddon
34	21034	Bannockburn
35	21035	Golden Plains - South
36	21036	Winchelsea
37	21037	Belmont
38	21038	Corio - Norlane
39	21039	Geelong
40	21040	Geelong West - Hamlyn Heights
41	21041	Grovedale
42	21042	Highton
43	21043	Lara
44	21044	Leopold
45	21045	Newcomb - Moolap
46	21046	Newtown (Vic.)
47	21047	North Geelong - Bell Park
48	21048	Clifton Springs
49	21049	Lorne - Anglesea
50	21050	Ocean Grove - Barwon Heads
51	21051	Portarlington
52	21052	Point Lonsdale - Queenscliff
53	21053	Torquay
54	21054	Alexandra
55	21055	Euroa
56	21056	Kilmore - Broadford
57	21057	Mansfield (Vic.)

SA2 Model No.	SA2 ID	SA2 Name
58	21058	Nagambie
59	21059	Seymour
60	21060	Seymour Region
61	21061	Upper Yarra Valley
62	21062	Yea
63	21063	Benalla
64	21064	Benalla Region
65	21065	Rutherglen
66	21066	Wangaratta
67	21067	Wangaratta Region
68	21068	Beechworth
69	21069	Bright - Mount Beauty
70	21070	Chiltern - Indigo Valley
71	21071	Myrtleford
72	21072	Towong
73	21073	West Wodonga
74	21074	Wodonga
75	21075	Yackandandah
76	21076	Drouin
77	21077	Mount Baw Baw Region
78	21078	Trafalgar (Vic.)
79	21079	Warragul
80	21080	Alps - East
81	21081	Bairnsdale
82	21082	Bruthen - Omeo
83	21083	Lake King
84	21084	Lakes Entrance
85	21085	Orbost
86	21086	Paynesville
87	21087	Foster
88	21088	French Island
89	21089	Korumburra
90	21090	Leongatha
91	21091	Phillip Island
92	21092	Wilsons Promontory
93	21093	Wonthaggi - Inverloch
94	21094	Churchill
95	21095	Moe - Newborough
96	21096	Morwell
97	21097	Traralgon
98	21098	Yallourn North - Glengarry
99	21099	Alps - West
100	21100	Longford - Loch Sport
101	21101	Maffra
102	21102	Rosedale
103	21103	Sale
104	21104	Yarram
105	21105	Brunswick
106	21106	Brunswick East
107	21107	Brunswick West
108	21108	Coburg
109	21109	Pascoe Vale South
110	21110	Alphington - Fairfield
111	21111	Northcote
112	21112	Thornbury
113	21113	Ascot Vale
114	21114	Essendon - Aberfeldie

SA2 Model No.	SA2 ID	SA2 Name
115	21115	Flemington
116	21116	Moonee Ponds
117	21117	Carlton
118	21118	Docklands
119	21119	East Melbourne
120	21120	Flemington Racecourse
121	21121	Kensington (Vic.)
122	21122	Melbourne
123	21123	North Melbourne
124	21124	Parkville
125	21125	South Yarra - West
126	21126	Southbank
127	21127	West Melbourne
128	21128	Albert Park
129	21129	Elwood
130	21130	Port Melbourne
131	21131	Port Melbourne Industrial
132	21132	South Melbourne
133	21133	St Kilda
134	21134	St Kilda East
135	21135	Armadale
136	21136	Prahran - Windsor
137	21137	South Yarra - East
138	21138	Toorak
139	21139	Abbotsford
140	21140	Carlton North - Princes Hill
141	21141	Collingwood
142	21142	Fitzroy
143	21143	Fitzroy North
144	21144	Richmond (Vic.)
145	21145	Yarra - North
146	21146	Ashburton (Vic.)
147	21147	Balwyn
148	21148	Balwyn North
149	21149	Camberwell
150	21150	Glen Iris - East
151	21151	Hawthorn
152	21152	Hawthorn East
153	21153	Kew
154	21154	Kew East
155	21155	Surrey Hills (West) - Canterbury
156	21156	Bulleen
157	21157	Doncaster
158	21159	Templestowe
159	21160	Templestowe Lower
160	21161	Blackburn
161	21162	Blackburn South
162	21163	Box Hill
163	21164	Box Hill North
164	21165	Burwood
165	21166	Burwood East
166	21167	Surrey Hills (East) - Mont Albert
167	21168	Beaumaris
168	21169	Brighton (Vic.)
169	21170	Brighton East
170	21171	Cheltenham - Highett (West)
171	21172	Hampton
172	21173	Sandringham - Black Rock
173	21174	Bentleigh - McKinnon
174	21176	Carnegie
175	21177	Caulfield - North
176	21178	Caulfield - South
177	21179	Elsternwick
178	21180	Hughesdale

SA2 Model No.	SA2 ID	SA2 Name
179	21181	Murrumbeena
180	21182	Ormond - Glen Huntly
181	21183	Aspendale Gardens - Waterways
182	21184	Braeside
183	21185	Carrum - Patterson Lakes
184	21186	Chelsea - Bonbeach
185	21187	Chelsea Heights
186	21188	Cheltenham - Highett (East)
187	21189	Edithvale - Aspendale
188	21190	Mentone
189	21191	Moorabbin - Heatherton
190	21192	Moorabbin Airport
191	21193	Mordialloc - Parkdale
192	21194	Malvern - Glen Iris
193	21195	Malvern East
194	21196	Bundoora - East
195	21197	Greensborough
196	21198	Heidelberg - Rosanna
197	21199	Heidelberg West
198	21200	Ivanhoe
199	21201	Ivanhoe East - Eaglemont
200	21202	Montmorency - Briar Hill
201	21203	Viewbank - Yallambie
202	21204	Watsonia
203	21205	Kingsbury
204	21207	Reservoir - East
205	21208	Reservoir - West
206	21209	Eltham
207	21210	Hurstbridge
208	21211	Kinglake
209	21212	Panton Hill - St Andrews
210	21213	Plenty - Yarrambat
211	21214	Research - North Warrandyte
212	21215	Wattle Glen - Diamond Creek
213	21216	Bundoora - North
214	21217	Bundoora - West
215	21219	Lalor
216	21220	Mill Park - North
217	21221	Mill Park - South
218	21223	Thomastown
219	21224	Wallan
220	21225	Whittlesea
221	21226	Airport West
222	21227	Essendon Airport
223	21228	Keilor
224	21229	Keilor East
225	21230	Niddrie - Essendon West
226	21231	Strathmore
227	21232	Gisborne
228	21233	Macedon
229	21234	Riddells Creek
230	21235	Romsey
231	21236	Coburg North
232	21237	Fawkner
233	21239	Pascoe Vale
234	21240	Sunbury
235	21241	Sunbury - South
236	21242	Broadmeadows
237	21243	Campbellfield - Coolaroo
238	21245	Gladstone Park - Westmeadows
239	21246	Greenvale - Bulla
240	21247	Meadow Heights
241	21248	Melbourne Airport
242	21249	Roxburgh Park - Somerton

SA2 Model No.	SA2 ID	SA2 Name
243	21250	Tullamarine
244	21251	Bayswater
245	21254	Knoxfield - Scoresby
246	21255	Lysterfield
247	21256	Rowville - Central
248	21257	Rowville - North
249	21258	Rowville - South
250	21259	Wantirna
251	21260	Wantirna South
252	21261	Donvale - Park Orchards
253	21262	Warrandyte - Wonga Park
254	21263	Bayswater North
255	21265	Croydon Hills - Warranwood
256	21266	Ringwood
257	21267	Ringwood East
258	21268	Ringwood North
259	21269	Forest Hill
260	21270	Mitcham (Vic.)
261	21271	Nunawading
262	21272	Vermont
263	21273	Vermont South
264	21274	Belgrave - Selby
265	21275	Chirnside Park
266	21276	Healesville - Yarra Glen
267	21277	Kilsyth
268	21278	Lilydale - Coldstream
269	21279	Monbulk - Silvan
270	21280	Montrose
271	21281	Mooroolbark
272	21282	Mount Dandenong - Olinda
273	21283	Mount Evelyn
274	21284	Upwey - Tecoma
275	21285	Wandin - Seville
276	21286	Yarra Valley
277	21287	Beaconsfield - Officer
278	21288	Bunyip - Garfield
279	21289	Emerald - Cockatoo
280	21290	Koo Wee Rup
281	21291	Pakenham - North
282	21292	Pakenham - South
283	21293	Berwick - North
284	21294	Berwick - South
285	21295	Doveton
286	21297	Hallam
287	21299	Narre Warren North
288	21300	Cranbourne
289	21301	Cranbourne East
290	21302	Cranbourne North
291	21303	Cranbourne South
292	21304	Cranbourne West
293	21305	Hampton Park - Lynbrook
294	21306	Lynbrook - Lyndhurst
295	21308	Pearcedale - Tooradin
296	21309	Clarinda - Oakleigh South
297	21310	Clayton South
298	21311	Dandenong
299	21312	Dandenong North
300	21313	Dingley Village
301	21314	Keysborough
302	21316	Noble Park North
303	21317	Springvale
304	21318	Springvale South
305	21319	Ashwood - Chadstone
306	21320	Clayton

SA2 Model No.	SA2 ID	SA2 Name
307	21321	Glen Waverley - East
308	21322	Glen Waverley - West
309	21323	Mount Waverley - North
310	21324	Mount Waverley - South
311	21325	Mulgrave
312	21326	Oakleigh - Huntingdale
313	21327	Wheelers Hill
314	21328	Ardeer - Albion
315	21329	Cairnlea
316	21330	Deer Park - Derrimut
317	21331	Delahey
318	21332	Keilor Downs
319	21333	Kings Park (Vic.)
320	21334	St Albans - North
321	21335	St Albans - South
322	21336	Sunshine
323	21337	Sunshine North
324	21338	Sunshine West
325	21339	Sydenham
326	21340	Taylors Lakes
327	21341	Altona
328	21342	Altona Meadows
329	21343	Altona North
330	21344	Newport
331	21345	Seabrook
332	21346	Williamstown
333	21347	Braybrook
334	21348	Footscray
335	21349	Maribyrnong
336	21350	Seddon - Kingsville
337	21351	West Footscray - Tottenham
338	21352	Yarraville
339	21353	Bacchus Marsh
340	21355	Hillside
341	21356	Melton
342	21357	Melton South
343	21358	Melton West
344	21359	Rockbank - Mount Cottrell
345	21360	Taylors Hill
346	21361	Hoppers Crossing - North
347	21362	Hoppers Crossing - South
348	21363	Laverton
349	21365	Tarneit
350	21366	Truganina
351	21368	Werribee - South
352	21369	Wyndham Vale
353	21370	Carrum Downs
354	21371	Frankston
355	21372	Frankston North
356	21373	Frankston South
357	21374	Langwarrin
358	21375	Seaford (Vic.)
359	21376	Skye - Sandhurst
360	21377	Dromana
361	21378	Flinders
362	21379	Hastings - Somers
363	21380	Mornington
364	21381	Mount Eliza
365	21382	Mount Martha
366	21383	Point Nepean
367	21384	Rosebud - McCrae
368	21385	Somerville
369	21386	Ararat
370	21387	Ararat Region

SA2 Model No.	SA2 ID	SA2 Name
371	21388	Horsham
372	21389	Horsham Region
373	21390	Nhill Region
374	21391	St Arnaud
375	21392	Stawell
376	21393	West Wimmera
377	21394	Yarriambiack
378	21395	Irymple
379	21396	Merbein
380	21398	Mildura Region
381	21399	Red Cliffs
382	21400	Buloke
383	21401	Gannawarra
384	21402	Kerang
385	21403	Robinvale
386	21404	Swan Hill
387	21405	Swan Hill Region
388	21406	Echuca
389	21407	Kyabram
390	21408	Lockington - Gunbower
391	21409	Rochester
392	21410	Rushworth
393	21411	Cobram
394	21412	Moira
395	21413	Numurkah
396	21414	Yarrawonga
397	21415	Mooroopna
398	21416	Shepparton - North
399	21417	Shepparton - South
400	21418	Shepparton Region - East
401	21419	Shepparton Region - West
402	21420	Glenelg (Vic.)
403	21421	Hamilton (Vic.)
404	21422	Portland
405	21423	Southern Grampians
406	21424	Doncaster East (North)
407	21425	Doncaster East (South)
408	21426	Bentleigh East (North)
409	21427	Bentleigh East (South)
410	21428	Preston - East
411	21429	Preston - West
412	21430	Doreen
413	21431	Epping - East
414	21432	Epping - South
415	21433	Epping - West
416	21434	Mernda
417	21435	South Morang (North)
418	21436	South Morang (South)
419	21437	Wollert
420	21438	Glenroy
421	21439	Gowanbrae
422	21440	Hadfield
423	21441	Craigieburn - Central
424	21442	Craigieburn - North
425	21443	Craigieburn - South
426	21444	Craigieburn - West
427	21445	Mickleham - Yuroke
428	21446	Boronia
429	21447	Ferntree Gully (North)
430	21448	Ferntree Gully (South) - Upper Ferntree Gully
431	21449	The Basin
432	21450	Croydon - East
433	21451	Croydon - West

SA2 Model No.	SA2 ID	SA2 Name
434	21452	Croydon South
435	21453	Endeavour Hills - North
436	21454	Endeavour Hills - South
437	21455	Narre Warren - North East
438	21456	Narre Warren - South West
439	21457	Narre Warren South (East)
440	21458	Narre Warren South (West)
441	21459	Noble Park - East
442	21460	Noble Park - West
443	21461	Burnside
444	21462	Burnside Heights
445	21463	Caroline Springs
446	21464	Point Cook - East
447	21465	Point Cook - North
448	21466	Point Cook - South
449	21467	Werribee - East
450	21468	Werribee - West
451	21469	Mildura - North
452	21470	Mildura - South
453	21471	Camperdown
454	21472	Colac
455	21473	Colac Region
456	21474	Corangamite - North
457	21475	Corangamite - South
458	21476	Otway
459	21477	Moyne - East
460	21478	Moyne - West
461	21479	Warrnambool - North
462	21480	Warrnambool - South