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Non-financial benefits of Higher Education

Analysis supporting Grattan's *Graduate Winners* report

James Savage & Andrew Norton

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This paper uses unit record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Families, Housing, Community Services and Indigenous Affairs (FaHCSIA) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper, however, are those of the authors and should not be attributed to either FaHCSIA or the Melbourne Institute.

This paper uses unit record data from the Australian Survey of Social Attitudes, a survey managed by the Australian National University and accessible through the Australian Data Archives. The findings and views reported in this paper, however, are those of the authors and should not be attributed to either the Australian National University or the Australian Data Archives.

Overview

This is the second technical report to *Graduate Winners*, outlining Grattan's research into the non-financial benefits that come from people going to university. We have used four data-sets to examine potential causal effects of university study on various non-financial benefits, including wellbeing, volunteering, civics, social distance and relationships, social aspects of job type, and private non-financial aspects of job type.

The main problem with estimating how much university changes graduates' behaviour, health, and wellbeing, is that people with certain characteristics are more likely to go to university in the first place. For example, this makes it difficult to check whether someone volunteers more because they went to university, or because their family encouraged them to both volunteer and go to university.

While the 'gold standard' of observational research is a *natural experiment,* we were unable to find any natural experiments that adequately described differences in education levels. Instead, we rely on regression techniques (to control for observable differences between survey respondents) and propensity score matching. This technique creates a control group (non-graduates) which is more similar to the treatment (graduate) group than those who did not go to university in the whole sample.

Our findings are that university probably improves longer-term self-reported health, potentially improves life satisfaction, improves some aspects of civic behaviour (through organisational membership), leads to the graduate having more friends, and increases volunteering rates. An interesting finding was that while university graduation predicts people holding more favourable views of people from different cultures *in general*, it tends not to predict more favourable views towards specific minority groups—especially aborigines and people from different religions. Another surprising finding was the relatively small number of factors which were strongly related to university attendance. While graduates experience and produce non-financial benefits, these are probably not as big as commonly thought.

In a way, these results are comforting: Australia, despite having only achieved high rates of tertiary education in recent decades, has long had a prosperous, law-abiding, civil society. Volunteer and community groups existed long before universal education, and the governments elected by our relatively uneducated predecessors were not systematically worse than governments elected in the age of the graduate. While tertiary education certainly produces some non-financial benefits, it is not necessary for their production.

The following table outlines the research question, the view of the literature, and our findings.

Non-financial benefit	Views in the literature	Grattan findings
Wellbeing and Happiness	There are few links between wellbeing and education in the literature. However, this may be due to cohort effects, with older graduates being a little less happy than older non-graduates, but younger graduates being happier than non-graduates.	We find a small correlation between education and life satisfaction for the General Social Survey, but no correlation in the other data-sets.
Volunteering	Most studies find very strong relationships between university education and volunteering, though few examine a causal effect.	In all our data-sets, graduates volunteer more, even after controlling for a range of factors. One method we use suggests that university may lead to higher volunteering rates.
Social Distance and Relationships	The consensus is that contact with other cultural groups—including through university—increases tolerance between groups.	Graduates are much more likely to display more tolerance to a general person from a different culture, though not a person from a specific culture. They are also likely to have more friends than similar non-graduates.
Civics	Causal estimates of the university effects on civic participation suggests that university causes higher voting rates, more political participation, and more acceptance of views contrary to the graduate's own. Graduates are also more likely to belong to civic groups.	Graduates are slightly more likely to belong to some civic groups—especially cultural, aid, or church groups—though no more likely to belong to a sports or charitable group. They are also more likely to be working in a job they consider useful to society. The civics effects are surprisingly small.
Health	Causal estimates suggest that university leads to graduates being less likely to start smoking, more likely to quit smoking, and less likely to be obese.	In all the data-sets used, we find strong effects of university on health and (decreased) BMI. We also consider the interaction between university and the proportion of the respondent's friends with the same amount of education. When this is included, university effects vanish, suggesting that there are strong group-norms effects.
Job Satisfaction	Several studies suggest that, among mature-age students, university improves job satisfaction. However, in a meta-study, the effects of additional education are found to be negative in certain industries.	Despite working in jobs with higher pay and better relationships both between employees and with management, holding a degree does not appear to improve job satisfaction. This may be a case of graduates living in a "fool's hell".

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1. Introduction

It is clear that many university graduates provide public benefits. Some of these are financial benefits, derived through productivity spillovers, higher wages for low-skilled workers, and higher tax revenues. Others are non-financial in nature; better-educated people may be more politically conscious, less xenophobic, or more willing to volunteer.

While the non-financial benefits of higher education are an important factor in deciding the optimal subsidy, thorough research into these non-financial benefits in Australia is virtually non-existent. While there has been some research on hot-topics, no broader studies have yet been done on this broader theme. This technical report aims to fill a part of this gap.

Grattan's approach to this research has been to examine four existing data-sets: the tenth wave of the survey of Household Income and Labour Dynamics in Australia (HILDA), the General Social Survey (2010), and the Australian Survey of Social Attitudes (AuSSA), both from 2005 and 2007. These data-sets contain observations of over forty thousand people, with questions on a variety of personal background variables (such as familial background, income, and occupation), and their views and actions on a large number of issues.

From these data-sets, we have extracted or constructed 107 variables describing whether participants behave or think in ways which could be broadly categorised as being in the public interest, or whether they experience non-financial private benefits. We then employ two statistical strategies designed to infer the causal impact of university attendance on the propensity to provide public benefits.

The research summarised in this report was conducted to support the accompanying paper *Graduate Winners*, which asks whether (under the HELP scheme) the private benefits of education are sufficiently large to induce university study regardless of the subsidy. This paper assesses the evidence for the proposition that universities cause non-financial benefits, both public and private.

Inherently, placing a value on non-financial benefits requires placing a numeric value on qualitative outcomes. In a theoretical sense, this could only be achieved by knowing society's preferences between various financial non-financial outcomes. As we do not know society's various indifference curves, we do not attempt to attach a dollar value to the non-financial benefits.

So what, then, is the point of examining how much university causes more non-financial benefits? The answer to this question has to do with the elasticity of tertiary study to subsidies.

If the sensitivity of tertiary study to the subsidy is high (meaning that an increase in the subsidy increases the number of students) then lower non-financial public returns are required to justify the subsidy. If, however, the elasticity of tertiary study to subsidies is low, then more non-financial public benefits are required to justify the subsidy. A key upside of the HELP scheme is that it makes it possible for people without the means to pay for education up-

front to study. That is, it reduces the price elasticity of demand for higher education.

We also consider non-financial *private* benefits to higher education. Again, we are interested in the degree to which the existence of non-financial benefits to higher education affect the optimal subsidy. The returns to education include all financial returns and non-financial returns, and so the greater the non-financial returns, the lower the optimal subsidy—it is not needed to induce more socially desirable behaviour.

A large problem in the literature on the returns to higher education is the existence of two biases. The first is selection bias: survey respondents may differ systematically from non-respondents. The second is omitted variables bias, which is when unobserved factors (like familial expectations or friendship group norms) may simultaneously cause university attendance and the provision of public benefits (like volunteering or less discrimination).

Because these biases exist, it is likely that the true causal effect of university education on public benefits provision cannot be estimated. However, there are several methods available to improve on a naive comparison of, say, volunteering rates of graduates and non-graduates. The first is regression using suitable controls. This method is likely to still suffer from both biases, however. The second is to employ a matching algorithm, which searches through the data and pairs observations which are most similar but differ in whether they went to university. Comparing volunteering rates between similar graduates and non-graduates is more likely than simple regression to reveal a causal effect of university education (although in the absence of a randomised-control trial, there are still likely to be biases in this approach). We employ both these strategies.

Another good strategy is in using *natural experiments* which effectively assign some people to a control group and others to a treatment group. A classic example is the strategy used by Card (1999), which used the distance from a four-year college (in the US) when the respondent was 17 as a treatment.[1] For those who lived closer to a college, continuing education after high school was effectively cheaper, and so distance to a university at 17 was able to predict (to an extent) whether the respondent went to university. Years later, when the surveys were done, the distance from a university at age 17 should have had little effect on earnings or political engagement other than through whether the respondent went to university.[2] Consequently, the *natural experiment* here could be used to gauge the causal impact of university education on earnings.

We have not employed a natural experiment strategy here. This is not because of a lack of will, but due more to a potential lack of natural experiments in the data. Two potential experiments (of the regression discontinuity design flavour) were in the reforms introduced in 1974 (introduction of free university education) and 1989 (introduction of HECS). However, in the data these did not provide significant explanatory power over university attendance to be worthwhile instruments. The Card (1999) strategy is unable to be replicated on the data-sets used in this study.

[1] Card (1999)
[2] Dee (2003)

2. Review of the literature

There are relatively few papers examining the causal effects of higher education on non-financial outcomes using Australia data. Most of the Australian studies reviewed below aim to explain given dependent variables (health, happiness, etc) using a variety of explanators, including education. As these studies use no strategies to identify the causal effect of education itself, the effects should not be interpreted as being causal.

2.1 Education and wellbeing

University students give up willingly three to six years of full-time paid employment, because they think that doing so will improve their wellbeing. They are (generally) right. As discussed thoroughly elsewhere, graduates earn quite a bit more.[3] However, it's also important to the decision of the potential student whether they will also be more satisfied, less likely to experience hardship, or happier. If wellbeing were entirely measurable in dollars, we'd presumably see more students eschewing university for careers in deep-sea welding.

The subjective welfare literature has examined links between different measures of wellbeing and education. The general finding is that direct relationships from university education to wellbeing, no-matter what the measure, are difficult to establish. However, graduates tend to earn more, have better personal and professional lives, and are healthier. These covariates tend to explain why graduates have better subjective wellbeing.

Graduates are also less likely to experience several stressors, like divorce, the death of a friend or relative, or being fired.[4] There are large selection effects in this sort of analysis, and so interpreting the relationships as causal could lead to over-confidence in the upsides of education. However, to the extent that university graduation *does* reduce life risks, it could be considered to cause an improvement in wellbeing.

2.1.1 Local evidence

There has been some research on the link between measures of wellbeing and education in Australia. The work that has been done points to an interesting (non-linear) relationship: older people tend to be happier, though older graduates tend to be less satisfied than older non-graduates. However, younger graduates are more satisfied than their non-graduate counterparts.[5] Due to the non-linearity of the relationships, studies using the HILDA data-set show negative relationships between education and happiness or life satisfaction, even without controlling for income and health.[6]

Another study, taking a panel-data approach to the Longitudinal Survey of Australian Youth,[7] found positive long-run effects of education on happiness, though still found that the effects of lower levels of education (such as certificate or diploma) were greater.

[3] See Weidmann and Norton (2012), and Card (1999)

[4] Grattan analysis of the General Social Survey, ABS (2010)
[5] See Gong, *et al.* (2011),
[6] Headey and Wooden (2004) and Hickson and Dockery (2008)
[7] Dockery (2010)

It should be noted that these studies examine the partial effect of completing (at least) an undergraduate degree on different measures of subjective wellbeing, normally controlling for other potential explanators of wellbeing. Even if there is little *partial* effect of completing a degree on wellbeing, this is not to say that graduating does not improve wellbeing. If income improves subjective wellbeing, and education causes higher income, then the expected wellbeing effect of education may be higher—just that if the graduate could increase their income by other means, the wellbeing effect would be similar.

2.1.2 International evidence

The field of subjective wellbeing has been extensively studied abroad, also. Perhaps the most important result is the so-called Easterlin paradox, which states that while richer people in a country tend to be happier, richer countries are not happier than less rich countries (once a basic level of material comfort has been reached), and while income has increased over time, happiness has not.[8] This suggests that at least some of measured subjective wellbeing is a positional good, in which case broader education (which raises incomes) may simply serve to redistribute rather than increase subjective wellbeing.

The results on Australian data are found also in a study using data from the Netherlands.[9] In that study, the authors find that vocational education is associated with larger wellbeing effects than university education. Contrasting results come from a Swedish study, in which university graduates tended to have more satisfaction with their professional lives, but less with their personal lives. [10]

Using the World Values Survey (which covers about fifty countries) another study finds small and insignificant correlations between various subjective wellbeing measures and education levels. [11] The author posits that perhaps the education effects education effects on wellbeing work through different channels — especially higher incomes, higher levels of participation, and better health outcomes.[12]

2.2 Education and volunteering

Volunteers tend to have more education than non-volunteers. This is true both in Australia and abroad. The literature on causal effects of university graduation on volunteering in Australia is, however, almost non-existent. As with wellbeing, most of the research which does address the relationship between education and volunteering does so only in passing. This is less the case in research from the US.

Drawing inference about the effects of education on volunteering in Australia based on studies in the US may lead to over-confidence of this particular externality of education. The university landscape in the US is considerably different to Australia's, and there are interesting interactions between (more prominent) religion and higher education there.[13]

[8] Easterlin (1995)
[9] Hartog and Oosterbeek (1998)
[10] Melin, *et al.* (2003)
[11] Helliwell (2003)
[12] Ibid.
[13] Campbell and Yonish (2003)

2.2.1 Local evidence

Despite there being considerable research into volunteering in Australia, there is little research into the causal effect of education on volunteering types, rates, or hours. As volunteering is crucially important to many of the community organisations that provide large financial and non-financial public benefits, this gap in the literature is conspicuous.

One study looking at volunteerism among *older adults* in Australia (using the General Social Survey) considers having a Bachelor or higher degree as an explanatory variable.[14] They do not find any statistically significant effects for education, income, or job status. But this doesn't seem to be the case for broader society.

Based on the General Social Survey, Andrew Leigh notes that "volunteering rates are highest among people with more formal education, in good health, and in more affluent households."[15] In the Grattan analysis discussed in section 6, we make similar findings.

2.2.2 International evidence

In the US there is a broader agreement that university education has a strong relationship with volunteering rates. This may be because the US has had higher rates of tertiary education for a longer period of time,[16] and so the sorts of non-graduate "good apples" in older Australian cohorts are actually graduates in the US.

Volunteers in the US are considerably more likely to have a degree, people with more than 13 years of education accounting for more than 60 per cent of all volunteers, and those with more than 16 years education accounting for a whole 38 per cent of volunteers.[17] "Education, the most commonly used measure of human capital, is perhaps the most reliable predictor of volunteer work."[18]

Wilson states that "education boosts volunteering because it heightens awareness of problems, increases empathy, and builds self-confidence."[19] He qualifies this, stating that while education predicts volunteering, the effects are stronger for the sorts of volunteering requiring organisational skills, like running meetings, but not other skills, like volunteer fire-fighting.

2.3 Education and Social Distance

Social Distance is a broad concept capturing the lack of connection between different groups of people. Here, we also consider the quality of relationships within groups. There are strong theoretical foundations for why education should reduce social distance — and conversely, why distance may cause low levels of education.

[14] Dolnicar and Randle (2007)
[15] Leigh (2011)
[16] Dolman (2007)
[17] Hayghe (1991)
[18] Wilson (1998)
[19] Wilson (2000)

In a seminal work, George Akerlof suggests that members of minorities can optimally under-educate themselves. This occurs because the people they are close to do not value education, and so there may be social costs to higher levels of education.[20] In this case, there may be a long-lasting cycle of social exclusion based on differing educational norms between groups (especially racial groups).

Working in the other direction is the so-called "contact theory", which suggests that people who are in more contact with different cultures are generally less prejudiced against those cultures. The overwhelming consensus is that contact does tend to reduce social distance.[21]

2.3.1 Local evidence

Increasingly, universities tend to be more culturally heterogeneous than broader society, in part due to the increasing global trade in education. If the contact theory holds in Australia, then the effects for new Australian students may not be similar to the effects from older Australian students (who went to university when it was more ethnically homogeneous)

Unfortunately, most of the research on the education effects on racism and social distance in Australia is quite old. As much has changed in Australian society since these studies were published, they may not have a great deal to say about the potential of university education to affect social distance.

The first of these, from 1983,[22] took students from three universities, one in Japan, another in Pakistan, and another in South Australia. The students (58 in Australia) were given questionnaires which covered the amount of contact they had with students from other cultures and also a list of social distance questions. This study found no contact effect—that is, students with greater amounts of contact with foreign students did not systematically differ in the social distance questionnaire. This study is unlikely to have broad implications for policy today, as universities have changed in composition, and as the study sample size was very small (and drew from only one Australian university in a relatively ethnically homogeneous part of Australia).

Another study, from 1993,[23] compared about 700 students, half domestic and half international, from a university in Western Australia, in terms of their contact with the other group and preferences for contact. In general, the study found that international students enjoyed contact with domestic students more than domestic students did contact with international students. Preferences differed, however, between disciplines and across different nationalities of international students, with greater mixing occurring in the humanities and economics, and with Singaporean students (who made up a large share of international enrolments at the time).

[20] Akerlof (1997)
[21] Pettigrew and Tropp (2006)
[22] O'Driscoll, *et al.* (1983)
[23] Nesdale and Toddâˆ— (1993)

2.3.2 International evidence

The global evidence is quite supportive of the contact theory. In a very large meta-analysis,[24] researchers examined 515 studies of intergroup contact, finding "that intergroup contact typically reduces intergroup prejudice."[25] However, the meta-analysis finds that the effect seems to be smaller for studies done on students.

Another study on attitudes towards immigrants in Western Europe[26] finds a small, statistically significant association between higher education levels and lower rates of ill-feeling towards immigrants. However, the education effect was dwarfed by the association with having even a single friend from an ethnic minority. Selection bias aside, this hints towards potentially large university effects of university education, especially if students are likely to form friendships with people from different backgrounds.

Narrower research, focusing more specifically on formal education, tends to support the notion of education as a tool to reduce social distance. In another older paper, based on 1984 US data, the researchers found that more formal education appeared to increase tolerance towards political minorities and homosexuals.[27]

2.4 Education and Civics

There is broad agreement that educated citizens are more likely to engage in what could be considered 'civic behaviour'. This may include staying up-to-date with political affairs, being more likely to vote (in countries where voting is not compulsory), or giving their time or expertise to organisations which provide broad public benefits.

There is a strong theoretical argument for why there may be civic externalities to education. There is a very strong correlation between education and democracy; indeed, few stable democracies exist in countries without relatively high levels of education. And students themselves have played crucial roles in the many democratic revolutions of the 20th and 21st centuries.[28] A potential causal channel is that a key part of education is the indoctrination of the political process: "One content standard listed by the State of California's Department of Education aspires that students *understand the obligations of civic-mindedness, including voting, being informed on civic issues, volunteering and performing public service, and serving in the military or alternative service*."[29]

A further complication occurs when people with low levels of skill and competence are asked or required to select people to run society. According to the well-known Dunning-Kreuger effect,[30] people with low amounts of skill are often poor judges of what highly skilled people look like. This makes uneducated people less likely to be able to recognise the best public officials (or public policy). Over time, this can lead to lower-quality public

[24] Pettigrew and Tropp (2006)
[25] Ibid. p 751
[26] McLaren (2003)
[27] Bobo and Licari (1989)
[28] Glaeser, *et al.* (2006)
[29] Ibid.
[30] Kruger and Dunning (1999)

policy, as series of second-best candidates and ideas come to dominate the political system.[31]

2.4.1 Local evidence

There is an overwhelming view among Australian researchers that "education shapes people as citizens",[32] and that governmental policy should be used to influence the process. As put by Simon Marginson, "there are also other institutions that do [shape people as citizens]...but none...are as open to governmental intervention".[33]

Unfortunately, there are not many quantitative studies on the civic returns to education in Australia. This may be due to the broader sociological and political-science disciplines in Australia being less quantitative than their US counterparts. However, a small amount of research into the question does exist.

In analysis of the Australian Survey of Social Attitudes 2003, researchers found that having a bachelor degree was quite strongly predictive of political activity (though was not a strong a predictor as belonging to a voluntary organisation). Considering only members of voluntary organisations, the researchers found that holding a university degree was a good predictor of higher levels of political activity.[34]

Using the Australian Survey of Social Attitudes 2005, researchers examined the role of various individual characteristics on a variety of measures of trust in government.[35] While 'trust in government' is certainly not the same as 'civic behaviour', differences between graduates and non-graduates are interesting. When presented with the propositions "Government doesn't care", and "We have no say about government", graduates were significantly less likely to agree than non-graduates. This should not be surprising. Affirmative responses to statements like these would indicate a sense of disenfranchisement, and graduates are unlikely to feel this way. However, when presented with the propositions "We cannot trust government", and "Politicians seek personal gain", graduates were slightly more likely to agree than non-graduates. If anything, this suggests that graduates are likely to be warier voters—a potential public non-financial benefit.

2.4.2 International evidence

The most broadly cited paper in the education-civics literature takes two different approaches to estimating the causal effect of university education on civics.[36] The research finds that additional education appears to cause higher rates of voting, newspaper readership, and support for free speech among politically-unpopular minorities (gays, communists, and religionists).

Another related paper examines whether the effects of education on civics are different among different groups.[37] The research finds that the civic returns to education appear to be higher among graduates who are less likely to attend university in the first place.

[31] Nagel (2010)
[32] Marginson (1997)
[33] Ibid. p5
[34] Gibson, *et al.* (2004)
[35] Bean and Denemark (2007)
[36] Dee (2003)
[37] Brand (2010)

In a large meta-analysis[38] of 142 social-trust studies and 268 social participation studies, the researchers find large and persistent correlations between higher education rates and both social trust and social participation. However, this was not a meta-analysis of studies analysing causal effects on universities, and so it confirms that indeed those with higher levels of education are more likely to display civic behaviour.

2.5 Education and health

Links between education and health are common across countries. Furthermore, the existing evidence (for men) suggests causal effects running from higher education to better health.

That a link exists between education and health is not surprising. There may be strong unobserved variable biases for both of these variables. Most likely, patient people are more suited to tertiary study and tend to eat and smoke less. Disentangling this bias is the role of a well-chosen Instrumental Variables estimator, discussed in section 5.2.1.

There are several plausible reasons why there may be a causal link from education to health. Perhaps education develops critical thinking skills, which can be better employed in making judgements about the likely health consequences of different actions. Or maybe completing a degree requires developing better self-control, in particular a lower discount rate, which helps people delay gratification by food, alcohol, or cigarettes. Another possibility still is that the sorts of networks formed at university encourage healthier group norms.

2.5.1 Local evidence

One way of thinking about how education may cause health is to consider how people generate their own health. *Technical efficiency* dictates the amount of health someone can generate given a given input. If education improves the technical efficiency of someone's health production, then graduates would be able to spend less per unit of health than non-graduates. *Allocative efficiency*, on the other hand, is the efficiency coming from the mixture of different factors used in producing health (food, gym, equipment, time, etc.). Education may affect allocative efficiency by improving the graduate's understanding of the returns to different health-improving activities (like diets versus exercise).

In Kennedy (2003), Australian and Canadian data were used to try to estimate the additional technical and allocative efficiency coming from education.[39] While the author holds back from making any causal claims (as a good instrument for education was not found), he found that indeed people from different educational backgrounds make use of various inputs—especially age and income—differently. This suggests that education *may* improve graduates' ability to combine various inputs to generate health. The paper also considers the effect of using smoking as a proxy for high rates of discounting. When used this way, the additional effect of education on health is uniformly reduced.

2.5.2 International evidence

The most convincing evidence for the positive influence of tertiary education on health makes use of the fact that going to college in

[38] Huang, *et al.* (2009)

[39] Kennedy (2003)

the US allowed conscript soldiers to escape being sent to Vietnam. However, the need to recruit so many conscripts ceased at the end of the war. Consequently, graduation rates for men born in the late 1940s are about 2 per cent higher than they would have been otherwise.[40] This means we can interpret the effect of education on the men who were induced to study by threat of the draft as causal.

Using this experiment, one study finds that both higher education enrolment and completion reduces the probability of becoming a smoker, reduces the probability of obesity, and may reduce the probability of diabetes and psychological distress.[41]

Another piece of research uses the risk of induction into the Vietnam war to instrument for varying levels of post high-school education.[42] Taking this approach, the paper concludes that it seems there is a causal link from education to lower rates of smoking. This is partly driven by lower take-up rates, and partly due to higher quitting rates.

While it seems indeed as though education caused higher rates of health among draft avoiders (especially by inducing lower smoking rates) we should take care in expecting similar results for an increase in the number of people with degrees today. Cultural norms in Australia are today very different from the late 1960s. Simply put, very few people smoke, graduates or not. If going to university improved graduates' health in the 1960s and 1970s because they were less likely to smoke, then, given all people smoke less today in Australia, we should expect the education effect on health to diminish for today's graduates.

2.6 Education and job satisfaction

A key reason students go to university is to improve the satisfaction they get from work. Some of this satisfaction comes from the thrill of making more money than the graduate would have otherwise. The remaining expected improvement in satisfaction comes from non-financial aspects, like working in a more pleasant environment, more perks, or more interesting work.

One of the little paradoxes of the returns to higher education is that cross-sectional surveys suggest the link between educational attainment and job satisfaction is nil, or maybe even negative. However, studies which look at the same person over time tend to find that individuals who become educated tend to become more satisfied with their work (and indeed, their life) as a result.[43]

2.6.1 Local evidence

The question of job satisfaction and educational attainment was addressed by some researchers at Monash University over the late 1980s.[44] They ran a survey asking 2384 former mature-aged students from sixty five higher educational institutions in Australia to reflect on their life, both before and after study. Some of the questions were objective, like former occupational level, while others were quite subjective, like quality of relationships. Mature-

[40] Card and Lemieux (2001)
[41] MacInnis (2008)
[42] De Walque (2007)
[43] See West and Hore (1989), and West and Hore ibid.
[44] West and Hore ibid.

aged students who did not finish their degree were also surveyed, to provide a control.

The study found that mature-aged graduates tended to self-assess as having improved on a variety of job satisfaction measures. However, the paper does not report the errors in the difference-in-differences, and so we cannot tell if the improvement for graduates is statistically different to the improvements for the non-graduates. Nevertheless, the research reports that mature-aged graduates do tend to have subjective improvements in their job prospects, the amount of stimulation they get from their work, the degree to which they find their work challenging, how important they find their work, how responsible they are in their work, and their overall happiness. On almost every measure, the self-assessed improvement is higher for graduates than for drop-outs.

2.6.2 International evidence

The Australian research discussed above was inspired, in part, by a similar study of mature-aged students in Wisconsin.[45] In this study, adult graduates of the University of Wisconsin were mailed questionnaires asking questions on the respondent's background, the reasons they went (back) to university, and how their work had changed since studying.

The study found that adult graduates experienced large improvements in their quality of work, and the status-related aspects of their jobs.

A mid-sized meta-analysis of 21 independent studies with a sample size of about 7000 employees (who provided educational details) found that higher education levels tended to be associated with varying levels of job satisfaction[46]. However, study results tended to differ according to the industry the study was performed on. Higher education among manufacturing workers was negatively correlated with job satisfaction in 11 studies. For non-manufacturing workers in the remaining 10 studies, there was no correlation between education attainment and job satisfaction.

These (conflicting) results suggest that there may be a strong selection effect among mature age students. The sorts of people who go back to tertiary study after 25 have a much higher opportunity cost of study (due simply to the increasing age-earnings profile among non-graduates). That they are willing to make a large sacrifice suggests they may place a larger value on status and job function (as well as academic achievement) than those who would never go to university.

2.7 Education and Crime

A key problem in analysing the link between university education and crime is that crime is strongly associated with low socioeconomic status. Many of the people who commit crimes are unlikely to go to university if some policy shift improves their access to it. Also, crime is a dynamic issue: it may not be today's criminals who we are able to affect by education, but the parents of tomorrow's. For these reasons, most of the existing link

[45] Mishler (1983)

[46] Brush, *et al.* (1987)

between crime and education has focussed on school education rather than university completion.

The main channel used to explain education's effect on crime is through an interpretation of Economic Theory of Crime, developed by Becker (1974). This theory suggests that criminals are, to an extent, rational—that crime increases where the returns are higher, and decreases when the probability of being caught increases or the punishment increases. "In these models, inequality leads to crime by placing low-income individuals who have low returns from market activity in proximity to high-income individuals who have things that are worth taking."[47] As income inequality is associated with educational inequality[48] (though especially at the school level), there is some prior reason to believe that formal education may reduce crime.

Another channel (within the Economic Theory paradigm) through which education could decrease crime is by increasing the student's patience, or by making them more aware of consequences, or improving their judgement of risk.[49] This is the same pathway argued above leading to other positive externalities, especially health. If university education works through this channel to affect health, it is not unreasonable to suggest it may affect crime likewise.

It is also possible that education may have the negative externality of increasing white-collar crime.[50] There is no prevailing consensus whether this is because education simply introduces criminally-minded people to positions from which crime can be committed, or whether it turns white-collar workers into criminals. While this could be an important externality from education, we do not discuss it further.

2.7.1 Local evidence

Evidence from Australia suggests that there are clear links between education and crime. However, the research done on this topic has focussed on school-completion as a measure of education, not university completion. As the main proposed channel for the causation—better labour-market outcomes among young men—is improved by higher education, university may decrease crime. As discussed before, however, the sorts of people dropping out of school and doing crime, facing bad labour-market outcomes, and resorting to crime are unlikely to go to university in the first place. Consequently, caution should be taken in giving these results external validity.

The crime/labour-market/education nexus in Australia has been researched quite thoroughly by Chapman *et al.* (2002). This research suggests there are strong links between dropping out of school and long-term unemployment for males, and strong links between long-term unemployment and property crime. The authors simulate several different policy setting, and report that based on their estimates of the links, an increase in school retention in NSW of 7000 males (to the end of senior high school) would reduce break-and-enter crime by 15 per cent.[51]

[47] Kelly (2000)
[48] Muller (2002)
[49] Lochner and Moretti (2002)
[50] Lochner (2004)
[51] Chapman, *et al.* (2002)

In earlier aggregative research, the author found only limited support that higher levels of education reduce crime.[52] Due to the highly aggregated measure of this research, and the fact the measure of education was the proportion of the adult population who had completed year 10 of schooling, these results are of limited use to the research question in this paper.

2.7.2 International evidence

More thorough research on the link between education and crime has been done abroad, including causal estimates using IV estimators. The broad consensus is that education does reduce crime, and the externalities (at least in the United States, which has higher levels of violent crime than Australia) are large. Again, most measures of education included in these analyses are school education, and so the results are of limited use to this analysis.

The United States allows individual states to set their own levels of compulsory schooling. These levels have changed considerably. This has resulted in a large degree of exogeneity in the amount of high-schooling had by the sorts of students who would simply stop going to school when it was no longer compulsory. The differences in amounts of schooling can consequently be interpreted (in medical jargon) as a treatment, or dose, and researchers can use Instrumental Variables to work out the causal effect of those additional years of education on the crime variable of interest.[53]

Research employing this identification strategy suggests that additional high-schooling does reduce crime.[54] This finding was invariant to the data-set used, suggesting the results are quite robust. The authors calculated that the social value of these externalities—especially in lower rates of murder and violent crime—were up to 26 per cent of the private returns to schooling. Almost all of the social returns to education estimated by reduced crime in this research come from reduced violent crime and murder.[55] As Australia has lower violent crime and murder rates, we should expect the positive externality of education on crime in Australia to be smaller.[56]

In a broader study of violent crime, analysing the determinants of crime across a variety of rich and poor countries, the level of educational attainment was not found to have much of a bearing on violent crime rates.[57] The authors speculated this was because education reduced the cost of committing crimes, or increased the rewards.

One study of different crime rates in counties across the US does include the proportion of the population with a college degree.[58] The paper does not instrument for education, meaning one cannot interpret the coefficients causally. However, across counties, there are robust negative correlations between college education and violent crimes, though also a positive relationship between

[52] Withers (1984)
[53] Lochner and Moretti (2002)
[54] Ibid.
[55] The authors estimate that increasing high-school completion rates by 1 per cent would reduce the social cost from murders by $1.1B (2002 USD), from assault by $368M, but all property crimes by only $52M.
[56] OECD (2009)
[57] Fajnzylber, *et al.* (2002)
[58] Kelly (2000)

college education and property crimes. The authors suggest that their evidence supports the proposition that income inequality does increase crime. To the extent that additional university education may can alter income inequality, it may reduce crime.

There is also an important intergenerational aspect to how education may affect crime levels: does educating someone to a higher lever reduce the probability their children or grandchildren do crime? One recent study claims to have found causal evidence to suggest this is the case.[59] Exploiting changes in Swedish education regulations in the 1960s, the research looks at crime rates of children of people who were likely to be affected by the reforms. It finds that an exogenous increase in the level of education of the parent is likely to reduce the amount of crime done by the child.

[59] Meghir, *et al.* (2011)

3. Description of data sources

To examine what sort of non-financial benefits exist due to higher education in Australia, we perform statistical analysis on four Australian data-sets. The data themselves are described in this section, the missing values strategy in section 4, the modelling strategy in section 5, and the results (and dependent variables) in section 6. All tables referenced in this section are at the end of the document.

3.1 HILDA

HILDA is a panel involving about twenty thousand people. It has followed most of these people since 2001, asking personal background questions, questions on views and feelings on a variety of issues, and questions on a large number of economic questions, including consumption patterns, personal finances, and work.

HILDA is able to be used as a cross-sectional study (examining the survey responses in a given 'wave') or as a panel (looking how people change over time). Our analysis here uses only the tenth wave of HILDA, and so examines the data as a cross-section. While our questions could be equally addressed using a panel-data approach, we have left this to future research.

The survey is managed jointly by the Melbourne Institute of Applied Economic and Social Research and the Department of Families, Housing, Community Services, and Indigenous Affairs (FaHCSIA). Those seeking to replicate the findings in this paper should apply to FaHCSIA to obtain access to the data.

3.1.1 Survey Methodology

HILDA is a geographically stratified survey, with respondents originally chosen from 488 areas in Australia. Generally, all eligible members of responding households undertake a face-to-face interview each year, though there is some attrition. Drop-outs are replaced each year with new participants. Unfortunately, the attrition in HILDA is not random: drop-outs tend to be young, single, born abroad or indigenous, or unskilled/unemployed. In the event a face-to-face interview cannot be arranged, follow-up interviews are pursued. In the case these are unsuccessful, the interview is done by telephone,

Each participant and participating household receives some compensation for taking part in the survey (responding to all questions may take several hours per year). While the compensation has changed over time, it now stands at $30 per person, plus a bonus $30 to the entire household if all eligible members are available for an interview.

3.1.2 Missing values

HILDA is a very large survey, and contains relatively many missing values. Missing values present serious issues for researchers, as they may bias the estimated relationships between variables. Our strategy for missing values interpolation is discussed more thoroughly in section 3.

3.1.3 Tables of variables

Table 8 contains all variables used in our analysis of the HILDA dataset. The first column *Variable Name* is the mnemonic we

have used in our regression programs, which are available upon request

The second column *Question* is the question asked in the HILDA survey. The third column *Possible responses* indicates the options available to respondents.

Table 9 contains all independent variables used in our analysis of the HILDA dataset

3.2 General Social Survey (GSS)

The General Social Survey is survey run by the Australian Bureau of Statistics, designed to measure various financial and non-financial facets of the community. The 2010 survey used here surveyed 15,028 households in non-remote areas of Australia. The survey is administered by face-to-face interviews. As the GSS is run by the Australian Bureau of Statistics, it has far fewer non-responses than either HILDA or the Australian Survey of Social Attitudes. It does not survey the same people repeatedly, and so is a pure cross-sectional survey.[60]

3.2.1 Survey Methodology

The GSS is able to be used as a survey of Australia or of the individual states. It is also designed to pick up as much disadvantage as possible. In keeping with these aims, the survey design is slightly atypical.

Each state has roughly the same number of households selected for inclusion in the survey (about 2000, after adjusting for different response rates in the different states). The ABS uses Census data to locate areas more likely to have particular disadvantages, and gives these areas a greater probability of being chosen. Inside each of these areas, dwellings are randomly chosen for participation.

Each chosen household is first sent a letter advising that they have been chosen for the survey, spelling out the importance of the survey and the confidentiality of the responses. The ABS then follows up with a phone call to organise an interview time. If the first interview cannot occur, a more senior interviewer follows up later on.

In each household, the responsible adult provides information about the members of the household and their relationship to one another. A randomly chosen member over 18 years old is then chosen for the interview. If this person is unable to be interviewed, another person in the household may answer on their behalf. The interviewer uses a computer-aided interview platform, in order to minimise potential errors.

3.2.2 Missing values

Due to the interviewing technique used and the smaller scope of the questions (relative to HILDA), missing values are less of a problem in the GSS. The ‘complete case’ proportion—that is, the proportion of all observations in the unit record data without any missing values whatsoever—is about 85 per cent.

[60] ABS (2011)

3.2.3 Tables of variables

.Table 10 and Table 11 contain all dependent and independent variables used in our analysis of the GSS.

It should be noted that for the GSS, most variables were rescaled, so that larger numbers represent more favourable outcomes. The values reported in these tables indicate the responses for the raw data. The results tables in section 6 make clear which variables have been rescaled

3.3 AuSSA

The Australian Survey of Social Attitudes (AuSSA) is a biennial survey designed to gauge public attitudes on a variety of (primarily non-financial) topics. It is a mail-based survey, and so has lower response rates than both the HILDA survey and GSS. It also polls fewer people. Nevertheless, it collects information on a variety of topics which are not explored in any deep way by the other surveys. It is used in this study for two purposes: first, it replicates some of the important question from HILDA and the GSS (like quality of life or happiness); and second, it asks important questions not asked by the other surveys—especially regarding group membership, social distance, and non-financial aspects of work.

We use both the AuSSA 2005 and 2007 data-sets. The survey allows researchers to purchase questions; this means the survey from any two years does not necessarily cover the same material. By using both surveys, we are able to address areas not covered by any one of the releases.

3.3.1 Survey Methodology

The two AuSSA surveys used have slightly different survey methodologies.

The AuSSA 2005 was a mail-out survey, sent to 10,000 households stratified by state. The package included a letter of introduction, instructions on completing the survey, and the survey itself. Using this method, the survey had a response rate of 39 per cent. There were two variants of the survey, which included the same core questions, but different additional questions. This design was necessary as the entire survey asks almost 500 questions.

The AuSSA 2007 was mailed out to 20,000 potential participants, drawn at random from the Australian Electoral Roll. The survey took a different approach to the 2005 mail-out, first sending a letter informing participants they had been selected, then sending the survey itself, then a reminder/thank you postcard, then, failing a response, another survey, then another reminder/thank you postcard. This increased the response rate to 42 per cent. The 2007 survey had three variants, again with the same core questions and separate additional questions.

3.3.2 Missing values

Due to the large number of questions and the fact the AuSSA had multiple variants, both surveys contain substantial missing values. Most of the missing values are dependent variables, however. This means that most estimated equations in section 6 are not estimated on the whole data-set. Missing values were less of a

problem for independent variables. The missing values imputation strategy used here is outlined in section 6.

3.3.3 Tables of variables

Table 12, Table 13, Table 14, and Table 15 contain all dependent and independent variables used in our analysis of the two AuSSA data-sets.

4. Missing values strategy

4.1 Why are missing values a problem?

When survey respondents skip a question or refuse to answer, they create a problem for researchers. This is because standard regression techniques generate a "predicted value" by summing the products of the independent values and their estimated coefficients. For example, let's say the following model predicts BMI using income (in thousands of dollars) and distance from work (in km):

BMI = 22 + 0.3*distance from work – 0.05 * income.

In this case, what should be the expected BMI for someone who refuses to disclose their income? We can't treat it as 0, as this would almost certainly over-estimate their BMI. Our choice of the interpolation method for missing values is the method we choose to fill this in.

In cases like this, it matters what process is generating the missing values: are people randomly skipping questions, or censoring themselves for other reasons? Under the first case, missing values do not affect the estimated parameters or their standard errors. If, however, the process generating the missing data is itself due to the questions being asked, then inference drawn from the data is biased—that is, it is systematically wrong.

In cases where missing values are not missing at random, there becomes a need to "fill in" the missing values with a measure least likely to bias the estimated coefficients. Popular methods include mean-value interpolation, and modelled value interpolation.

Under mean or median value interpolation, missing values are replaced with the mean or median value of the variable. So if someone omits their income, then we fill in their income with the average income for all respondents. While simple (and frequently used) this method can induce errors.[61]

We prefer to model each of the independent variables in turn using the Random Forest algorithm. This is described below.

4.2 Random forest interpolation

The Random Forest method[62] is a popular algorithm used to predict outcomes based on a set of inputs. As it is extremely powerful[63] and easy to implement, we use it to model the missing values in our datasets. The premise behind wanting to model these missing values is that we do not believe the missing values are missing entirely at random, and that the variables which the respondent *does* fill in may give us some idea about what the missing values are likely to be.

On a conceptual level, the Random Forest algorithm works like so: it builds hundreds of models using (different) randomly chosen subsets of the main data. Each of these models then has a "vote" on every value of the outcome variable. Where the outcome variable is categorical ("blue", "pink", "green"), it takes the mode of

[61] As discussed in Gelman and Hill (2007)
[62] Liaw and Wiener (2002)
[63] For example, the winning entry in the 2012 EMC Data Science Global Hackathon used a naïve Random Forest.

the votes and returns the winner; for continuous variables, it returns the mean of the votes. In terms of predictive power, the Random Forest algorithm is more accurate than most other supervised learning methods. [64]

The two following sections describe the inner workings of the method.

4.2.1 Regression trees

At the core of the Random Forest procedure are many smaller models, called Classification and Regression Trees (CARTs). These are decision trees, which sort variables into "leaves" depending on characteristics given by the independent variables. The aim is to sort the variables in such a way that minimises the differences between the dependent variables (impurity) for the observations in the leaves.

For example, let's say we have a thousand respondents and we want to group them into "single", "married", "divorced", and so on. For each of these people, we know their age, education, gender, and height. A regression tree estimates thresholds for any of these independent variables (for example, is the respondent taller than 154cm?), and sends all the people who meet the threshold down a particular branch; likewise all those who do not meet the threshold go down another branch. This process is continued until no sensible improvement in the purity of the leaves can be had by defining more thresholds.

Formally, let's say there are N different categories the dependent variable can take. The proportion of the total sample which is category i is denoted p_i. Let the group at any point in the tree have its impurity defined as

$$\Sigma_i^N -p_i * \ln(p_i)$$

Where Σ_i^N sums the proceeding terms for all values of i. This measure of impurity is known as a *Gini index*; it is equal to 0 when all observations are of the same type, and ln(N) when there are an equal number of each type in the sample. All other mixtures have values between these two extremes.

The CART algorithm works by sorting the entire sample by each independent variable (smallest to largest) in turn, then calculating the impurity which would result from splitting the dependent variable so that all the observations above the split go down one branch, and the rest go down another. The threshold value which is finally chosen is the one that maximises the decrease in impurity of the (split) samples. The process is repeated again, until no further improvements to purity can be made.

It is possible to attach some "cost" to defining a model which misclassifies observations as, say, being "divorced" when they're actually "married", or one with too many branches (which is likely to perform badly at predicting outcomes in new observations). The algorithm then simply weighs this cost against the improvement in impurity which would result from the split. If the cost is too high, the split is not made.

For some new observation (say, a 32 year old male who is 176cm tall and earns $45k), we can ask which branches to send it down.

[64] Caruana and Niculescu-Mizil (2006)

When the observation arrives at the final destination—the leaf—the tree predicts its value as either the mode or the average of the other observations that arrive in the same leaf.

4.2.2 Random forest

The Random Forest algorithm simply grows some specified number of CARTs (we use 300), by randomly sampling both the independent variables and the observations included. This means that no single tree is estimated on all the observations or on all independent variables, reducing the prospect of any particular observations or variables having too great a say in the value of the outcome variable.

Each of the newly-constructed CARTs then votes on the outcome value for each observation. The mode or the mean of the predictions for every CART is then calculated, and this value becomes the predicted value for the observation.

As each of the underlying CARTs is not constrained by assumptions of linearity, or limited in the number of interactions between independent variables, a Random Forest suffers from fewer of the problems than a standard regression model. As such, it is a useful tool for imputing missing values.

4.2.3 Putting it all together to impute missing values

To impute the missing values in each of the data-sets discussed above, we use the *rfImpute* function in R's *randomForest* library.[65] The method works by firstly filling in all NAs with the mean or modal value for each independent value. All observations are then fed through every decision tree in the forest. For each tree, if two observations end up in the same leaf, then the two observations are said to be proximate to one another, and their "proximity score" increases by one. The sum of two values' proximities (for all trees) divided by the number of trees is the normalised proximity score.

The formerly missing values are then updated to the weighted average of the each variable, where the weights are the (normalised) proximity scores. This drags the formerly missing values towards the values in observations which are most similar. The whole process is repeated a number of times (we do it three times).

Quite clearly, the dependent variable used in this interpolation process has an important role to play. Ideally, we want to use a dependent variable which will be able to be predicted reasonably well by the independent variables *and* which has a small number of missing values itself. We argue that *Shibboleth* variables (such as belief in marijuana legalisation or gay marriage) are suitable, as different and demographic and cultural groups are likely to disagree about the dependent variable. Self-assessed health and life satisfaction variables are also likely to be useful, as these measures differ across ages, genders, and backgrounds. For the AuSSA 2005, we use belief in marijuana legalisation. For AuSSA 2007, we use the degree of political support for chosen party. For the GSS, we use self-assessed health. Finally, for the HILDA, we use a measure of life satisfaction.

[65] Liaw and Wiener (2002)

5. Model strategies

5.1 Regression models

The modelling strategy we have used for each dataset differs according to the data type of the dependent variable. In general, we have used ordinary least squares for all continuous dependent variables, generalised least squares (probit) for all binary dependent variables, and Bayesian ordered logit regression for all ordered categorical variables.

5.2 The aim and impossibility of causal inference

We are interested primarily in estimating the causal effect of university attendance on non-financial public and private returns. Unfortunately, we cannot run an experiment randomly assigning people to education or barring them from education, and so a true 'treatment' effect of university education is difficult (or perhaps impossible) to estimate. The main problem is that there are certainly many unmeasured or unmeasurable variables which cause someone to go to university and also cause positive non-financial outcomes. Consequently, some of the estimated "treatment effect" of university on our data is highly likely to reflect the actual "treatment effect" of having high familial expectations, or academic friends (to name just a few potential unobserved confounders).

To obtain a better estimate of the treatment effect, we need to control as much as possible for these omitted variables. Two popular approaches to dealing with this issue are *Instrumental variables* and *propensity score matching*.

5.2.1 Instrumental Variables

As discussed in section 2 above, instrumental variables (IV) is a popular approach in the literature on the effects of education. The central idea is to identify a portion of true exogeneity in the level of education of different people. This can be conceptualised intuitively as a *natural experiment,* under which some geographic or historical feature assigns some people to higher (treatment) and lower (control) education groups. The validity of the natural experiment is dependent on three factors:

1. Participants should not be able to choose whether they are in the control or the treatment, and the treatment group should not differ systematically from the control group (other than the amount of education they receive).

2. The treatment should provide some predictive power over the level of education each participant gains.

3. The so-called "exclusion restriction". This simply means that we don't expect that the treatment has any effect on the dependent variable other than through its effect on the key independent variable. In the case of the Card (1999) study, this means that we do not expect the distance to university at 17 has any effect on adult earnings other than through its effect on higher education.

The third condition is unable to be tested empirically. This is because there may be unobserved characteristics which differ between the control and treatment. In this case, the researcher should rely on theoretical arguments or common sense to justify the experiment—that is, we should have a good understanding

before the experiment why it is highly unlikely that unobserved confounders differ between treatment and control.

The method of IV can be implemented easily by the method of two stage least squares. This can be explained using the Card example.[66] Say we are explaining how much university education affects earnings, and we have a set of controls (presumably age, race, local average earnings, rural, family background, etc.). We also have an experiment: how far did the respondent live from a university when they were in their last year of school?

In the first stage, we run a linear model predicting whether the respondent went to university, based on all of the independent variables *and* the 'instrument'—in this case, the distance from a university in their last year of school. From this first regression, we save the predicted probability of each respondent attending university based on their individual characteristics. It should be noted that using a generalised linear model (like probit) in the first stage is not recommended.[67]

The second regression tries to predict the respondent's earnings, based on the independent variables *and* the predicted probability of the respondent going to university (which was saved after the first regression). The coefficient estimate on the predicted university attendance then has the interpretation of the *causal* effect of university on earnings.

Instrumental variables are in many cases susceptible to (valid) criticism. In the example above, differences in the university attendance between people who lived varying distances from university may be driven by other factors. For instance, perhaps parents who value education (and higher earnings or civic behaviour) choose to move closer to universities to enhance their children's life options. Or perhaps universities tend to locate themselves close to already affluent populations, where people may be more likely to want an education (and higher earnings). In these cases, there are essentially unobservable characteristics which differ between the treatment and control groups which plausibly explain both university attendance and later earnings. If we give weight to the probability that unobserved characteristics differ between control and treatment, then the coefficient estimate on predicted university attendance (in the second-stage regression) loses its causal interpretation.

Another identification technique is to use Regression Discontinuity Design (RDD), in which the treatment is given to respondents who fall on one side of an arbitrary threshold. By comparing those who fall on one side of an arbitrary threshold, with those on the other, we may be able to infer a causal effect from the treatment. As in the case above, it is important that respondents cannot choose whether they fall into the treatment or control. This approach is frequently used with birth dates, which provide plausible exogeneity for a number of measures.[68]

In our research, we experimented with two potential instruments, which were ultimately unsuccessful. They are reported here not because they were successful, but precisely because they failed

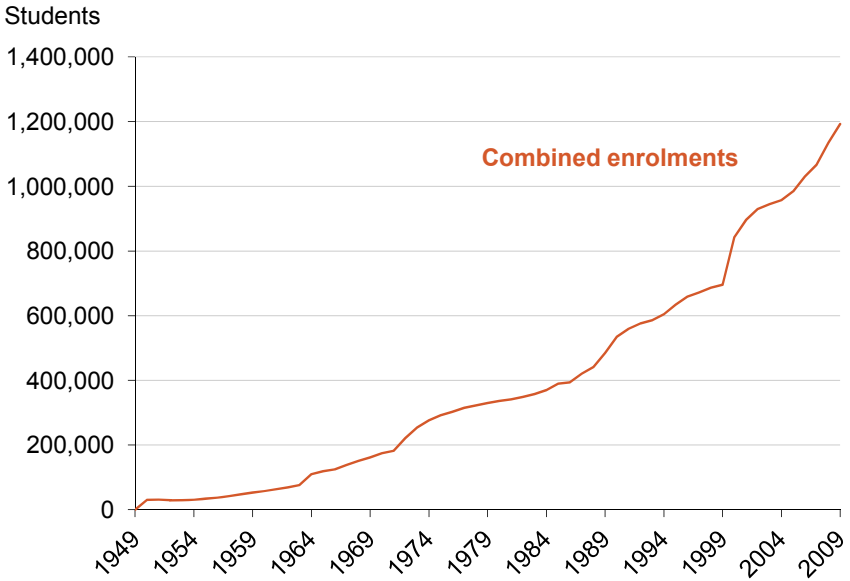
[66] Card (1999)
[67] For further discussion, see Angrist and Pischke (2009), p 190.
[68] For example, see Angrist and Krueger (1990) (which uses quarter of birth as an instrument) or Venkataramani (2010), which finds that large-scale malaria eradication efforts in Mexico led to improved cognition among children.

(despite there being some—admittedly circumstantial—argument that they should be useful). We examined discontinuity in the university completion rates of school-completers who matriculated shortly before and shortly after two significant reforms in Australian higher education: the introduction of free university education in 1974 and the introduction of HECS in 1989 (this itself was proxied by birth-year). In the AuSSA 2005 data-set, we did find that the 1974 reforms were positively correlated with increased rates of university attendance. However, this correlation not present in either the AuSSA 2007 or HILDA (wave 10).

There are some good reasons the 1974 and 1989 reforms may not be quality instruments for university attendance. While the popular perception is that these reforms begot large increases in student numbers, the real picture is somewhat muddier. This is illustrated in Figure 1 below. Based on enrolment numbers before and after the two reforms, we should not expect large discontinuities in proportion of school-leavers holding degrees.

Unfortunately, the distance-to-university-at-17 instrument is not viable in the data-sets used for this analysis (as it is not asked). Even if it were able to be deduced from these data-sets, we believe the distance from university is likely to contain unobserved information in Australia, and so the instrument is unlikely to be a high quality one.

Figure 1: Total university enrolments 1949-2009[69]



5.2.2 Propensity score matching

When there are few sources of plausible exogeneity available in the survey, we need to find other methods of estimating the

[69] The numbers presented in Figure 1: Total university enrolments 1949-2009 are solely for universities between 1949-64. Later, the data include Colleges of Advances Education (1965-1989), include government and non-government teachers' colleges (from 1973 and 1974 respectively) and progressively include state-funded nursing courses from 1985 to 1993. From 2001, figures include full-year enrolments; before then the figures include enrolments at March 31. Data compiled from DEEWR (2000), DEEWR (2001-2010).

causal effect of university on certain behaviours or beliefs. One method is to match observations based on the degree to which their observed characteristics predict whether they will be in the treatment group, and ignore unmatched observations. The researcher then estimates the treatment effect for this restricted (matched) sample.

In our case, we want to find people who, based on their survey responses, we think went to university. Among this group, we match those who did go to university against those who did not, and discard the unmatched observations. This means that we create a control group who are more similar to the university graduates than the original control group (at least in terms of observable characteristics). Estimating the treatment effect of university attendance in this subsample should result in an estimate closer to the true causal effect of university on non-financial benefits than vanilla regression alone.

So why should throwing out unmatched observations improve the causal estimate? The reasoning for this claim is that we may believe one or both of two things:

1. That there is a selection bias in treatment: those who go to university may be more civically minded, have higher ability, etc. If this is the case, the original control group may not be suitable for comparison with graduates.

2. That the unobservable omitted variables are correlated with several of our independent variables. This makes it especially likely that we will ignore observations of people who are not only dissimilar to graduates in terms of their observable characteristics but also their unobservable characteristics.

In our estimates in section 6 below, we present coefficient estimates both for the unrestricted data-sets, and data-sets matched by propensity score matching. Propensity score matching works by first using the independent variables to determine whether someone was likely to go to university (we use a probit model for all data-sets). We then take the predicted values for each observation (expressed as X'B; that is the value going to the link function). We then use the 'matching' function in the ARM package in R[70] to prepare an index of matches, and use these matches to subset the whole data-set.

As expected, the estimated treatment effects are almost universally lower for regressions run on the restricted data-sets than the treatment effects estimated on the whole sample. This suggests that those who are likely to go to university (whether they go to university or not) are already more likely to provide or experience non-financial benefits. These results are presented in section 6.

5.2.3 Bad controls and partial effects

When aiming to estimate the causal effect of education on a variety of dependent variables, we face a potentially large issue: including bad controls. Bad controls are those which are potentially caused by the independent variable of interest (education, in this case). Education probably affects income, marital status, partner education level, whether the respondent

[70] Gelman, *et al.* ; Team

lives in the city or country, and the number of children. Consequently, including these independent variables in the regression equations affects the causal interpretation of the coefficient estimate on education. To see why, suppose education increases income, and income increases donations. Then someone randomly assigned to receive more education would be expected to donate more—even if the coefficient estimate on education was zero. But by eliminating income from the equation, then the coefficient on education would not be zero (as graduates earn more and therefore donate more).

When the researcher has a relevant and valid instrument, then they can exclude these bad control variables and still consistently estimate the causal effect of university. However, we do not have a good instrument for education, and so removing these bad controls from our regressions would induce omitted variables bias with certainty. Moreover, it is not clear in which direction the bias would run: if high income earners without a university education systematically donate less than graduates, then the "causal" effect estimated would be upwardly biased, and *vice versa*.

While we are aware of the issue, our compromise is to include these bad controls, and instead interpret the coefficient estimates on education as being our estimates of the partial causal effect of graduation. That is, for two people of the same marital status, income, etc., but with one holding a degree and the other not, the coefficient estimate on education is the expected difference between the graduate and non-graduate. If we had a good instrument, these bad controls would be excluded from the analysis.

5.2.4 A quick note on practical significance

In general, the analysis in section 6 is concerned with whether university education can be practically expected to have much of an effect on the sort of non-financial benefits provided by or enjoyed by graduates. Here, statistical significance is unlikely to be a superb guide on whether university effects are (normally) large—which is what we are concerned with. We are asking: *would a betting man reckon there are effects of going to university?* From this perspective, a large but relatively imprecise (and perhaps statistically insignificant) estimate of the treatment effect may be very important from a policy perspective. Likewise, a very small (but significant) result may as well be zero for the intents and purposes of policy.[71]

The Betting Man and public policy research

Let's say you have the choice between two medicines, whose efficacy has been the subject of a clinical trial involving a large number of participants. The first medicine improves the condition with probability 0.01 and standard error 0.001—this is a highly statistically significant result. The second medicine improves the condition with probability 0.3, but a standard deviation of 0.2—the result is not statistically significant at the 95 per cent confidence interval. Which medicine would you take? Invoking the *betting man* is useful here.

When analysing policy using statistical modelling, it is sensible to distinguish practically insignificant and practically significant

[71] For an entertaining treatment of this subject matter, consult Ziliak and McCloskey (2008)

results. Just as a betting man does not need 19-1 odds (a 95 per cent confidence interval) to place a sensible bet on a football game, neither is statistical significance an overly convincing necessary condition for making evidence-based policy. As put by Deidre McKloskey:

"If someone called "Help, help!" in a faint voice, in the midst of lots of noise, so that at the 1% level of significance (the satisfactorily low probability that you will be embarrassed by a false alarm) it could be that she's saying "Kelp, kelp!" (which arose perhaps because she was in a heated argument about a word proposed in a game of Scrabble), you wouldn't go to her rescue?"[72]

While naturally deciding on whether something is practically significant is subjective, there are tools to help with the process. Consider: what is the utility cost of making policy based on a false positive versus the utility cost of making policy based on a false negative? By specifying a loss function this way—either formally or informally—the job of deciding on whether something is practically significant or not loses some subjectivity.

5.3 Models

Our modelling strategy was to start with simple models, and where interesting or counter-intuitive results turned up, build slightly more complex models. Due to the large number of dependent variables in our analysis, we were unable to build extremely complex models. When these models returned interesting results, we checked a number of possible interactions between independent variables, discussed in section 6. Finally, where we believed the results were being driven by unobserved heterogeneity between graduates from different disciplines (for example, are higher graduate civics rates driven by Teachers and Nurses?), we used mixed-effects variants of the models below. Mixed-effects models allow graduates from different disciplines to have separate intercept and slope terms.

Below are outlined the basic models used for analysis of the HILDA, GSS, and AuSSA data-sets. All the data series used are either the series described in section 3, or simple transformations of those variables.

5.3.1 HILDA

The HILDA data come in continuous, binary, and ordered forms. For the continuous dependent variables, we used:

$$\begin{aligned}\text{Dep var} = \beta_0 + \beta 1 \ \ \text{uni} \ + \beta_2 \text{postgrad} \ + \beta_3 \text{male} \\ + \ \beta_4 \text{country.birth1} + \ \beta_5 \text{Market.income} \\ + \ \beta_6 \text{HH.net.income} + \beta_7 \text{Age} \ + \ \beta_8 \text{Mother.edu1} \\ + \ \beta_9 \text{Father.edu1} \ + \ \beta_{10} \text{Number.children} \\ + \ \beta_{11} \text{HS.level} \ + \ \beta_{12} \text{Married}\end{aligned}$$

Where *uni* is an indicator which includes all university-levels of education; *postgrad* is an indicator for any post-graduate study, *male* is an indicator for being male; *country.birth1* is an indicator for being born in Australia, NZ, the US or UK; *Market.income* is the top end of the bucket for personal (private) income; *HH.net.income* is the top end of the bucket for household income, *Age* is the respondent's age when answering the survey; *Mother.edu1* is an indicator for whether the respondent's mother did any study after high school; *Father.edu1* is the equivalent for

[72] McCloskey (2005)

the respondent's father; *Number.children* is the number of children had by the respondent; *HS.level* is the respondent's level of high schooling; and *Married* is the respondent's marital status. The β values are estimated coefficients.

For the binary dependent variables, we used Probit models. Probit models make use of a (cumulative standard normal) *link function* which maps a linear projection of the independent variables onto the interval (0,1). Where $\Phi(\mu)$ is the cumulative normal distribution, we write the model as so:

$$\begin{aligned}\Pr(\text{Binary Dep var}) &= \Phi(\beta_0 + \beta_1 \text{uni} + \beta_2 \text{postgrad} + \beta_3 \text{male} \\ &+ \beta_4 \text{country.birth1} + \beta_5 \text{Market.income} \\ &+ \beta_6 \text{HH.net.income} + \beta_7 \text{Age} + \beta_8 \text{Mother.edu1} \\ &+ \beta_9 \text{Father.edu1} + \beta_{10} \text{Number.children} \\ &+ \beta_{11} \text{HS.level} + \beta_{12} \text{Married})\end{aligned}$$

An intuitive explanation of this sort of model (and how the parameters can be read) is given in section 6.2.

Finally, ordered categorical dependent variables (Likert scale) were modelled with an ordered Logit model. This model returns both a set of β estimates for matrix of independent variables used above, *X*, and a set of thresholds or *cut points*, c_i. Where Logit^{-1} is the inverse of the logistic distribution, *y* is the outcome, and there are N ordered categories, the model can be written:

$$\begin{aligned}\Pr(y > 1) &= \text{Logit}^{-1}(X\beta) \\ \Pr(y > 2) &= \text{Logit}^{-1}(X\beta - c_2) \\ \Pr(y > 3) &= \text{Logit}^{-1}(X\beta - c_3) \\ &\vdots \\ \Pr(y > N - 1) &= \text{Logit}^{-1}(X\beta - c_{N-1})\end{aligned}$$

5.3.2 GSS

The dependent variables used from the GSS also come in linear, binary, and ordered form. The linear model takes:

$$\begin{aligned}\text{Dep var} = \beta_0 + \beta_1 \text{HighestEduLevel} + \beta_2 \text{PropFriendsSameEdu} \\ + \beta_3 \text{Postgrad} + \beta_4 \text{Age} + \beta_5 \text{Sex} + \beta_6 \text{Married} \\ + \beta_7 \text{DepChilInHouse} + \beta_8 \text{ForeignCountries} \\ + \beta_9 \text{HousholdIncDec} + \beta_{10} \text{SchoolHighLevel}\end{aligned}$$

Where *HighestEduLevel* is an indicator for any university study; *PropFriendsSameEdu* is a four-pointed scale (on 0-1) indicating the proportion of close friends that have the same education level as the respondent; *Postgrad* is an indicator for postgraduate study; *Age* is age; *Sex* is an indicator for male; *Married* is the respondent's marital status; *DepChilInHouse* is the number of dependent children that live in the respondent's house; *ForeignCountries* is an indicator for whether the respondent was not born in Australia or another English-speaking country; *HousholdIncDec* is the household's income decile; and *SchoolHighLevel* is an indicator for whether the respondent finished high school.

For binary dependent variables, again we used the Probit model, with

$$\begin{aligned}\text{pr(Dep var)} = \Phi(\beta_0 + \beta_1 \text{HighestEduLevel} \\ + \beta_2 \text{PropFriendsSameEdu} + \beta_3 \text{Postgrad} + \beta_4 \text{Age} \\ + \beta_5 \text{Sex} + \beta_6 \text{Married} + \beta_7 \text{DepChilInHouse} \\ + \beta_8 \text{ForeignCountries} + \beta_9 \text{HousholdIncDec} \\ + \beta_{10} \text{SchoolHighLevel})\end{aligned}$$

For ordered categorical variables, the specification used was the same as for HILDA.

5.3.3 AuSSA 2005 and 2007

For analyses of the AuSSA 2005 and 2007 data-sets, we used only ordered logistic regressions of the type described above.

The independent variables used for AuSSA 2005 were *edu_highest=="Bachelor"*, an indicator for whether the respondent's highest level of education was a bachelor; *edu_highest=="Postgrad",* an indicator for whether the respondent had a postgraduate degree or diploma; *hs*, the respondent's level of high-schooling; *partner_hs*, the respondent's partner's level of high schooling (if applicable); *partner_edu*, the respondent's partner's level of post-school education; *house_own*, the respondent's home-ownership status; *birth_year*, the respondent's birth year; *city_country*, describing what sort of city or town the respondent lived in; *marital*, the respondent's marital status; *secondary_schooltype*, the respondent's secondary school type; *male* if the respondent was male; *irreligious* if the respondent replied "no" to the question "do you have a religion?"; *birth_foreign* if the respondent was born outside Australia; *status*, where the respondent placed themselves on a scale from 1-10 within society; *income*, the (log of the) top of the bucket for the respondent's income; and *income_hh*, the (log of the) top of the bucket for the respondent's household's income.

The independent variables used for AuSSA 2007 were *edu.highest=="Bachelor"* indicating whether the respondent's highest education level was bachelor; *edu.highest=="Postgrad",* for postgraduate level; *activity.lastweek*, a factor describing what

the respondent was doing the week before the survey; *status* is a scale indicating where the respondent considers themselves within society; *birth.australia* indicates if they were born in Australia; *marital*, the respondent's marital status; *city.country*, the city or town type live in; *religious*, if the respondent identified as having a religion; *income,* the (log of the) top of the income bucket for the respondent; *income.hh*, the (log of the) top of the income bucket for the household; *partner.edu*, the respondent's partner's education level; *gender,* an indicator for whether the respondent was male; *hs,* the respondent's highest level of high-school education; and *Age,* the respondent's age.

6. Results of statistical analysis

6.1 Summary

This section summarises the findings of the models discussed in the preceding sections. For this analysis, we ran over 200 regression models of the forms described above. Here, we report only the coefficient estimates for bachelor-level studies, with a brief discussion of the practical significance of the coefficient estimate from a policy perspective. Those wanting the full regression output should contact the Grattan Institute.

For each variable type, we report the coefficient estimates on bachelor-level education estimated both on the complete data-set (that is, all the complete-case observations for each dependent variable after missing-values interpolation) and the data-set restricted by the propensity score matching algorithm described in Section 5.2.2. We believe that the estimates in the restricted data-set are more likely to be closer to the true causal effects of university. However, these estimates are estimated on far fewer observations, with the result that we are less certain about the precision of the estimate.

6.2 Interpreting the output

For each of the themes below, we present a table summarising the various coefficient estimates on the variable "has a bachelor degree". The meaning of this estimate depends on the dependent variable and the model type.

The column "Positive or negative is better?" tells us whether a positive or a negative coefficient estimate would correspond to greater non-financial benefits coming from a university education. The reason for this is that some dependent variables are ordered so that "strongly agree" is the first response, while others have "strongly disagree" as the first response.

The column "Model Type" tells us how we should interpret the coefficient estimates. The simplest case is when the model is linear. In this type of model, the coefficient estimate is the expected change in the dependent variable due to the respondent holding a university degree, with all other variables held equal.

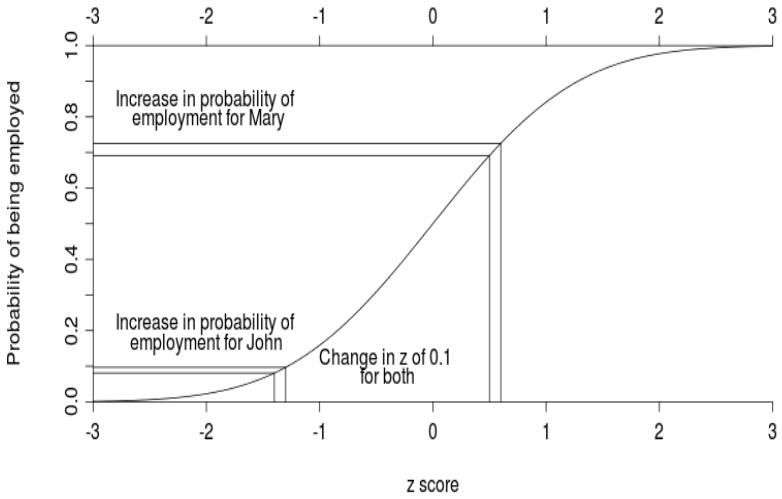
In the binary probit models and ordered logit models, however, the estimate loses this neat interpretation. In these models, the coefficient estimates correspond to the expected change in the z-score (or log odds) due to the respondent having a degree (this is explained below). It is important to note that the actual change in probability of the dependent variable due to university changes according to the other variables. Let us illustrate with an example.

Say the coefficient estimate on university for "being employed" is 0.1, which means if the respondent has a degree, their "z-score" corresponding to the probability they have a job increases by 0.1.

Here, the dependent variable is a binary indicator variable; that is, one that takes 0 if the respondent has no job, and 1 if they do. Now let's say we have two respondents, John and Mary, who are quite dissimilar. John, based on his personal characteristics, has a z-score of -1.4. The implied probability of him having a job is about 8.1 per cent. Mary's characteristics make her quite a bit more likely to have a job: let's say her z-score is 0.5. This

corresponds to an implied probability of being employed of 69.1 per cent. Now, what happens to the employment prospects of both John and Mary if they both get degrees? For John, his new z-score is -1.3, which corresponds to a probability of employment of 9.6 per cent — a 1.6 per cent improvement. However, for Mary, a degree changes her new z-score to 0.6, which corresponds to a probability of employment of 72.6 per cent — a 3.4 per cent improvement. This is illustrated in Figure 2 below.

Figure 2: Interpreting probit or logit coefficients



As the coefficient estimates of binary and ordered logit models do not have a straightforward interpretation, it is sometimes useful to evaluate the effects in terms of *compensating variation*. This simply asks which of our other independent variables need to change in order for the graduate and the non-graduate to have the same probability of, say, volunteering. By comparing the coefficient on university with the coefficients on the other independent variables, we can make judgements like "going to university has a similar effect on the probability of volunteering as having two children" (this, of course, assumes that both going to university and having children are true exogenous variables). Interpreting regression output in this manner may allow the researcher to judge better the magnitude of the likely effects.

6.3 Wellbeing

In our 'Wellbeing' classification, we look at measures of non-work life satisfaction and happiness. The four variables in this measure were AuSSA 2005's Happiness (on a 1-10 scale) and a measure of optimism ("people like me have a good chance of improving their standard of living?"), and the life satisfaction indexes from both the GSS and HILDA. Of these, only the GSS's measure of life satisfaction was statistically significant at the 95 per cent confidence interval. The difference in the estimates between the HILDA and GSS data-sets are somewhat confusing. Interestingly, the effects for both data-sets grow after restricting the data by matching. However, their signs are opposite, and the estimate for the effect of university in the GSS is quite surely not zero—let alone negative.

There are several potential reasons this may be the case. As the university effect grows after restricting the data, this suggests that the average excluded observation is of someone with higher (GSS) or lower (HILDA) average life satisfaction than those without a degree who are left in the sample. Some research done

at the NATSEM[73], suggests this may be driven by demographic effects: older people with lower rates of education are happier than those with higher rates of education, though this effect is reversed for younger people.

In drawing policy conclusions from the data, we need to decide whether it is likely that going to university can be expected to improve the happiness or life satisfaction of graduates. Given the better response rate for the GSS (the GSS has a response rate of nearly 90 per cent, while HILDA's first wave had a response of about 60 per cent), we lean towards the estimates from the General Social Survey. This also fits with the societal rule of thumb: that getting a better education improves the odds of having a better life—something worth being satisfied about!

If indeed higher education leads to more life satisfaction, then this could be classified as a part of the expected non-financial remuneration accruing to the degree-holder. All else equal, this decreases the future wage needed to spur a potential student's investment in herself.

However, there appear to be few happiness effects from education. A plausible explanation from the happiness literature is that any individual's happiness is only temporarily altered by a given life situation; after a short time, their happiness simply reverts to some base-line. In a study of mono- and di-zygotic twins, levels of identical twins' happiness were far more closely correlated than fraternal twins—regardless of whether the twins were raised together or apart.[74] This suggests that strong biological effects may dominate situational effects. The policy consequence may be that "happiness" may be relatively unable to be affected by higher education subsidies.

[73] Gong, *et al.* (2011)
[74] Lykken and Tellegen (1996)

Table 1: Coefficient estimates on university for wellbeing variables

Variable	Dataset	Positive or negative is better?	Model type	Association (unrestricted model)	Std Error	Causal estimate (restricted model)	Std error
Standard_living	AuSSA 05	negative	ordered	-0.09	0.1	-0.07	0.14
Happiness	AuSSA 05	positive	ordered	0.08	0.1	-0.04	0.11
LifeSatisfaction	GSS	positive	ordered	0.12	0.05	0.14	0.05
Life.satisfaction	HILDA	positive	ordered	-0.07	0.04	-0.05	0.07

6.4 Voluntary Work

Volunteering is an important part of civil society in Australia, and many community organisations (which provide significant non-financial public benefits) would cease to exist without volunteers.

As discussed in section 2, education may induce more volunteering. This is examined in the GSS and HILDA. The GSS asks the question in two parts: the first asks whether the respondent volunteers, and the second question asks how frequently. HILDA asks the respondent how many hours they spend volunteering per week.

We find that university graduates have a higher probability of volunteering, and that university (or the life path that a university education allows) may cause this. However, having a degree does not seem to predict the frequency in the GSS, and in HILDA, it seems to have a negligible effect (with university "causing" almost four minutes more volunteering per week). Graduates tend to earn more, and so their time has a higher opportunity cost. This may explain why graduates tend not to volunteer more hours relative to non-graduates.

If university education causes higher volunteering rates, then all else equal, the optimal subsidy is higher. However, this does not mean that tuition subsidies are necessarily an efficient method of supporting volunteers in civic or community organisations. There are likely to be many alternative (and more cost-effective) subsidies which could improve the provision of these same public goods, like direct subsidies to community organisations.

Table 2: Coefficient estimates on university for volunteering variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
VoluntaryWork	GSS	positive	binary	0.25	0.05	0.26	0.04
VolWorkFreq	GSS	positive	linear	0.0001	0.1	-0.005	0.06
Hours.volunteer	HILDA	positive	linear	0.05	0.01	0.06	0.02
Caring.Elderly	HILDA	positive	linear	-0.04	0.05	-0.01	0.05

6.5 Social Distance and relationships

Important non-financial side-effects of university may be reduced social distance and improved relationships. These may take two dimensions: from a public benefits perspective, reduced social distance (particularly between different types of people) is likely to improve the smooth functioning of society; from a private benefits perspective, more and better quality relationships are likely to improve life experience and family quality.

Naturally, getting a good-quality quantitative measure of an abstract concept like social distance is difficult. To work around this problem, we use several questions, from the AuSSA 2005 and 2007 surveys, HILDA, and the GSS.

We find that while university may cause graduates to have more close friends than they might otherwise have, and may increase their general level of tolerance of people from other cultures, the effects on other measures of social distance are weak.

It is prudent to not under-sell these potential benefits of higher education. Having more close friends is extremely valuable. Likewise, lower rates of intolerance make life easier for those in ethnic or religious minorities.

6.5.1 Private

The central hypothesis is that experience at university is likely to allow students with similar (possibly eclectic) extrospective preferences meet one another. This allows people who may not otherwise have the opportunity to form as many high-quality relationships to do so.

In general, we find that university is likely to cause an increase in the number of close friends (we find strong correlations in both the unrestricted and restricted data-sets). However, this does not translate to increased rates of face-to-face contact. University graduates are also likely to feel more a part of their local community, though seem to have no better relationships inside the family than their non-graduate counterparts.

Graduates do, however, appear to have better relationships within the workplace, both between colleagues and between employees and management. Interestingly, these effects appear to strengthen in the restricted data-set. This suggests that people whom we expect to have gone to university but have not have worse workplace relationships than those who do not have similar attributes to graduates (and have not gone to university). This is a potentially large private return to higher education for the marginal student.

Table 3: Coefficient estimates on university for private relationships variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
Relationships							
FaceToFaceFriends	GSS	Positive	ordered	-0.04	0.05	-0.07	0.08
CloseFriends	GSS	Positive	ordered	0.19	0.05	0.2	0.05
Satisf.w.former.part	HILDA	Positive	ordered	-0.1	0.08	-0.16	0.15
Satisf.w.partner	HILDA	Positive	ordered	-0.05	0.05	0.01	0.09
Feel.part.commun	HILDA	Positive	ordered	0.1	0.04	0.12	0.07
Satisf.w.children	HILDA	Positive	ordered	-0.12	0.06	0.01	0.09

6.5.2 Public

Graduates tend to have greater levels of acceptance of people from other religions and races than non-graduates. However, much of this additional acceptance seems to wash out with the inclusion of other important controls, such as age, gender, and whether the respondent is from abroad. However, for many cases, a *betting man* would likely conclude there are at least small effects on multicultural acceptance coming from university.

Our primary finding is that when respondents are faced with questions regarding specific nationalities or religions and specific levels of closeness (ranging from “keep out of Australia altogether” to “welcome as a family member”, in the AuSSA 2007), having a university degree does not appear to reliably predict higher levels of acceptance (though age and less education do predict lower levels of tolerance). However, when asked more broadly whether the respondent “accepts other cultures” (GSS), university does seem to predict higher levels of acceptance.

Apart from the main model discussed in section 5, we also examined a specification with an interaction term between university education and the proportion of friends with the same educational level as the respondent. With the inclusion of this interaction term, the coefficient on university education reduced to 0.11 for the unrestricted model (standard error of 0.11) and 0.20 for the restricted model (standard error of 0.14). The interaction term inherited most of the explanatory power, with coefficient estimates of 0.72 and 0.64 respectively (standard errors of 0.17 and 0.21).

This suggests that social group norms are significant drivers of tolerance, hinting towards network externalities in broadening higher education.

Table 4: Coefficient estimates on university for public social distance variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
Race and religion							
Muslim	AuSSA 07	positive	ordered	0.07	0.11	0.06	0.13
Jewish	AuSSA 07	positive	ordered	0.09	0.12	0.06	0.13
Jehovah	AuSSA 07	positive	ordered	0.006	0.12	-0.006	0.13
Hindu	AuSSA 07	positive	ordered	0.13	0.12	0.07	0.13
Greek Orthodox	AuSSA 07	positive	ordered	0.05	0.11	0.07	0.13
Catholic	AuSSA 07	positive	ordered	0.04	0.12	0.002	0.13
Buddhist	AuSSA 07	positive	ordered	0.13	0.11	0.09	0.13
Born-again Christian	AuSSA 07	positive	ordered	-0.15	0.11	-0.15	0.13
Anglican	AuSSA 07	positive	ordered	0.03	0.12	0.04	0.13
Lebanese	AuSSA 07	positive	ordered	0.27	0.11	0.36	0.21
Vietnamese	AuSSA 07	positive	ordered	0.27	0.11	0.33	0.21
Aborigines	AuSSA 07	positive	ordered	0.15	0.11	-0.04	0.21
Accept Other Cultures	GSS	positive	ordered	0.54	0.05	0.59	0.06

6.5.3 Policy implications

University appears to have some small (though welfare-improving) effects in terms of social distance. Graduates tend to have more close friends, and those who spend time around other graduates tend to be more accepting of people from different backgrounds. One of these is a private (or perhaps a common) good, where the other is a public good.

Given this, the optimal subsidy balances the marginal public and private benefits. If reduced social distance were the only externality, the optimal subsidy could be thought of as the amount people (generally minorities) would be willing to pay to potential students in order to get them to go to university. But given there already large financial—and as we now know social—benefits from tertiary study, the marginal student may be sufficiently difficult to induce into education by reduced tuition fees that the efficient subsidy (given this externality) is plausibly zero.

6.6 Civic Attitudes

As discussed in section 2, a commonly claimed benefit of higher education is that gradates tend to display civic virtues to a greater extent. They may join (or create) clubs, read more frequently, become more involved citizens, or work in jobs that provide broader public benefits (such as teachers or nurses).

Many of these claims broadly match what we observe in the data. However, others do not. To examine civic attitudes, we examined responses to several questions in the Australian Survey of Social Attitudes (2005, 2007). In general, we are more concerned about selection bias in the correlations between higher education and improved civic behaviour, as some, like reading, are likely to predict whether someone would want to go to university in the first place.

In the restricted data-set, university graduation is strongly associated with higher rates of reading and having a useful job, and more mildly associated with civic or aid association membership, church attendance, and the difference between having and wanting a socially useful job. After controlling for correlates, graduates do not to tend to want a job that involves helping others any more than non-graduates, are unlikely to have stronger biases towards non-financial ends, do not exhibit more socially-helpful views on voting, tax evasion, or breaking laws, aren't much more likely to belong to a sports club, charity, or profession-related society, aren't any more likely to go to sports events, and aren't more trusting.

We also checked to see whether more detailed modelling (including different study fields) could give any indication about whether graduates in some disciplines were especially likely to display civic virtues. For this, we used a mixed effects model using study fields as a hierarchy. Surprisingly, there were no interesting or large results.

This all suggests some of the civic results of higher education are over-sold. This should be no great surprise. Australia has a large, active civic society, and only a small proportion of graduates in the population. There are many existing social mechanisms which encourage people to provide civic or club goods—university is only one. Having a degree is not a necessary qualification for amateur theatre companies or the CWA.

Table 5: Coefficient estimates on university for civic capital variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
Social Aspects of Job							
want to help_others	AuSSA 07	negative	ordered	-0.3	0.2	-0.14	0.2
want useful_job	AuSSA 07	negative	ordered	-0.12	0.15	-0.22	0.2
has_interesting_job	AuSSA 07	negative	ordered	-0.03	0.18	-0.01	0.24
works_independently	AuSSA 07	negative	ordered	-0.03	0.02	-0.11	0.25
has_helping_job	AuSSA 07	negative	ordered	-0.04	0.18	-0.32	0.23
has_useful_job	AuSSA 07	negative	ordered	-0.41	0.17	-0.55	0.22
diff.helping	AuSSA 07	negative	ordered	-0.02	0.17	0.17	0.23
diff.useful	AuSSA 07	negative	ordered	-0.23	0.17	-0.36	0.22
Civic Capital							
imp oth than fin future	AuSSA 05	negative	ordered	-0.23	0.15	-0.19	0.19
trust	AuSSA 05	positive	binary	0.13	0.1	-0.1	0.12
involved aid org	AuSSA 05	positive	ordered	0.48	0.22	0.48	0.3
import that always vote	AuSSA 05	positive	ordered	-0.1	0.17	-0.37	0.24
import that never evade tax	AuSSA 05	positive	ordered	-0.16	0.16	-0.19	0.23
important that always obey laws	AuSSA 05	positive	ordered	-0.38	0.16	-0.3	0.23

belong_church	AuSSA 05	negative	ordered	-0.55	0.15	-0.37	0.21
belong sports club	AuSSA 05	negative	ordered	-0.06	0.15	-0.14	0.21
sports club member	AuSSA 07	positive	ordered	0.2	0.12	0.2	0.24
charity member	AuSSA 07	positive	ordered	0.18	0.14	-0.18	0.26
professional society member	AuSSA 07	positive	ordered	0.6	0.19	0.34	0.38
farmers group member	AuSSA 07	positive	ordered	-0.67	0.38	-0.46	0.64
business network member	AuSSA 07	positive	ordered	0.13	0.2	-0.03	0.4
trust	AuSSA 07	positive	ordered	0.16	0.12	0.13	0.13
Like to acquire new skills	AuSSA 07	positive	ordered	0.34	0.11	0.03	0.12
Like to attend sports	AuSSA 07	positive	ordered	0.02	0.11	0.009	0.12
Like to attend cultural events	AuSSA 07	positive	ordered	0.22	0.12	0.22	0.14
Like to read books	AuSSA 07	positive	ordered	0.3	0.1	0.36	0.12
Belong community org	AuSSA 07	positive	ordered	0.28	0.12	0.19	0.13
Belong church	AuSSA 07	positive	ordered	0.18	0.15	0.14	0.17
Belong cultural assoc	AuSSA 07	positive	ordered	0.25	0.14	0.23	0.15
Belong sports assoc	AuSSA 07	positive	ordered	0.16	0.12	0.06	0.13

6.7 Health

One surprising finding was the strength and uniformity of the association between university graduation and both improved (self assessed) health and reduced BMI. As discussed in section 2, there are two competing views as to why this may be the case. The first says that graduates have better ability to process information—including dietary information—due to their education, and use this to improve their diet. The second says that the very fact that graduates are graduates reveals something about their discount rate, with less patient people (who are presumably impatient about food, too) more likely to wind up without degrees and with worse health.

Another possibility, which we explore, is that graduates are likely to face more healthy social norms, in which graduates face more social pressure than non-graduates to keep healthy. There may be positive network externalities if this is the case. Analysis of the GSS suggests it is a plausible hypothesis.

After restricting the (AuSSA 2005 and GSS) data-sets to people who were similar to graduates, and controlling for covariates, university graduates were more likely than non-graduates to rate their health highly. In the HILDA, they had a BMI 0.5 lower than non-graduates.

We also examined an interaction effect between university completion and the proportion of friends with the same level of education. When this term was included in the GSS analysis, the effect of solely having a degree was near zero and not statistically significant. This suggests that most of the health effect accrue to those graduates who spend time with other graduates, implying something of a network effect.

If university does *cause* better health, then how much of the benefit accrues to the individual, and how much to the state? Naturally, those with better health feel better and live longer; and so a very large proportion of the benefits of better health are private in nature. This is especially the case for the potential effects of university on obesity; a one point reduction in BMI at 20 years old being associated with an increased life expectancy of up to two years.[75] However, under socialised health-care, the public may benefit from an individual's improved health, via reduced health expenditures. It is possible, however, that because the healthier live longer, they may rack up more health costs in the long run, in which case the utility coming from better health must be offset against higher expected costs.[76]

Other research suggests that health may be a luxury good—that is, as income increases, we should expect health-care expenditure to increase disproportionately.[77] This is because as people become richer, they value additional years of life more than they do an additional sports car. From a broader societal perspective, this suggests that the increased prosperity coming from higher levels of education may induce people to vote for

[75] The relationship between BMI and life expectancy appears to be non-linear, and larger improvements in life expectancy due to weight loss occur for those who are very obese. See Fontaine (2003).
[76] A recent Dutch study found that lifetime medical expenses are higher for non-smokers and the non-obese. As put by the authors "Obesity prevention may be an important and cost-effective way of improving public health, but it is not a cure for increasing health expenditures". Van Baal, *et al.* (2008)
[77] See Hall and Jones (2004)

higher levels of health-care provision. This could well be the utility-maximising outcome, but it may not be a public benefit.

Table 6: Coefficient estimates on university for health variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
Health							
Self assessed health	AuSSA 05	negative	ordered	-0.25	0.11	-0.32	0.15
Self assessed health	GSS	positive	ordered	0.18	0.05	0.16	0.05
BMI	HILDA	negative	linear	-0.5	0.15	-0.5	0.2
Self assessed health	HILDA	positive	ordered	0.28	0.05	0.23	0.08

6.8 Private benefits from job

The main improvements to the working life of a graduate appear to be, surprisingly, not linked to the job itself, but come from better relationships in the workplace—both between colleagues and between management and employees. After controlling for the relevant covariates and restricting the samples to those who most resemble graduates, the additional effect of having a degree appears not to affect job satisfaction (nor pay or security satisfaction).

This problem has been examined before.[78] Using UK data, researchers examined in detail the relationship between differing levels of education and job satisfaction, with similar (null) results to those below. Their explanatory hypothesis was that graduates tend to compare themselves to other graduates, leading graduates in otherwise satisfying employment to understate the level of satisfaction in the job. However, their research found only weak evidence in support of this hypothesis.

If reported job satisfaction is strongly determined by comparison-group effects or expectations effects (under which graduates simply expect too much from a job), then less subjective measures of workplace wellbeing are probably more valid measures of the *actual* pleasantness of work for graduates. Graduates earn more, have better relationships with their colleagues and bosses, and work in sectors with lower risks of injury or death. While they may not systematically report higher rates of satisfaction, graduates are likely to have more satisfying jobs.

[78] See, Belfield and Harris (2002)

Table 7: Coefficient estimates on university for private benefits of job variables

Variable	Dataset	Positive or negative is better?	Model type	Association	Std Error	Causal estimate	Std error
Private benefits of job							
Interesting job important	AuSSA 05	negative	ordered	-0.1	0.16	-0.21	0.21
work independently important	AuSSA 05	negative	ordered	-0.18	0.15	-0.29	0.19
Relationship between management and employees	AuSSA 05	positive	ordered	0.41	0.17	0.51	0.23
Relationship between colleagues	AuSSA 05	positive	ordered	0.3	0.18	0.63	0.24
job satisfaction	AuSSA 05	positive	ordered	0.32	0.17	0.28	0.23
difference between actual and desired work independence	AuSSA 05	negative	ordered	0.09	0.17	0.14	0.24
difference between actual and desired interesting work	AuSSA 05	negative	ordered	-0.03	0.18	0.11	0.23
job pay satisfaction	HILDA	positive	ordered	0.04	0.06	0.08	0.1
job security satisfaction	HILDA	positive	ordered	0.01	0.06	-0.01	0.1
job satisfaction	HILDA	positive	ordered	-0.05	0.05	-0.07	0.08

7. References

ABS (2011) *4159.0.55.002: The 2010 General Social Survey User Guide,* The Australian Bureau of Statistics

Akerlof, G. A. (1997) 'Social distance and social decisions', *Econometrica: Journal of the Econometric Society*, p 1005-1027

Angrist, J. D. and Krueger, A. B. (1990) *The effect of age at school entry on educational attainment: an application of instrumental variables with moments from two samples,* National Bureau of Economic Research

Angrist, J. D. and Pischke, J. S. (2009) *Mostly harmless econometrics: An empiricist's companion*, Princeton Univ Pr

Bean, C. S. and Denemark, D. (2007) 'Citizenship, participation, efficacy and trust in Australia', *Australian Social Attitudes 2: Citizenship, Work and Aspirations*, p 58-80

Becker, G. S. (1974) *Crime and punishment: An economic approach*, UMI

Belfield, C. R. and Harris, R. D. F. (2002) 'How well do theories of job matching explain variations in job satisfaction across education levels? Evidence for UK graduates', *Applied Economics*, 34(5), p 535-548

Bobo, L. and Licari, F. C. (1989) 'Education and political tolerance', *Public Opinion Quarterly*, 53(3), p 285-308

Brand, J. E. (2010) 'Civic returns to higher education: A note on heterogeneous effects', *Social Forces*, 89(2), p 417-433

Brush, D. H., Moch, M. K. and Pooyan, A. (1987) 'Individual demographic differences and job satisfaction', *Journal of Organizational Behavior*, 8(2), p 139-155

Campbell, D. E. and Yonish, S. J. (2003) 'Religion and volunteering in America', *Religion as social capital: Producing the common good*, p 87-106

Card, D. (1999) 'The causal effect of education on earnings', *Handbook of Labor Economics*, 3, p 1801-1863

Card, D. and Lemieux, T. (2001) 'Going to college to avoid the draft: The unintended legacy of the Vietnam War', *The American Economic Review*, 91(2), p 97-102

Caruana, R. and Niculescu-Mizil, A. (2006) *An empirical comparison of supervised learning algorithms*

Chapman, B. J., Weatherburn, D., Kapuscinsky, C. A., Chilvers, M. and Roussel, S. (2002) *Unemployment duration, schooling and property crime,* Australian National University, Centre for Economic Policy Research

De Walque, D. (2007) 'Does education affect smoking behaviors?:: Evidence using the Vietnam draft as an instrument for college education', *Journal of health economics*, 26(5), p 877-895

Dee, T. S. (2003) 'Are there civic returns to education?', *NBER Working Paper Series*(9588),

DEEWR (2000) *Higher education students time series tables, 2000: selected higher education statistics,* Australian Department of Education, Employment and Workplace Relations

DEEWR (2001-2010) *Students: Selected higher education statistics,* Australian Department of Education, Employment and Workplace Relations

Dockery, A. M. (2010) *Education and happiness in the school-to-work transition*, NCVER

Dolman, B. P., Dean; Zheng, Simon (2007) 'Can Australia match US productivity performance?', *Productivity Commission Staff Working Papers*,

Dolnicar, S. and Randle, M. (2007) 'What motivates which volunteers? Psychographic heterogeneity among volunteers in Australia', *Voluntas: International Journal of Voluntary and Nonprofit Organizations*, 18(2), p 135-155

Easterlin, R. A. (1995) 'Will raising the incomes of all increase the happiness of all?', *Journal of Economic Behavior & Organization*, 27(1), p 35-47

Fajnzylber, P., Lederman, D. and Loayza, N. (2002) 'What causes violent crime?', *European Economic Review*, 46(7), p 1323-1357

Fontaine, K., Redden, D T, Wang, C, Westfall, A O, Allison, D B (2003) 'Years of life lost due to obesity', *JAMA: The Journal of the American Medical Association*, 289(2), p 187-193

Gelman, A. and Hill, J. (2007) *Data analysis using regression and multilevel/hierarchical models*, Cambridge University Press New York

Gelman, A., Su, Y. S., Yajima, M., Hill, J., Pittau, M. G., Kerman, J. and Zheng, T. 'arm: Data analysis using regression and multilevel/hierarchical models', *R package version*, p 1.3-02

Gibson, R., Wilson, S., Denemark, D., Meagher, G. and Western, M. (2004) 'The Australian Survey of Social Attitudes, 2003', *computer file]. Canberra: Australian Social Science Data Archive, Australian National University*,

Glaeser, E., Ponzetto, G. and Shleifer, A. (2006) *Why does democracy need education?,* National Bureau of Economic Research

Gong, H. C., Cassells, R. and Keegan, M. (2011) 'Understanding Life Satisfaction and the Education Puzzle in Australia: A profile from HILDA Wave 9', *NATSEM Working Paper Series*,

Hall, R. E. and Jones, C. I. (2004) *The value of life and the rise in health spending,* National Bureau of Economic Research
Hartog, J. and Oosterbeek, H. (1998) 'Health, wealth and happiness: why pursue a higher education?', *Economics of Education Review*, 17(3), p 245-256
Hayghe, H. V. (1991) 'Volunteers in the US: Who donates the time', *Monthly Lab. Rev.*, 114, p 17
Headey, B. and Wooden, M. (2004) 'The Effects of Wealth and Income on Subjective Wellâ€ Being and Illâ€ Being*', *Economic Record*, 80, p S24-S33
Helliwell, J. F. (2003) 'How's life? Combining individual and national variables to explain subjective well-being', *Economic Modelling*, 20(2), p 331-360
Hickson, H. and Dockery, A. M. (2008) *Is ignorance bliss: Exploring the links between education, expectations and happiness*
Huang, J., Maassen van den Brink, H. and Groot, W. (2009) 'A meta-analysis of the effect of education on social capital', *Economics of Education Review*, 28(4), p 454-464
Kelly, M. (2000) 'Inequality and crime', *Review of Economics and Statistics*, 82(4), p 530-539
Kennedy, S. (2003) 'The relationship between education and health in Australia and Canada', *Social and Economic Dimensions of an Aging Population Research Papers*,
Kruger, J. and Dunning, D. (1999) 'Unskilled and unaware of it: how difficulties in recognizing one's own incompetence lead to inflated self-assessments', *Journal of Personality and Social Psychology; Journal of Personality and Social Psychology*, 77(6), p 1121
Leigh, A. (2011) *Disconnected*, UNSW Press
Liaw, A. and Wiener, M. (2002) 'Classification and Regression by randomForest', *R news*, 2(3), p 18-22
Lochner, L. (2004) 'EDUCATION, WORK, AND CRIME: A HUMAN CAPITAL APPROACH*', *International Economic Review*, 45(3), p 811-843
Lochner, L. and Moretti, E. (2002) *The Effect of Education on Crime: Evidence from Prison Inmates, Arrests, and Self-Reports*, from http://www.escholarship.org/uc/item/4mf8k11n
Lykken, D. and Tellegen, A. (1996) 'Happiness is a stochastic phenomenon', *Psychological Science*, 7(3), p 186
MacInnis, B. (2008) *Does college education impact health? Evidence from the pre-lottery Vietnam draft,* mimeo
Marginson, S. (1997) *Educating Australia: Government, economy, and citizen since 1960*, Cambridge Univ Pr
McCloskey, D. (2005) 'The trouble with mathematics and statistics in economics', *History of Economic Ideas*, 13(3), p 85
McLaren, L. M. (2003) 'Anti-immigrant prejudice in Europe: Contact, threat perception, and preferences for the exclusion of migrants', *Social Forces*, 81(3), p 909-936
Meghir, C., Palme, M. and Schnabel, M. (2011) 'The effect of education policy on crime: an intergenerational perspective',
Melin, R., Fugl-Meyer, K. S. and Fugl-Meyer, A. R. (2003) 'Life satisfaction in 18- to 64-year-old Swedes: in relation to education, employment situation, health and physical activity', *Journal of rehabilitation medicine*, 35(2), p 84-90
Mishler, C. J. (1983) 'Adults' Perceptions of the Benefits of a College Degree', *Research in Higher Education*, 19(2), p 213-230
Muller, A. (2002) 'Education, income inequality, and mortality: a multiple regression analysis', *BMJ*, 324(7328), p 23
Nagel, M. (2010) 'A Mathematical Model of Democratic Elections', *Current Research Journal of Social Sciences*, 2(4), p 255-261
Nesdale, D. and Toddâˆ—, P. (1993) 'Internationalising Australian universities: the intercultural contact issue', *Journal of Tertiary Education Administration*, 15(2), p 189-202
O'Driscoll, M., Haque, A. and Ohsako, T. (1983) 'Effects of contact and perceived attitude differences on social distances among Australian, Japanese, and Pakistani students', *Journal of Social Psychology*, 120(2), p 163
OECD (2009) *Quality of life - Security - Victimisation rates*, OECD Factbook 2009: Economic, Environmental and Social Statisticsfrom http://statlinks.oecdcode.org/302009011P1T135.XLS
Pettigrew, T. F. and Tropp, L. R. (2006) 'A meta-analytic test of intergroup contact theory', *Journal of personality and social psychology*, 90(5), p 751
Team, R. 'R: A language and environment for statistical computing', *R Foundation for Statistical Computing Vienna Austria*(01/19),
Van Baal, P. H. M., Polder, J. J., De Wit, G. A., Hoogenveen, R. T., Feenstra, T. L., Boshuizen, H. C., Engelfriet, P. M. and Brouwer, W. B. F. (2008) 'Lifetime medical costs of obesity: prevention no cure for increasing health expenditure', *PLoS Medicine*, 5(2), p e29

Venkataramani, A. (2010) 'Early Life Exposure to Malaria and Cognition and Skills in Adulthood: Evidence from Mexico',
Weidmann, B. and Norton, A. (2012) *Detailed financial analysis,* The Grattan Institute
West, L. H. T. and Hore, T. (1989) 'The impact of higher education on adult students in Australia Part 2. The person', *Higher Education*, 18(4), p 473-483
West, L. H. T. and Hore, T. (1989) 'The Impact of Higher Education on Adult Students in Australia: Part 1. Employment', *Higher Education*, 18(3), p 341-352
Wilson, J. (2000) 'Volunteering', *Annual review of sociology*, p 215-240
Wilson, J. M. M. (1998) 'The Contribution of Social Resources to Volunteering', *Social Science Quarterly (University of Texas Press)*, 79(4), p 799-814
Withers, G. (1984) 'Crime, Punishment and Deterrence in Australia: An Empirical Investigation*', *Economic Record*, 60(2), p 176-185
Ziliak, S. T. and McCloskey, D. N. (2008) *The cult of statistical significance: How the standard error costs us jobs, justice, and lives*, Univ of Michigan Pr

8. Tables describing data sources

Table 8: Dependent variables used in analysis of HILDA

Variable name	Question	Possible responses
Life.satisfaction	All things considered, how satisfied are you with your life?	0: dissatisfied to 10: completely satisfied
Satisf.w.former.part	How satisfied are you with: h) your relationship with your (most recent) former spouse or partner?	0: dissatisfied to 10: completely satisfied
Satisf.w.partner	How satisfied are you with: a) your relationship with your partner?	0: dissatisfied to 10: completely satisfied
Job.pay.satisfaction	How satisfied are you with a) your total pay?	0: dissatisfied to 10: completely satisfied
Job.sec.satisfaction	How satisfied are you with b) your job security?	0: dissatisfied to 10: completely satisfied
Job.satisfaction	How satisfied are you with c) The work itself (what you do)?	0: dissatisfied to 10: completely satisfied
Feel.part.commun	How satisfied are you with a) feeling part of your local community	0: dissatisfied to 10: completely satisfied
Satisf.w.children	How satisfied are you with: b) your relationship with your children?	0: dissatisfied to 10: completely satisfied
Hours.volunteer	Combined hrs/mins per week - Volunteer/Charity work	Continuous variable
BMI	Derived from height and weight	Continuous variable
Caring.elderly	Combined hrs/mins per week - Caring for disabled/elderly relative	Continuous variable
Labour.force.status	At any time at all during the last 7 days, did you do any work in a job, business of farm?	Employed Unemployed Not in the labour force
Self.assessed.health	In general, would you say your health is:	Excellent Very good Good


Fair
Poor

Table 9: Independent variables used in analysis of HILDA

Variable name	Question	Possible responses
Country.birth	What country were you born in?	All countries (SACC)
hours.employed	Combined hrs/mins per week - Paid employment	Continuous
Market.income	Financial year private income ($) Positive values [weighted topcode]	Continuous
HH.net.income	Household financial year gross income ($) (excl windfall) [imputed]	Continuous
Age	Age last birthday at June 30 2010	Continuous
Living.moth.fath.14	Were you living with both your own mother and father around the time you were 14 years old?	1: Living with both own mother and father at age 14; 2: Father and stepmother; 3: Mother and stepfather; 4: Father only; 5: Mother only; Other
Highest.edu	Highest education level achieved	1: Postgrad - Masters or Doctorate; 2: Grad Diploma, Grad Certificate; 3: Bachelor or honours; 4: Adv Diploma; 5: Cert 3 or 4; 6: Cert 1 or 2; 7: Cert not defined; 8: Year 12; 9: Year 11 and below; 10: undetermined
HS.level	Highest year of school completed/currently attending	Years 7-12; Finished primary school; did not finish primary school; special needs school
Married	Marital status from person questionairre	Legally married; De facto; Separated; Divorced; Widowed; Never married and not de facto
Number.children	Total children ever had	Continuous
Industry.1dig	Current main job industry.	ANZSIC 2006 division
Industry.2dig	Current main job industry.	ANZSIC 2006 division (2 digit)

Mother.emp.at.14	History: Was mother in paid employment when you were 14?	Mother was employed; Mother was not employed; Mother was deceased; Not living with mother so don't know.
Mother.edu	Mother completed an educational qualification after leaving school	Yes, No
Mother.ocu.status.scale	AUSEI06 occupational status scale, Mother's occupation	Derived
Parents.divorce	Did your mother and father ever get divorced or separate	Yes, No
Father.emp.at.14	Was father in paid employment when you were 14	Father was employed; Father was not employed; Father was decrased; Not living with father so don't know
Father.ocu.status.scale	AUSEI06 occupational status scale, Father's occupation	Derived
Father.edu	Father completed an educational qualification after leaving school	Yes, No
Gender	Gender	1 = Male, 2 = Female

.Table 10: Dependent variables used in analysis of the General Social Survey

Variable name	Question	Possible responses
HealthSelfAss	Self-assessed health status	1 = Excellent through 5 = Poor
LifeSatisfaction	Overall Life Satisfaction	1 = Delighted through 7 = Terrible; 8 = don't know
LabourForceStat	Labour Force Status	1 = Employed, 2 = Unemployed, 3 = Not in labour force
FaceToFaceFriends	Frequency of face to face contact with family or friends	1 = Every day, 2 = At least 0nce a week, 3 = At least once a month, 4 = At least once in three months, 5 = No recent contact, 6 = No family and no friends
VoluntaryWork	Whether did unpaid voluntary work in last 12 months through an organisation	1 = did unpaid voluntary work for an organisation last 12 months, 2 = Did not do unpaid voluntary work for an organisation in last 12 months.
VolWorkFreq	Frequency of voluntary work for organisation(s)	1 = At least once a week, 2 = At least once a fortnight, 3 = At least once a month, 4 = Several times a year, 5 = Less regularly.
AcceptOthCultures	Acceptance of different cultures	1 = strongly agree through 5 = Strongly disagree.
CloseFriends	Number of friends can confide in	1 = No friends can confide in, 2 = 1-2 friends can confde in, 3 = 3-4 friends can confide in, 4 = 5 or more friends can confide in

Table 11: Independent variables used in analysis of the General Social Survey

Variable name	Question	Possible responses
Age	Age	In 15 age buckets from 18 to more than 85
Sex	Sex	1 = Male, 2 = Female
Married	Registered Marital status	1 = Never Married, 2 = Widowed, 3 = Divorced, 4 = Separated, 5 = Married
DepChildInHouse	Number of dependent children in household	0 = None, 1 = One, 2 = Two, 3 = Three or more
HouseholdIncDec	Deciles for equivalised household gross weekly income	1 is the first decile, 10 is the tenth decile
PropFriendsSameEdu	Proportion of friends with roughly the same level of education	A scale from 1 = none to 4 = all.
HighestEduLevel	Level of highest educational attainment	1 Postgraduate Degree, Graduate Diploma/Graduate Certificate, 2 Bachelor Degree, 3 Advanced Diploma/Diploma, 4 Certificate III/IV, 5 Certificate I/II, 6 Certificate not further defined, 7 Year 12, 8 Year 11, 9 Year 10, 10 Year 9, 11 Year 8 or below including never attended school, 12 Level not determined
EduField	Main field of highest educational attainment	0 Not applicable, 1 Natural and physical sciences, 2 Information technology, 3 Engineering and related technologies, 4 Architecture and building, 5 Agriculture, environmental and related studies, 6 Health, 7 Education, 8 Management and commerce, 9 Society and culture, 10 Creative arts, 11 Food, hospitality and personal services, 12 Mixed field programmes/Field not determined

Table 12: Dependent variables used in the analysis of the Australian Survey of Social Attitudes 2005

Variable name	Question	Possible responses
Interesting_job	How important is an interesting job to you?	From 1 = Very important, to 5 = Not important at all
work_independently	How important is a job that allows someone to work independently?	From 1 = Very important, to 5 = Not important at all
help_others	How important is a job that allows someone to help other people?	From 1 = Very important, to 5 = Not important at all
job_useful	How important is a job that is useful to society?	From 1 = Very important, to 5 = Not important at all
man_employee	In general, how would you describe relations at your workplace between management and employees?	From 1 = Very good to 5 = Very bad
between_colleagues	And between workmates/colleagues	From 1 = Very good to 5 = Very bad
job_satisfaction	How satisfied are you in your main job?	From 1 = Completely satisfied to 7 = Completely dissatisfied
other_fin_future	Other things are more important to me than my financial future?	From 1 = Strongly agree to 5 = Strongly disagree
happiness	All in all, how happy are you with your life these days?	From 0 = Extremely unhappy to 10 = Extremely happy
health	How would you rate your health in general?	From 1 = Excellent to 4 = Poor
standard_living	The way things are in Australia, people like me and my family have a good chance of improving our standard of living	From 1 = Strongly agree to 5 = Strongly disagree
has_interesting_job	My job is interesting	From 1 = Strongly agree to 5 = Strongly disagree
works_independently	I can work independently in my main job	From 1 = Strongly agree to 5 = Strongly disagree
has_helping_job	In my job I can help other people	From 1 = Strongly agree to 5 = Strongly disagree
has_useful_job	My job is useful to society	From 1 = Strongly agree to 5 = Strongly disagree
trust	Generally speaking, would you say that most people can be trusted or that you can't be too careful in dealing with	1 = Can be trusted, 2 = Can't be too careful

	people?	
strike	In the past two years, have you participated in a strike or industrial action?	1 = Yes, 2 = No
aid	Are you a member of an aid organisation?	1 = Don't belong, 2 = Member, 3 = Active member, 4 = Office holder
always_vote	How important is it that citizens always vote in elections?	1 = Not important at all through 7 = Very important
never_evade_tax	How important is it that citizens never try to evade taxes?	1 = Not important at all through 7 = Very important
obey_laws	How important is it that citizens always obey laws?	1 = Not important at all through 7 = Very important
belong_church	Do you belong to a church or other religious organisation?	1 = Belong and actively participate, 2 = Belong but don't participate, 3 = Used to belong, 4 = Never belonged
belong_sports	Do you belong to a sports, leisure, or cultural group?	1 = Belong and actively participate, 2 = Belong but don't participate, 3 = Used to belong, 4 = Never belonged

Table 13: Independent variables used in the analysis of the Australian Survey of Social Attitudes 2005

Variable name	Question	Possible responses
hs	What is the highest level of high school education you have completed	Did not go to school, Did not complete high school to year 10, Completed high school to year 10, Completed high school to year 12, Still at high school
edu_highest	What is the highest level of education you have completed since leaving high school?	None, Trade qualificiation or apprenticeship, Certificate or diploma (TAFE or business college), Bachelor degree (inc Hons), Postgraduate degree or Postgraduate diploma
birth_year	When were you born?	Year
partner_hs	What is the highest level of high school education your partner has completed?	Did not go to school, Did not complete high school to year 10, Completed high school to year 10, Completed high school to year 12, Still at high school
partner_edu	What is the highest level of education your partner has completed since leaving high school?	None, Trade qualificiation or apprenticeship, Certificate or diploma (TAFE or business college), Bachelor degree (inc Hons), Postgraduate degree or Postgraduate diploma
house_own	Do you own outright, are you buying or renting the dwelling in which you now live?	Own outright, Own- paying off mortgage, Rent from private landlord, Rent from public housing authority, other
city_country	Would you say you now live in	A rural area or village, A small country town, A larger country town, A large town, Outer metropolitan, Inner metropolitan
marital	What is your current marital status	Single- never married, de facto, married, divorced, separated but not divorced, widowed
secondary_schooltype	What type of secondary school did you attend?	Government, Catholic, Other non-Government
male	Are you…	Female, male
irreligious	Do you have a religion?	Yes, no
birth.foreign	What country were you born in?	Australia, Overseas

status	Where would you put yourself on this scale (of society) ?	1 = Bottom through 10 = Top
income	What is your gross annual income, before tax or other deductions, from all sources. Please include any pensiona dn allowances, and income from interests or dividends	Various buckets from nil through $104,000 or more p.a
income_hh	What is your gross household annual income, before tax or other deductions, from all sources. Please include any pensiona dn allowances, and income from interests or dividends	Various buckets from nil through $182,000 or more p.a

Table 14: Dependent variables used in the analysis of the Australian Survey of Social Attitudes 2007

Variable name	Question	Possible responses
sport.memb	Are you an active member of… a sports or recreation association?	Active member, Inactive member, Don't belong
charity.memb	a charity organisation	Active member, Inactive member, Don't belong
prof.memb	a professional association	Active member, Inactive member, Don't belong
farm.memb	a farmers' association	Active member, Inactive member, Don't belong
busn.memb	a business or employers' association	Active member, Inactive member, Don't belong
degree.pol.support	Would you call yourself a very strong, fairly strong, or not very strong supporter of your chosen political party?	very strong, fairly strong, or not very strong
close.muslim	How close are you prepared to be with people of the following religious and cultural groups… Muslim	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.jewish	Jewish	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.jehova	Jehova's Witness	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.hindu	Hindu	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.greekorth	Greek Orthodox	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether

close.catholic	Catholic	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.buddhist	Buddhist	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.bornagain	Born-again Christian	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.anglican	Anglican	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.lebanese	Lebanese	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.vietnamese	Vietnamese	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
close.aborigines	Aborigines	1 = Welcome as a family member, 2 = Welcome as a close friend, 3 = Have as a next-door neighbour, 4 = Welcome as work mates, 5 = Allow as an Australian citizen, 6 = Have as a visitor only, 7 = Keep out of Australia altogether
trust	Generally speaking, would you say that people can be trusted or that you can't be too careful in dealing with people?	1 = People can almost always be trusted, 2 = People can usually be trusted, 3 = You usually can't be too careful in dealing with people, 4 = You almost always cant be too careful in dealing with people
new.skills	How often do you use your free time to try to learn or develop new skills	1 = Very often through 5 = Never

attend.sports	How often do you... attend sporting events as a spectator?	1 = Daily, 2 = Several times a week, 3 = Several times a month, 4 = Several times a year or less often, 5 = Never
cultural.events	Attend cultural events such as concerts, live theatre, or exhibition	1 = Daily, 2 = Several times a week, 3 = Several times a month, 4 = Several times a year or less often, 5 = Never
read.books	Read books	1 = Daily, 2 = Several times a week, 3 = Several times a month, 4 = Several times a year or less often, 5 = Never
community.org	In the last 12 months, how often have you participated in the activities of… a community-service or civic organisation	1 = At least once a week, 2 = At least once a month, 3 = Several times, 4 = Once or twice, 5 = Never
church	A church or other religious organisation	1 = At least once a week, 2 = At least once a month, 3 = Several times, 4 = Once or twice, 5 = Never
cultural.assoc	A cultural association	1 = At least once a week, 2 = At least once a month, 3 = Several times, 4 = Once or twice, 5 = Never
sports.assoc	A sports association	1 = At least once a week, 2 = At least once a month, 3 = Several times, 4 = Once or twice, 5 = Never

Table 15: Independent variables used in the analysis of the Australian Survey of Social Attitudes 2007

Variable name	Question	Possible responses
edu.highest	What is the highest level of education you have completed since leaving high school?	None, Trade qualificiation or apprenticeship, Certificate or diploma (TAFE or business college), Bachelor degree (inc Hons), Postgraduate degree or Postgraduate diploma
activity.lastweek	Which of the following best describes what you were doing last week?	Working for pay or self-employed, Unemployed- looking for work, Retired from paid work, A full-time school or university student, Household duties, Helping a family member, Living with a disability
status	Where would you put yourslef on a scale in society?	1 = bottom through 10 = top
birth.australia	Where were you born?	Australia, Overseas
marital	What is your current marital status	Single- never married, de facto, married, divorced, separated but not divorced, widowed
city.country	Would you say you now live in	A rural area or village, A small country town, A larger country town, A large town, Outer metropolitan, Inner metropolitan
religious	How often do you attend religious services?	1 = Several times a week, 2 = Once a week, 3 = 2 or 3 times a month, 4 = once a month, 5 = Several times a year, 6 = Onmce a year, 7 = Less frequently, 8 = Never
income	What is your gross annual income, before tax or other deductions, from all sources. Please include any pensiona dn allowances, and income from interests or dividends	Various buckets from nil through $104,000 or more p.a
income.hh	What is your gross household annual income, before tax or other deductions, from all sources. Please include any pensiona dn allowances, and income from interests or dividends	Various buckets from nil through $182,000 or more p.a
partner.edu	What is the highest level of education	None, Trade qualificiation or apprenticeship, Certificate or

	your partner has completed since leaving high school?	diploma (TAFE or business college), Bachelor degree (inc Hons), Postgraduate degree or Postgraduate diploma
gender	Are you	Male, Female
hs	What is the highest level of high school education you have completed	Did not go to school, Did not complete high school to year 10, Completed high school to year 12, Still at high school
Age	What year were you born?	Year (transformed to Age)