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DO EXPANSIONS MAKE AUSTRALIANS HEALTHY?

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This paper aims to investigate the impact of expansions on the mortality and lifestyle factors of the Australian population using data gathered from HILDA. The results suggest that alcohol and tobacco consumption decline during expansions, however there is a decline in participation in physical activity.

1. INTRODUCTION

This paper aims to investigate the impact of expansions on the mortality rates in Australia as well as the impact of expansions on the lifestyle choices of the Australian population.

The relationship between economic growth and health status of individuals within an economy has long been investigated. For developing nations in particular, it seems that economic growth leads to better health in individuals in the economy.

This impact is intuitive as economic growth brings with it better resources for health care, leading to better medical treatment and easier access to medicines. This in turn is reflected in the health of the population, particularly, mortality rates. However, the impact of economic growth on health status in developed countries has not been investigated as much. In particular, Ruhm (2000) argues that "even though a permanent rise in income improves health, temporary growth could cause mortality to increase". He attributes this difference in long run and short run factors to two main reasons. He suggests that in the long run individuals have more flexibility in making time allocation, consumption and production choices so as to improve health. However, in the short run, he argues that small negative health shocks associated with temporary upturns in growth can cause weaker individuals to die sooner than expected. For example, a stop in funding for certain medications making them more expensive and thus unaffordable for some members of the population could possibly lead them to dying earlier than if the funding still continued.

Lifestyle factors such as alcohol and tobacco consumption as well as participation in physical activity are seen to be important in determining the life-expectancy for an

individual. In Australia, alcohol, tobacco and obesity are the leading causes of preventable deaths. It is expected that these factors would have an impact on mortality rates in Australia.

This paper attempts to investigate the impact of expansions on the mortality rates in Australia as well as their impact on the alcohol and tobacco consumption and the level of physical activity of the Australian population. Using panel data from HILDA survey and fixed-effects regressions, I have attempted to explain the impact of a decline in state unemployment (hence expansions) on mortality (as measured by the Crude death Rate) and lifestyle factors indicated by alcohol, tobacco consumption and levels of physical activity.

The following sections of this part of the paper will describe the relevant literature, data, econometric methodology and the results obtained.

2. Literature Review

2.1 Early Research

Macroeconomic expansions are generally associated with higher incomes, better lifestyles, better access to health resources and overall declining mortality rates. Conversely, health is believed to deteriorate during downturns and recessions. There has been extensive research into examining exactly how recessions impact the health of an economy's population. Most of these studies have been pioneered by the work of Brenner (1971, 1973, 1975, 1979, 1987). Brenner argued that recessions and various other sources of economic fluctuations increased overall mortality.

However, Brenner's analysis was severely flawed. Many researchers such as Kasl (1979), Gravelle *et al.* (1981), Wagstaff (1985) have pointed out severe flaws in Brenner's work, pointing out that results are sensitive to the choice of countries, time periods and the proxies used for health. Most contemporaneous evidence suggests that economic expansions increase mortality and downturns improve health and lead to a reduction in mortality.

2.2Econometric Methods

With the development of new research methodologies, many researchers attempted to correct for the problems that were identified in the earliest research in this arena. Studies such as Joyce& Mocan (1993) and Laporte (2004) corrected for nonstationarity in the time-series data. Joyce & Mocan (1993) found no impact of macroeconomic conditions on mortality, while Laporte (2004) suggested that it was procyclical in nature. Additionally, new methods have also been used by researchers to investigate the impact of macroeconomic conditions on mortality. For example, Tapia Granados (2004a) used spectral analysis and local regression techniques. His paper concluded that mortality is procyclical in nature. It seems that there is no consensus on the impact of macroeconomic conditions.

Kasl (1979, p. 787) suggests that "a more refined ecological analysis" needs to be conducted to accurately model the impact of macroeconomic conditions on mortality. Although there is no consensus on the appropriate method, it is believed by most researchers that the omitted variables in the analysis cause the results to be extremely sensitive and not easily replicated. Stern (1983, p.69) suggests that using first differencing techniques in panel data could be the solution. Recent studies have indeed used panel data for multiple geographic locations for several time periods to eliminate this omitted variable bias.

2.3 Risky behaviours

Changes in lifestyles and behaviours during economic expansions and downturns can be attributed to changing health status among individuals in a given economy. One of the most widely studied behaviours is alcohol consumption. Several researchers have found that alcohol consumption and alcohol-related road fatalities vary procyclically (see for example, Evans & Graham, 1988, Ruhm 1995, Freeman, 1999). This implies that expansions lead to increase in road fatalities.

Additionally, impacts of smoking and physical inactivity are also investigated. Ruhm (2004) showed that smoking and height adjusted weight decline during temporary economic downturns while leisure-time physical activity rises. In his paper, Ruhm concludes that changes in behaviour might be one of the explanations for procyclical variation in mortality observed.

Most of the papers mentioned in this section have investigated the impact of macroeconomic conditions on health outcomes in USA or Europe. However, very few studies have been carried out to investigate such an impact on Australia. One of the few studies carried out on Australia is by Berk, Dodd and Henry (2005). Berk *et al.* (2005) investigate the effect of macroeconomic variables on suicide in Australia, using suicide data from the Australian Bureau of Statistics. They concluded that macroeconomic trends were significantly associated with suicide.

This paper aims to add to the literature on the impact of macroeconomic conditions on mortality, and risky behaviour by estimating such an impact for Australia. If the impact of macroeconomic conditions is indeed country and time-period sensitive, then it will be interesting to note if Australian mortality rates vary procyclically. Additionally, it will also be interesting to note whether Australian populations'

consumption of alcohol, tobacco and participation in physical activity is influenced by macroeconomic conditions.

3. Data

In order to test this procyclical variation in mortality and the impact of macroeconomic conditions on risky behaviour, this paper uses state-level mortality and unemployment data as well as data obtained on personal income, age, sex, tobacco and alcohol consumption as well as physical activity levels of a representative population of individuals in Australia.

3.2.1 State Mortality

The Australian Institute of Health and Welfare (AIHW) publishes state and national level mortality data. This data is a compilation of long term mortality data on selected causes of death grouped by age and sex of individuals in Australia known as General Record of Incidence of Mortality (GRIM). For the purposes of this term paper, I have used the state mortality data for all causes combined. The variable used in all calculations is the log of the Crude Death Rate (CDR). The CDR is calculated by the AIHW as the number of deaths per 100,000 births. The data was standardized using the 2001 Australian Population statistics.

3.2.2 State Unemployment levels

The data on state level of unemployment was derived from the time series data provided by the Department of Workplace Relations. It is reported as a percentage.

3.2.3 Micro data

The variables representing lifestyle risky behaviours and household characteristics were derived from Household Income and Labour Dynamics (HILDA) survey. HILDA is a longitudinal panel data set that survey's respondents across all states and territories in Australia and tracks changes in lifestyle and behaviour of these individuals. HILDA is funded by the Department of Families, Housing, Community Services and Indigenous Affairs (FaCHSIA). HILDA data from Waves 2-6 [2002-2006] has been used in this particular term paper.

3.2.3.1 Income, Age and Sex Variables

Income was recorded as the current weekly gross weekly salary and/or wages from the responders' main job. Age and Sex were the age and sex of the first person in the household. Mortality rates as well as risky behaviours are closely related the income, age and sex of individuals and are commonly used in relevant literature sources as controls. Hence, they were also used in this paper as controls in all econometric specifications.

3.2.3.2 Tobacco use

Tobacco smoking is the largest single preventable cause of death and disease in Australia (Cancer Council 2006).Smoking is a key risk factor for the three diseases that cause most deaths in Australia: ischaemic heart disease, cerebrovascular disease and lung cancer. Smokers are also at increased risk of developing chronic obstructive pulmonary disease and reduced lung function (DoHA 2006).

Economic expansions generally lead to increases in income, making smoking more affordable for the general population. Being a highly-risky behaviour, it would be interesting to examine the impact of economic expansions on smoking behaviour among Australian public.

The variable for tobacco use (*lstbcn)[waves 2-6]* recorded the number of cigarettes smoked by the respondent every week. If the respondent did not smoke cigarettes but used other tobacco related products, he/she was asked to convert the use of any other tobacco related products into an approximate number of cigarettes.

3.2.3.3 Alcohol use

Alcohol, though widely used and enjoyed in Australian society, is a depressant drug. In low quantities it causes people to become less inhibited, in higher doses it can cause unconsciousness and even death. It is thought that low to moderate alcohol consumption may offer some protective health effects. However, high alcohol consumption increases the risk of heart, stroke and vascular diseases, liver cirrhosis and some cancers. It also contributes to disability and death through accidents, violence, suicide and homicide (WHO 2004).

Alcohol use is particularly related to socioeconomic status, age as well as sex. Alcohol is the second largest cause of drug-related deaths and hospitalisations in Australia (after tobacco) (AIHW, 2005a). Alcohol is also responsible for a large number of injury, and in particular, road fatalities. During economic expansions, it is plausible

that an increase in incomes would lead to increased consumption in alcohol, and also lead to an increase in social drinking.

The variable for alcohol use (*lsdrkf)[waves 2-6]* recorded whether the responder drank alcohol, and if so, how often during a usual week. Responses were grouped by the frequencies presented below in Table 1

Table 1

Value	Definition
1	I have never drunk alcohol
2	I no longer drink alcohol
3	Yes, I drink alcohol everyday
4	Yes, I drink alcohol 5 or 6 days per week
5	Yes, I drink alcohol 3 or 4 days per week
6	Yes, I drink alcohol 1 or 2 days per week
7	Yes, I drink alcohol 2 or 3 days per month
8	Yes, but only rarely

3.2.3.4 Exercise

Suitable regular daily physical activity is a major factor in preventing chronic diseases and can provide a wide range of physical, social and mental health benefits (WHO 2006a). Physical inactivity increases all causes of mortality, doubles the risk of cardiovascular disease, Type 2 diabetes, and obesity. It also increases the risks of

colon and breast cancer, high blood pressure, lipid disorders, osteoporosis, depression and anxiety (WHO 2006b)[1].

As reasoned before, the lack of time during expansions could essentially reduce participation in physical activity, and could lead to risks and possibly even death. In this paper the exercise variable (*lspact*) [waves 2-6] recorded the responders' level of physical activity. Physical activity was defined as the participation in moderate or intensive physical activity for at least 30 minutes.

Responses were grouped by exercise frequency as presented in Table 2 below:

Table 2

Value	Definition
1	Not at all
2	Less than once a week
3	1 to 2 times a week
4	3 times a week
5	More than 3 times a week
6	Every day

3.2.4 Data manipulation

The data has been manipulated for certain variables. All the non-respondents were removed from the data. All missing values and values of those that the respondent refused to disclose were converted to 0's. In addition, there were numerous occasions

[1] Australian Bureau of Statistics

when certain individuals were not asked questions on their risky behaviour; these too were converted into 0.

4. Econometric Methodology

The following section of the paper will present the econometric methodology used to analyse the impact of macroeconomic conditions as proxied by the state unemployment rate on mortality rates as well as their impact on the participation in risky behaviour by the Australian population.

The aggregate data used in this paper covers the 6 states and 2 territories in Australia. Fixed-effects models have been estimated for the data for the period between 2002 and 2006.

Although some of the most important factors that affect mortality and a respondents' participation in risky behaviour have been accounted for, there still remain factors that are potentially unobserved and hence can cause omitted variable bias in standard Ordinary Least Squares (OLS) regressions. One possible solution is to control for all possible factors that can affect an outcome. For example, in this case, mortality rates can also be affected by a person's exposure to pollution, or a person's ethnicity. However, it is not easy to estimate such factors, and variables such as ethnicity are often kept confidential. An alternative means to use panel data could be to view these unobserved factors affecting the dependent variable as time-variant and constant. Letting i denote the cross-sectional unit and t the time period, we can write such a model with a single observed explanatory variable as:

$$y_{it} = \beta_0 + \delta_0 d2_t + \beta_1 x_{it} + a_i + u_{it} \qquad where \;\; t = 1,2. \qquad (equation\ 1)$$

The variable a_i captures all the unobserved, time-constant factors that affect y_{it}. This a_i is known as the fixed-effect over time. Panel data allows this unobserved effect a_i to be correlated with the explanatory variables. For example, in this paper I do not control for a respondents' level of education since it will be correlated to income levels, which is controlled for in the model.

The major advantage of fixed effects estimation is that rather than estimating a simple cross-sectional relationship that is most likely to suffer from omitted variable bias thereby making ceteris paribus conclusions difficult, equation 1 allows us to explicitly consider how changes in the explanatory variables over time will affect the change in *y* over the same time period.

4.1 Impact of Macroeconomic Conditions on Mortality

Using subscripts to *j* to index the state and *t* to index the year, the basic econometric specification was:

$$H_{jt} = \alpha_t + X_{jt}\beta + E_{jt}\gamma + S_j + \varepsilon_{jt} \qquad (equation\ 2)$$

In the equation above, H is the natural log of the state mortality rate, E proxies for economic conditions; X is a vector of supplementary regressors and ε is the error term. The fixed-effects S_j controls for the time-invariant state characteristics (such as weather patterns in the state for example, Tasmania is colder than Queensland, hence people would be more likely to fall sick in the winter months). α_t accounts for the nationwide time effects, and γ captures the impact of within-state deviations in economic conditions (such as geographical location within the state).

Normal OLS regressions do not allow us to account for these unobserved factors in panel data, hence Fixed-Effects regressions were utilized, so that the omitted variable bias problem could be solved.

4.2 Impact of Macroeconomic Conditions on Risky Behaviour

Similarly, the corresponding equation for Micro data where *i* indexed the individual, *j* indexed the state and *t* indexed the time period was:

$$H_{ijt} = \alpha_t + X_{ijt}\beta + E_{jt}\gamma + S_j + \varepsilon_{ijt} \qquad (equation\ 3)$$

In the equation above, H is the variable for risky behaviour, E proxies for economic conditions; X is a vector of supplementary regressors and ε is the error term. The fixed-effects S_j controls for the time-invariant state characteristics (such as weather

patterns in the state for example, Tasmania is colder than Queensland, hence people would be more likely to fall sick in the winter months). α_t accounts for the nationwide time effects, and γ captures the impact of within-state deviations in economic conditions (such as geographical location within the state).

All the model specifications for equations 1 and 2 included year dummy variables and the aforementioned personal characteristics. Equation 2 above was also estimated using both Fixed-effects as well as the Random-effects model.

5. Results

Following from the methodology presented in Section 4, I will now use the variables discussed in Section 3 to estimate the impact of macroeconomic conditions on mortality rates in Australia as well as their impact on the risky behaviour.

5.1 Impact of macroeconomic conditions on the total mortality in Australia

Table 3 summarizes the results of the fixed-effects specification of equation 2. The specification controls for the responders age, weekly wage as well as sex. The state fixed-effects will account for all time invariant factors; year dummies have also been included.

Table 3

Variable	Coefficient	Standard Error
Unemployment	-0.00053*	0.0002929
Sex	0.0003209	0.0007621
Age	0.0000606	0.0001323
Income	0.000000485****	0.000000315
2003	-0.0402987*	0.0003277
2004	-0.066765*	0.000426
2005	-0.1088982*	0.0005082
2006	-0.1122588*	0.0006277
age^2	-3.71E-07	1.57E-06

* Indicates coefficient is significant at 1%

**** Indicates coefficient is significant at 15%

As is clear from the Table 3 above, unemployment is negatively related to the log of the CDR (crude death rate). For the full sample, a 1 percentage point increase in the state unemployment rate decreases the predicted death rate by approximately 0.5%[2]. This figure suggests that mortality rates are likely to rise during economic expansions. This implies that mortality is procyclical. As we can also see from the model, personal income is also slightly statistically significant at 15%, and also has a positive impact on the mortality rate. It suggests that a $1 increase in income leads to an increase in fatalities by 0.00004%. However, this result is economically insignificant. The results obtained are consistent with those obtained by Ruhm (2000). Ruhm found a similar procyclical variation in his study for the USA. He found that unemployment was statistically significant and negatively related to total mortality. Additionally, all the year dummy variables are negative, declining and are statistically highly significant at 1%. This also suggests that mortality is declining over time.

5.2 Impact of macroeconomic conditions on risky behaviour

During economic expansions, incomes rise and it is possible that lifestyle changes occur in the Australian population. If the impact of changing macroeconomic conditions is procyclical such that deaths increase during expansions, then it can be

[2] Calculated as [exp(-0.0052)-1]

expected that alcohol use, tobacco use as well as levels of physical activity mirror these effects, particularly because they are some of the leading causes of preventable deaths in Australia. This section will estimate the impact of macroeconomic conditions on these risky behaviours.

5.2.1 Impact on levels of physical activity

The level of exercise is an important determinant in determining the maintenance of a healthy weight range. Table 4 below summarized the fixed-effects coefficient estimates for physical activity.

Table 4

Variable	Coefficient	Standard Error
Unemployment	0.0119029	0.0120092
Sex	0.0330949	0.0475046
Age	0.0298936*	0.0070374
Income	-0.0000165	0.0000166
2002	0.00485	0.0291643
2003	-0.013927	0.0227611
2004	-0.0134741	0.0193839
2005	-0.00892	0.0165996
age^2	-0.0003679*	0.000879
Constant	2.993059	0.1417686

* Indicates coefficient is significant at 1%

As seen in Table 4 above, macroeconomic conditions have a positive impact on the level of physical activity undertaken by the responder. It suggests that a 1% decrease in the state unemployment rate leads to a decrease in the level of physical activity by 0.011%. However, the coefficient on the level of physical activity is insignificant.

Although the coefficient is statistically insignificant, it exhibits a strong implication. It implies that during economic expansions, individuals in Australia seem to participate less in exercise. One of the major reasons for this reduced participation would be the increase in work related pressure, extra hours demanded by firms as production levels expand in the economy. This result coincides with that obtained by Ruhm (2000) in a comparative study. He also documented a fall in physical activity as economic expansions occur.

In addition, these results are also consistent with the findings of the National Health Survey (2004-05) [NHS 04-05] conducted by the ABS. The NHS 04-05 reports that the amount of exercise carried out by the Australian public has declined between 2001 and 2005. Almost 35.2% of the population reported participating in no physical activity in 2005 as opposed to 31.6% in 2001. These statistics provide further evidence suggesting that expansions lead to a fall in the level of physical activity carried out.

As expected, the coefficient on age^2 is negative and highly statistically significant along with the coefficient on age. It is intuitive to expect that there exists a quadratic relationship between age and physical activity, as physical activity is low is infants and increases in youth and then declines with age.

5.2.3 Impact on tobacco use

Tobacco use was measured by the number of cigarettes smoked by the responder in a usual week. Table 5 below summarizes the results of the fixed-effects estimates of the impact of macroeconomic conditions on tobacco usage.

Table 5

Variable	Coefficient	Standard Error
Unemployment	0.4769**	0.2877
Sex	-1.444	1.3791
Age	-0.9108*	0.1782
Income	0.00057	0.0003632
2002	2.1311*	0.6900
2003	1.2911*	0.555
2004	1.2799*	0.4582
2005	0.3455*	0.3801
age^2	0.00922*	0.0022
Constant	35.04765	3.630789

* Indicates coefficient is significant at 1%

** Indicates coefficient is significant at 10%

As seen in table 5 above, macroeconomic conditions have a positive impact on tobacco usage. The coefficient suggests that a 1% decrease in the unemployment rates leads to a decrease in the number of cigarettes smoked in a usual week by 0.5%. This impact of macroeconomic conditions on tobacco use is only slightly significant at 15%.

This is a very surprising result and is not similar to that obtained by Ruhm (2000). In his study, he found that tobacco exhibited a strong procyclical variation, and could possibly help explain the increase in mortality rates during expansions. He found that a 1% point increase in state unemployment rate reduces the predicted number of current smokers by 0.3%.

Additionally, it is important to note that all the year dummy variables except for 2004 are statistically highly significant, positive and decreasing in size. This again implies a reduction in tobacco consumption over the sample. These results are supported by the trend in decline in the real value of income spent on tobacco products over time in Australia.[3] There can be several reasons for this apparent reduction in tobacco consumption, some of which include increased awareness through findings from research into health consequences of tobacco use, mandatory warnings on cigarette packets, advertising restrictions, health campaigns and bans on smoking in enclosed spaces.

5.2.4 Impact on Alcohol use

Similar to physical activity and tobacco, the alcohol variable attempts to group the amount of alcohol consumed on average in a usual week. Table 6 below reports the Fixed-Effects estimates of the impact of macroeconomic conditions on alcohol use.

[3] AUSTRALIAN BUREAU OF STATISTICS

Table 6

Variable	Coefficient	Standard Error
Unemployment	0.01357	0.015288
Sex	0.01515	0.06694
Age	-0.00641	0.0097
Income	2.59E-06	0.0000183
2003	0.0042726	0.022922
2004	-0.030186	0.026512
2005	-0.023064	0.0312536
2006	-0.038026	0.030143
age^2	0.000627	0.0001173
Constant	5.3128*	0.2185

* Indicates coefficient is significant at 1%

As it can be seen from Table 6 above, macroeconomic conditions also seem to have a positive impact on the level of alcohol drunk during a usual week. It suggests that a 1% point decrease in the state unemployment rate leads to a 0.014% decrease in alcohol consumption. However, this estimate is statistically insignificant. This suggests that macroeconomic conditions have almost no impact on the level of alcohol consumption. These results are similar to those obtained by Ruhm (2000).

There may be several plausible reasons for this counter cyclical variation in alcohol consumption. One of the main reasons could be the representative population interviewed and the sample selected. When selecting the sample, I only used the responses of the first person in the household. As can be seen from table 3 in the data section of this paper, the average age of the respondents was 47.5 years. This

suggests that this data may not accurately represent the youth in Australia. Expansions could have a different impact on youth, and as incomes increase, this would lead to an increase in social drinking and also binge drinking. Almost 13% of people aged 18-24 years participate in binge drinking. Additionally, the models do not control for alcohol taxes and legislation which could also affect alcohol consumption in an economy.

6. Conclusions

The objective of this paper was to analyse the impact of macroeconomic conditions on total mortality in Australia and also analyse their impact on risky behaviour carried out by the Australian population.

In order to effectively analyse this impact, mortality data taken from AIHW, state unemployment data taken from the Department of Workplace Relations, and lifestyle behaviour data taken from HILDA survey was used. A fixed-effects methodology was employed in order to analyse this unbalanced panel.

State unemployment was used as a proxy for macroeconomic conditions. Mortality rates were approximated used Crude Death Rates (CDR). This paper found that mortality is procyclical in nature. Fixed-effects estimates suggest that mortality rates tend to increase during economic expansions. This result was found to be similar to that obtained by Ruhm (2000). His study of the USA also found that mortality was procyclical.

Furthermore, this paper also attempted to investigate the impact of macroeconomic conditions on risky behaviour. The outcomes tested were level of physical activity, alcohol use and tobacco use. Fixed-effects estimates obtained through regressions suggest that levels of alcohol, tobacco and physical activity decline during economic expansions. The finding for reduction in consumption of alcohol and tobacco does not explain the procyclical variation in mortality. It was reasoned that since alcohol and tobacco use is dependent on many different factors rather than just economic

conditions, it is possible that these estimates are coincidental and biased. Additionally, the average age of the sample is 47.5 years, and suggests that these estimates might not accurately represent the youth. It is thus important to analyse these impacts accordingly.

Decline in levels of physical activity possibly explains the procyclical variation in mortality. Obesity is one of the leading causes of cardiac diseases, Type 2 diabetes etc. hence lists as one of the major preventable causes of death in Australia. If levels of physical activity have declined over the expansionary phase that the Australian economy has experienced as suggested by the estimates found in this paper, then it is important that the government launches campaigns to increase obesity awareness and promote healthier lifestyles and well being in the community.

It is important to understand that these estimates can be improved upon by using a better sample of the available data, possibly a sample that represents all sections of the Australian population. Also, not all possible explanatory variables have been included in the models used in this paper. Explanatory variables such as ethnicity, family history should ideally be included in such an analysis, as genetics and race determine the attitudes towards alcohol, tobacco consumption. Explanatory variables controlling for family history might also be important in understanding obesity related issues, as it could possibly be a genetic problem. In such a scenario, the level of physical activity or diet will not be the sole cause of obesity.

Additionally, the state unemployment rates were used to proxy for macroeconomic conditions as they were most easily available. In reality, there may possibly be numerous variables that could be used in conjunction to proxy macroeconomic conditions.

This study utilizes simple fixed-effects regression methodology in order to analyse the impact of macroeconomic conditions. However, fixed effects models have a few drawbacks. Firstly, panel data sets are incredibly difficult to collect, and not all interviewees respond to all questions. Since HILDA is a survey and all survey data is subject to biases resulting from misreporting of data items, deficiencies in coverage, non-response and coverage errors. Secondly, the differencing used to eliminate a_i can possibly greatly reduce the variation in the explanatory variables. If there is little variation in the explanatory variables it can lead to large standard errors when estimated using OLS.

This study could also be extended to use more accurate representations of the population investigating the impact of macroeconomic conditions on other risky behaviours such as drug-abuse etc. This topic has enabled me to understand the impact Australian economic expansions have had on the health status of the Australian population. In order to ensure a good quality of life, governments must ensure that economic growth also translates into a healthier and more able labour force.

7. References

Australian Institute of Health and Welfare (AIHW) 2008. State & Territories GRIM (General Record of Incidence of Mortality) Books. AIHW: Canberra."

Brenner, M. Harvey (1971), 'Economic Changes and Heart Disease Mortality', American Journal of Public Health, 61 (3), 606-11.

Brenner, M. Harvey (1973), Mental Illness and the Economy, Cambridge, MA: Harvard University Press, 1973.

Brenner, M. Harvey (1975), 'Trends in Alcohol Consumption and Associated Illnesses', The American Journal of Public Health, 656 (12), 1279-92.

Brenner, M. Harvey (1979), 'Mortality and the National Economy', The Lancet, 314 (8142), 568-73.

Brenner, M. Harvey (1984), Estimating the Effects of Economic Change on National Health and Social Well Being, Washington, DC: Joint Economic Committee, U.S. Congress, U.S. Government Printing Office.

Brenner, M. Harvey and Anne Mooney (1983), 'Unemployment and Health in the Context of Economic Change', Social Science Medicine, 17 (16), 1125-38.

Evans William and John D. Graham (1988), 'Traffic Safety and the Business Cycle', Alcohol, Drugs, and Driving, 4 (1), 31-8.

Freeman, Donald G. (1999), 'A Note on 'Economic Conditions and Alcohol Problems'', Journal of Health Economics, 18 (5), 661-70.

Gravelle, H.S.E., G. Hutchinson and J. Stern (1981), 'Mortality and Unemployment: A Critique of Brenner's Time-Series Analysis', The Lancet, 318 (8248), 675-9.

Gravelle, Hugh S.E. (1984), 'Time Series Analysis of Mortality and Unemployment', Journal of Health Economics, 3 (3), 297-305.

HILDA Survey, Melbourne Institute of Economics and Applied Statistics

Joyce, Theodore J. and H. Naci Mocan (1993), 'Unemployment and Infant Health: Time-Series Evidence from the State of Tennessee', Journal of Human Resources, 28 (1), 185-203.

Kasl, Stanislav V. (1979) 'Mortality and the Business Cycle: Some Questions about Research Strategies When Utilizing Macro-Social and Ecological Data', American Journal of Public Health, 69 (8), 784-8.

Laporte, Audrey (2004), 'Do Economic Cycles Have a Permanent Effect on Population Health? Revisiting the Brenner Hypothesis', Health Economics, 13 (8), 767-79.

Ruhm, Christopher J. (2000), 'Are Recessions Good For Your Health?', Quarterly Journal of Economics, 115 (2), 617-50.

Ruhm, Christopher J. and William E. Black (2002), 'Does Drinking Really Decrease in Bad Times?', Journal of Health Economics, 21 (4), 659-78.

Ruhm, Christopher J. (forthcoming) 'Healthy Living in Hard Times', Journal of Health Economics.

Tapia Granados, José. (2004a), 'Mortality and Economic Fluctuations in Sweden, 1800-1998', mimeo, University of Michigan.

Tapia Granados, José. (2004b), 'Recessions and Mortality in Spain: Reconceptualizing and Empirical Relationship', mimeo, University of Michigan.`

Wagstaff, Adam (1985), 'Time Series Analysis of the Relationship Between Unemployment and Mortality: A Survey of Econometric Critiques and Replications of Brenner's Studies', Social Science and Medicine, 21 (9), 985-96.

Wooldridge, Jeffrey (2009), "Introductory Econometrics, A Modern Approach". South-Western Cengage Learning.

www.workplace.gov.au