ARC Centre of Excellence in Population Ageing Research

Working Paper 2021/02

Pensions and Participation: Evidence from World War II Veterans in Australia

David Rodgers

Pensions and Participation: Evidence from World War II Veterans in Australia

David Rodgers*

February 16, 2021

Abstract

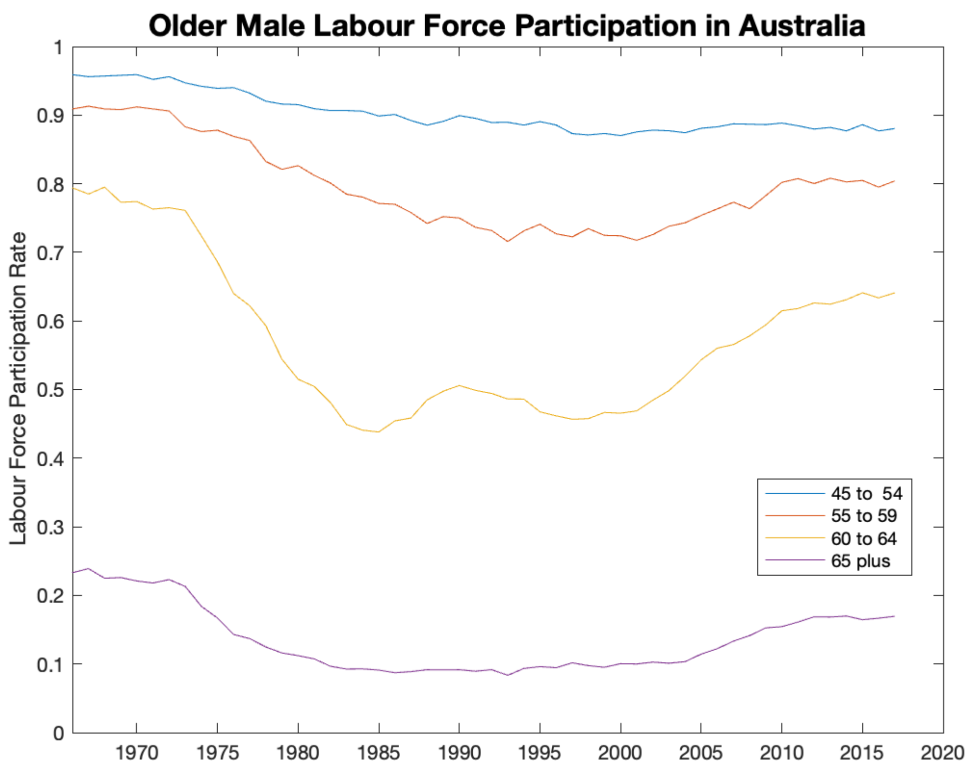
Older male labour force participation in Australia plummeted in the last three decades of the twentieth century. This paper investigates the extent to which this fall in participation was due to a large share of these older men having fought in World War II. Australian World War II veterans could access retirement and disability benefits that the rest of the population could not; they also had worse health than non-veterans. Sharp quasi-random variation in service across birth cohorts in Australia enables the effects of WWII service to be measured. WWII veterans had slightly lower labour force participation over prime working years (around 1 percentage point lower in their late 40s), and then much lower participation from the age of 60 onwards (around 17 percentage points lower in their early 60s). Sixty was the access age for the retirement pension given to veterans. Survey data indicate that the retirement expectations of veterans, when young, were clustered at this age. Various measurements of the health effects of WWII service indicate ill health is unlikely to explain the sharp fall in labour participation at sixty. Despite these findings, in aggregate, WWII service can explain only a modest share of the fall in older male labour participation in Australia in the late twentieth century, suggesting other factors must be responsible for most of the fall. These results contribute to the literature on the labour supply effects of retirement and disability programs. In particular, they are consistent with earnings tests having large effects on participation and program parameters framing retirement decisions.

*PhD Student, UNSW School of Economics. The author is indebted to Alan Woodland, George Kudrna, Peter Siminski, Todd Morris, Jeff Borland, Rafal Chomik, Gianni La Cava, and Adam Gorajek for thoughtful comments and suggestions. The author also thanks audiences at the 29th Australian Labour Market Research Workshop, the Pensions and Superannuation Seminar at CEPAR/UNSW, Sydney University, and the Asian and Australasian Society of Labour Economics 2019 Conference.

1 Introduction

The labour force participation of older men in Australia fell dramatically during the second half of the twentieth century. Figure 1 shows the labour force participation of a range of older male age groups over time. In 1970, around 80 percent of men in their early 60s were in the labour force; in 1985 less than half of such men were. Participation also fell across other older male age groups. There was a similar fall in older male participation in almost all advanced economies over the same period (Blundell et al., 2016). Changes in older-age participation are attributed to a range of factors, but the changes to retirement income systems are probably the most commonly cited factor (Gruber and Wise, 1998).[1]

Figure 1



Sources: ABS (2007), ABS (2015) and ABS (2018)

This paper investigates the role that rising eligibility for veterans' benefits played in this fall in older male participation. A very large share of older Australia men during the late twentieth century were WWII veterans, and veterans could access a range of retirement and disability programs the rest of the population could not. In examining this question, the paper aims to contribute to the large and growing literature that examines the effect of retirement and disability programs on

[1]Other commonly cited drivers of older-age participation include: prime-age participation, health status, macroeconomic conditions, spousal participation, education, and occupation.

economic outcomes using large scale changes in program parameters that can be treated as natural experiments (Vestad (2013), Staubli and Zweimuller (2013), Hernaes et al. (2016), Fetter and Lockwood (2018), Morris (2018)). This paper is also related to the literature that uses the experience of veterans to estimate the broader societal impact of government programs (Costa (1995), Fetter (2013), Autor et al. (2016)).

The main retirement income program for WWII veterans in Australia was the Service Pension. This benefit was available to those who served overseas during WWII. It was available to men from the age of 60, five years before the male eligibility age for the Age Pension (the main public retirement income program in Australia, available to almost everyone), but the two pensions otherwise had the same benefit levels and means tests. This means test included an earnings test which meant that most individuals who continued full-time work received no pension income. WWII veterans were also eligible for a disability pension to compensate for incapacity or injury caused by service. A large share of WWII veterans accessed this pension, including from quite young ages, but most accessed a version that paid a modest rate and did not attract an earnings test.

The timing of WWII, together with minimum age requirements for service, created quasi-random variation in WWII service levels across birth cohorts in Australia (Cousley et al. (2017)). This variation was striking: 28 per cent of Australian men born in 1927 served during WWII, compared to 2 per cent born in 1928. The scale of this variation in service rates allows the effect of WWII service on outcomes to be measured by comparing narrow ranges of cohorts observed in a particular census year. This allows the effect of WWII service on participation to be examined over a period of volatile macroeconomic conditions. The late 1970s and early 1980s were a period of very poor macroeconomic outcomes in Australia, and this has been identified as a cause of falling older age participation (Stricker and Sheehan (1981)).

I find that WWII Service lowered participation slightly over prime working ages, and then sharply over the age range of 60 to 64. Veterans' participation was around 3 percentage points lower over the age range 50 to 54, and then around 17 percentage points lower over the age range of 60 to 64. Focusing only on veterans who served overseas (so were eligible for the Service Pension), the effect was 27 percentage points over the age range 60 to 64. This is the age range over which veterans were able to access the Service Pension, and non-veterans were unable to access the normal Age Pension.

I provide a range of evidence that WWII service is affecting participation via the veterans programs mentioned above, rather than other mechanisms. Survey data from the early 1970s indicates that veterans expected to retire earlier than non-veterans. Their median expected retirement age was 60 versus 65 for non-veterans. Distribution regressions indicate that veterans were around 13 percentage points more likely to expect to retire by the age of 60 than non-veterans. Cousley et al. (2017) showed that there were no large differences in other relevant characteristics between veterans and non-veterans at younger ages, including in housing tenure, marital status, and education. Unsurprisingly, WWII service worsened veterans health. I document this for Australian veterans for the first time in the published literature, using mortality data and data on disability pension receipt. The adverse health effects of WWII service increased with age, but a simple accounting exercise indicates they cannot explain the participation effects of service.

Despite the magnitude of the effect of WWII service on participation, it is only able to explain a small proportion of the fall in older male participation in Australia over the end of the twentieth century. WWII service can explain only 3 percentage points of the 32 percentage point decline in labour force participation among 60-64 year olds males between 1970 and 1985. Other factors, including changes in macroeconomic conditions, must therefore explain the remainder of the difference.

These results contribute to the literature on labour supply responses to retirement and disability programs. The totality of available evidence indicates that WWII veterans had sharply lower participation from the age of 60 because of their access to the Service Pension from this age and the earnings tests attached to this benefit. This result is consistent with the existing reduced-form econometric literature, which suggests that changes in the age at which pensions can be accessed have large effects on labour supply when accompanied by financial incentives to retire (e.g. Hernaes et al. (2016), Staubli and Zweimuller (2013)). The large share of veterans who expected to retire at the Service Pension access age is also consistent with program parameters 'framing' retirement decisions (Cribb et al. (2016), Gruber et al. (2020)).

The next section of the paper explains the retirement income system in Australia and the benefits available to WWII veterans. Section 3 explores the related literature, focusing on measurements of the effects of changes in pension access ages on labour force participation. Section 4 constructs a simple theoretical model to examine the effects service and veterans' benefits might have on participation. Section 5 explains the varied data sources used in the statistical work in this paper. The primary statistical evidence offered by the paper is the relationship between cohort WWII service and participation - this is contained in Section 6. The exploration of veterans' retirement expectations is in Section 7. Section 8 examines the relationship between WWII service and health in Australia. Section 9 concludes.

2 Background

2.1 The retirement and disability income systems in Australia

The primary public retirement benefit in Australia is the Age Pension. This a non-contributory, means-tested, pension available to all persons above a specific age. From its establishment in 1909 until 2016, the access age for men was 65. For women, the access age was 60 from 1910 until 1995, after which it rose until it reached 65 in 2013. The access age for both men and women is rising gradually to 67 between 2017 and 2023.

The Age Pension has always paid a rate around 20-25% of the average fulltime wage. The means test applicable to the Age Pension has always involved an earnings test, and has usually involved an assets tests as well. The thresholds for the earnings test have varied over time. On average, over the second half of the twentieth century, the earnings test began to reduce payments if private income was above 10 per cent of average wages, and reduced payments to zero if income was above 70 per cent of average wages. The assets test was in force for all of the second half of the twentieth century, except for between 1976 and 1985.[2] Warren and Freebairn (2010) show that individuals above Age Pension access age face very high effective marginal tax rates due to the earnings test.

The primary disability income program in Australia is the Disability Pension (until 1991, it was called the 'Invalid Pension'). This was introduced at the same time as the Age Pension, and has always had the same payment rates and means tests. Eligibility requirements have evolved over time, but the primary criteria has always been a disability rendering an individuals permanently unable to work (Australian Parliamentary Library, 2011).

2.2 Government programs for WWII veterans

In many ways, the Service Pension was a substitute for the Age and Disability Pensions for veterans. It was introduced in 1935, and was intended 'to cover the indefinable and intangible effects of war service which could cause premature ageing and loss of power to earn a living' (Department of Veterans' Affairs (DVA) (1945-2000)). It was available to veterans who had (1) qualifying service *and* either (2a) attained the age of 60 or (2b) were unable to work due to disability. Qualifying service, for WWII veterans, was defined as having been deployed overseas, or having served in certain parts of Australia's Northern Territory during the period when it came under Japanese attack. The Service Pension has always been paid at the same rate as the Age Pension, and with the same earnings and assets tests.

Criteria 2a for the Service Pension creates the main difference in retirement program access for WWII veterans and non-veterans. WWII veterans could access the Service Pension from 60, while non-veterans had to wait until 65 to access the Age Pension. Criteria 2b likely did not create a meaningful difference between veterans and non-veterans, as it was substantial the same as the criteria to access the Disability Pension (which was available to everyone).

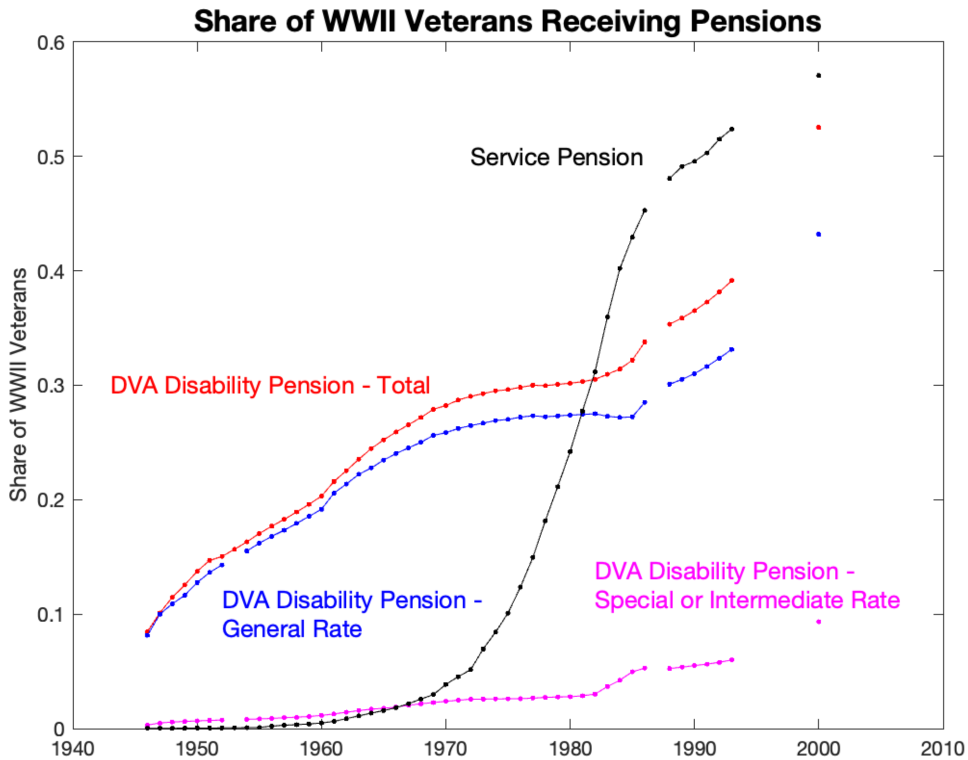
The share of WWII veterans receiving a Service Pension rose sharply during the 1970s and 1980s as the bulk of the cohort aged past 60 (see Figure 2). Most WWII veterans who took up a Service Pension during the 1960s to the 1980s qualified based on age, rather than disability.

WWII veterans did have access to more generous disability benefits than non-veterans, in respect of injuries or illneses caused by their military service. This was afforded by the Department of Veterans' Affairs Disability Pension (DVADP).[3] This was paid to veterans to compensate for incapacity caused or exacerbated by military service, without regard to age. It provided for three

[2] For further information on the Age Pension and its historical parameters, see Chomik et al. (2018).

[3] This was originally called the 'War Pension'.

Figure 2



Sources: DVA (1945-2000) and DVA (2018)

tiers of payment, in increasing order of severity of disability and payment amount: General Rate, Intermediate Rate, and Special Rate. This payment was not taxable and not means tested, although Intermediate Rate and Special Rate payments were only available to those assessed as unable to work more than 20 and 8 hours per week (respectively). Both the Service Pension and the DVA Disability Pension could be received at the same time, and income from the latter was not counted in the means test for the former. The DVADP did not require overseas service, but claims of those with overseas service were assessed using a reverse criminal onus of proof.

Several points are worth noting about DVA Disability Pension receipt among WWII veterans (see Figure 2). The first is that a significant share of WWII veterans received this pension. Given the eligibility requirement (of ill-health caused by service), this is a strong signal that WWII service had a significant negative impact upon health. Another clear feature is that the share of veterans in receipt rose over time. Around 10 per cent of WWII veterans were in receipt of a disability pension in 1946, when the median age of veterans was 28. Receipt rose rapidly over the next two decades, to 26 per cent in 1966, when the median veteran was 48. It then rose slowly to 31 per cent by 1986, and then rose more rapidly to reach 42 per cent by 1993. There was significant public debate on the criteria and validity of DVADP claims from the late 1960s onwards (Payton, 2018). While part of the rise in receipt is due to ageing exacerbating war-related illnesses, some part is likely also due to judicial and legislative relaxations of the proof needed to support a claim during the 1980s and 1990s (Lloyd (1994) and Clarke et al. (2015)). A third important feature to note is that only a small share of veterans received the higher-rate Intermediate and Special Rate payments that attracted work tests. The median General Rate payment was quite low, ranging from 20-30% of the Service Pension rate over time.

In addition to these pension benefits, WWII veterans also had access to education, housing, and healthcare benefits that the rest of the population did not (Payton (2018) and (Lloyd (1994)). Educational assistance focused on covering the costs of vocational or university education programs. Housing assistance was mainly in the form of concessional financing for housing purchases. Providing care in respect of injury or illnesses caused by service was a central part of Australia's repatriation system, and closely related to the DVADP. This was done both through a system of veterans hospitals, and by covering the costs of medical services obtained by veterans from other parts of the public health system and as well as private providers.

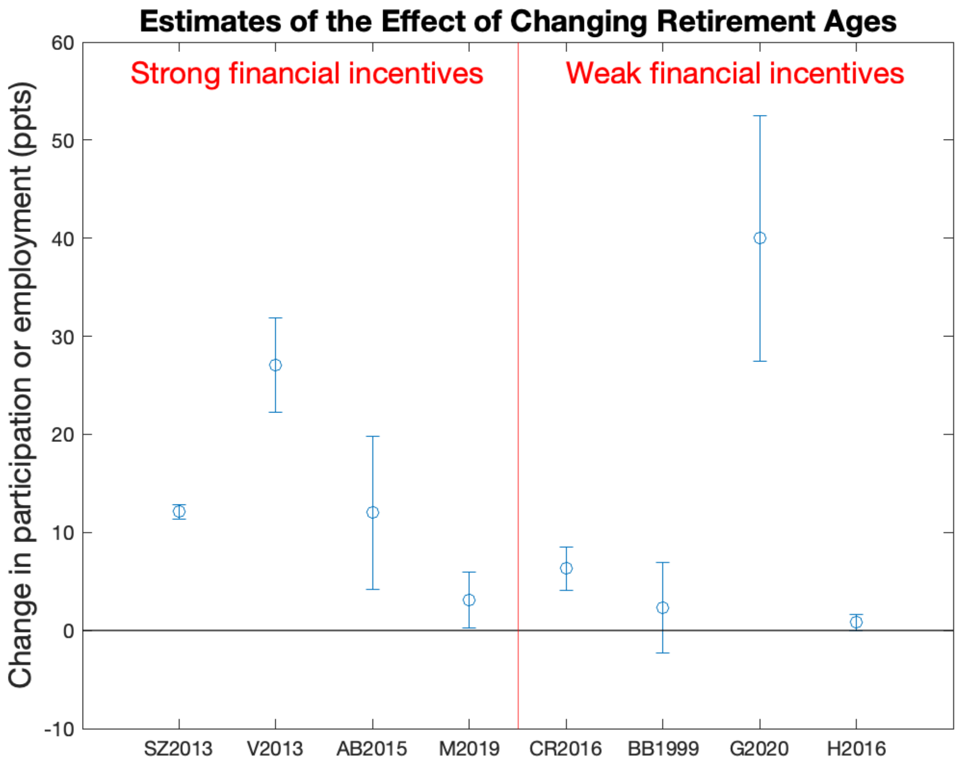
3 Relevant Literature

The most relevant literature for this paper is the one that examines the effect of changes to ages at which pensions can be accessed ('retirement ages') using reduced form econometric methods. Figure 3 below shows estimated effects on participation or employment of changes in retirement ages across papers in this literature. Care must be taken in comparing these estimates, given they come from different jurisdictions, treated populations of different ages, and different estimation methodologies. All of the estimates show the effect of raising retirement ages on employment or participation; this involves multiplying estimates by minus one for papers focusing on reductions in retirement ages.

The headline conclusion from Figure 3 is that changes in retirement ages appear to have large effects on labour force participation. The simple average of estimated effects across these papers is 13 percentage points. Figure 3 separates the estimates into those where the change in retirement age was accompanied by significant financial incentives to retire at that age, and those where it was not. Financial incentives - where present - usually take the form of an earnings test on pension income (as is the case in Australia) or the lack of a financial incentive to delay claiming beyond the retirement age. The dispersion in the magnitude of the estimates is unsurprising, given the large differences in retirement income systems across the countries studied. A number of the more recent papers use high-quality administrative data (Staubli and Zweimuller (2013), Vestad (2013), Hernaes et al. (2016), Gruber et al. (2020)); the remainder use survey data from national statistical authorities.

At the same time, another strand strand of the literature finds large participation effects even with no financial incentives. Cribb et al. (2016) examine the rise in the state pension age in the UK from 60 to 65. There were limited financial incentives to retire at this age, because the state

Figure 3



Notes: This figure shows estimates from the reduced form literature of the effect on participation or employment of changing retirement ages. SZ2013 = Staubli and Zweimuller (2013); V2013 = Vestad (2013); AB2015 = Atalay and Barrett (2015); M2019 = Morris (2019), CR2016 = Cribb et al. (2016); BB1999 = Baker and Benjamin (1999); G2020 = Gruber et al. (2020); H2016 = Hernaes et al. (2016). All estimates have been transformed to be positive. This involved multiplying the estimates from reductions in retirement ages by minus one (done for Hernaes et al. (2016), Gruber et al. (2020), Vestad (2013)). Bars show 90% confidence intervals.

pension in the UK has no earnings test, and the pension increased by an above-actuarially fair amount for each year of delayed claiming. These authors found affected women increased their labour supply by around 6.3 percentage points over the affected ages. The authors suggest that this result is likely driven by the new retirement age providing a signal as to the appropriate age at which to retire. It is worth nothing that affected individuals had around 15 years notice of this change. Gruber et al. (2020) provide evidence from a similar natural experiment that occurred in Finland in 2005. This change led to a lower range of ages being relabelled as the normal retirement age for a range of cohorts. This was accompanied by modest and largely continuous changes in financial incentives. Retirement rose by around 40 percentage points at the affected ages, which is a very large response. The authors also find a significant amount of 'regret' among the affected population - a larger share returned to work than among other retirees.

Two of estimates in Figure 3 are from Australian papers examining a rise in the Age Pension access age for females (Atalay and Barrett (2015) and Morris (2019)). The episode examined is the gradual rise in the female Age Pension access age from 60 to 65 between 1995 and 2013. This reform meant that women born on or before 30 June 1935 were able to access the Age Pension at 60, while the access age increased by six months for each subsequent 18 month birth cohort. Atalay and Barrett (2015) examine the effect of this change by comparing the participation of women born before June 1935 with later cohorts; they also follow a strategy of using male cohorts as controls. Their results indicate a rise in participation across affected ages of 12-18 percentage points. Morris (2018) and Morris (2019) re-examine this episode. Morris' key insight is that there was a strong rise in prime-age female participation across the female cohorts in question, and that this is likely to have influenced older age participation. Adding cohort controls, Morris estimates participation effects that range from 1-3 ppts. The estimation methodology used appears robust, but may have a bias towards underestimating participation effects.[4] Morris also provides evidence that the participation effects were concentrated among single and lower-wealth women, which makes sense given the means testing of the Age Pension.

The literature on the effects of disability pensions, as distinct from retirement pensions, is also relevant for this paper. Literature examining the main such program in the United States - Social Security Disability Insurance - has established that receipt reduces labour supply and earnings beyond the reduction that comes from underlying ill health. Using random allocation of applications to examiners and judges, a number of papers have found that this program reduces beneficiaries' labour force participation by around 25 percentage points (Maestas et al. (2013); French and Song (2014)). Similar results have been found for the main disability program for US veterans, Disability Compensation, which is quite similar to the DVA Disability Pension described above. Autor et al. (2016) used a change in the eligibility rules for this program to measure its effect on the labour force participation. In 2001, US veterans who served in Vietnam and had Type II diabetes were made eligible for Disability Compensation, based on studies linking this condition to exposure to Agent Orange (a defoliant used in Vietnam). The authors use US army veterans who served during the same period but were not deployed to Vietnam as a control group. Overall, the authors found that receipt of Disability Compensation lowered labour force participation by 18 percentage points. Costa (1995) examined the labour supply effects of a pension paid to Union Army veterans of the American Civil War, and found an elasticitiy of labour force non-participation with respect to pension income of 0.7.

There is evidence that the Service Pension and DVA Disability Pension lowered the participation of Australia's Vietnam Veterans. Siminski (2013) used the draft lottery for national service during the Vietnam era to examine the labour supply effects of service during this conflict. The

[4] This is simply because the cohort controls are correlated with the reforms. Morris (2019) uses cohort fixed effects and so can only measure the effects of the reform over affected ages. Any affect of the reform on participation over a wider range of ages will be removed by the cohort control.

draft lottery in Australia provides a strong instrument for both Vietnam-era service, and service in Vietnam, with the latter the condition for eligibility for the Service Pension and the reverse-criminal onus of proof for DVADP claims. Siminski found that service in Vietnam lowered employment by 37 percentage points in 2006, when the cohorts under consideration (those born from 1945 to 1952) were aged from 54 to 61. If the effect of service in Vietnam is separated into those aged under 60 and those aged 60 and over, 33 percentage points occurs prior to age 60 and around 8 percentage points from age 60 onwards. There is evidence that this very large employment effect of Vietnam service is driven by a high rate of receipt of the Special Rate DVA Disability Pension. Army service in Vietnam raised the probability of receiving this benefit by 50 percentage points. Siminski uses tax return data to show that both the employment and pension receipt effects emerged during the mid 1990s. The rate at which disability pensions were claimed by Vietnam veterans rose sharply after the 1994 Statement of Principles, which clarified eligibility for disability claims (Clarke et al., 2015) .

The early and mid-life outcomes of Australian WWII veterans have been studied using similar data and methods to the current paper. Cousley et al. (2017) examine the effect of WWII service on a range of prime and middle-age outcomes for Australian men, including labour force participation, employment, education, marriage, and home ownership. As noted above, in addition to pension benefits, WWII veterans could access education, housing and healthcare benefits that the rest of the population could not. WWII service does not appear to have had large effects on the outcomes these authors studied. They found that service had a negligible effect on participation and employment at the ages they examined.[5] They find positive, but small, effects of service on the likelihood of having a non-tertiary education (around 2 percentage points) and being married (1 percentage point). They also found that service increased the probability of owning a home (by around 1 percentage point), but decreased the probability of owning a home outright (without a mortgage; by around 7 percentage points). Aided by mortgage access programs, veterans purchased homes earlier than non-veterans, but consistent with the findings of Fetter (2013) for the United States, these differences in homeownership and mortgage indebtedness faded with age. Overall, the results of Cousley et al. (2017) indicate that WWII service did not have a large effect on early and mid-life outcomes of Australian WWII veterans.

Health is another mechanism through which military service can affect labour market activity, given a presumed negative effect of service on health, and the close relationship between health and labour market activity. Cai and Kalb (2006) document this latter relationship using Australian data. They show that moving from a self-assessed health level of 'excellent', to a level of 'poor', lowered labour force participation of males aged 50-64 from 78 percent to 62 percent.

To the best of my knowledge, no existing research examines the health or mortality experience of Australia's WWII veterans as a cohort. Bedard and Deschenes (2006) show that WWII and Ko-

[5] The latest year in which they examine labour market outcomes is 1976. In this year, the oldest members of their sample are 58 and the youngest are 42.

rean War service increased mortality rates for US veterans. These authors showed that, over the ages of 40 to 75, veterans faced annual mortality rates 0.3 ppts higher than non-veterans (mean annual mortality over these ages is 1.5%). Bedard and Deschenes (2006) also show that much of this heightened mortality was due to lung cancer, ischemic heart disease, and other respiratory diseases. Consistent with these mortality causes, these authors also show that military status raised the probability of being a smoker by around 25 percentage points, likely in part due to free provision of tobacco to soldiers. Adair et al. (2011) documents trends in male tobacco consumption in Australia that are consistent with WWII service having increased smoking. These authors also document the close association between tobacco consumption and lung cancer mortality in Australia.

4 Theoretical Model

This section provides a simple economic model to analyze the effect of being a WWII veteran on labour force participation. The model provides a framework in which to understand the statistical results presented in the subsequent sections.

This simple model is based on that presented in Fetter and Lockwood (2018); I have added only the health and disability aspects to it. It involves only one choice for individuals: the age at which to retire, r. Individuals start work at the age of 21, and continue to work until they retire at r or die at the age of 90. They receive a wage w each year they work. Differences in health and disability are modelled through different levels of the wage w. This reflects the fact that less healthy individuals often find work more difficult.

For the first type of pensions, means tested pensions, individuals receive pension payments p per year, if they are eligible for the relevant pension, if they pass the means test, and if their age is greater than or equal to the relevant access age q. Means tests for these pension are simple: individuals receive no pension income if they continue to work. Individuals eligible for the second type of pension, non-means tested disability pensions, receive a lump-sum increase in non-labour income, v.

Individuals have preferences over *lifetime* consumption, C, and *lifetime* leisure, L. This removes the need to model choices within each period, consistent with the single choice available to individuals (retirement age, r). Lifetime consumption is equal to the sum of all labour earnings and pension income, given there is no stochastic mortality and no bequest motive. Lifetime leisure is equal to years spent in retirement. Preferences are defined by a function U that is concave in both C and L. Parameter α determines the relative preference for consumption over leisure.

$$U = C^{\alpha} + L^{1-\alpha} \tag{1}$$
$$0 < \alpha < 1$$

This setup gives the lifetime budget constraint (which defines possible levels of C and L) below. Individuals with different pension entitlements and different levels of health - such as non-veterans and WWII veterans - face different values of q, v, and w.

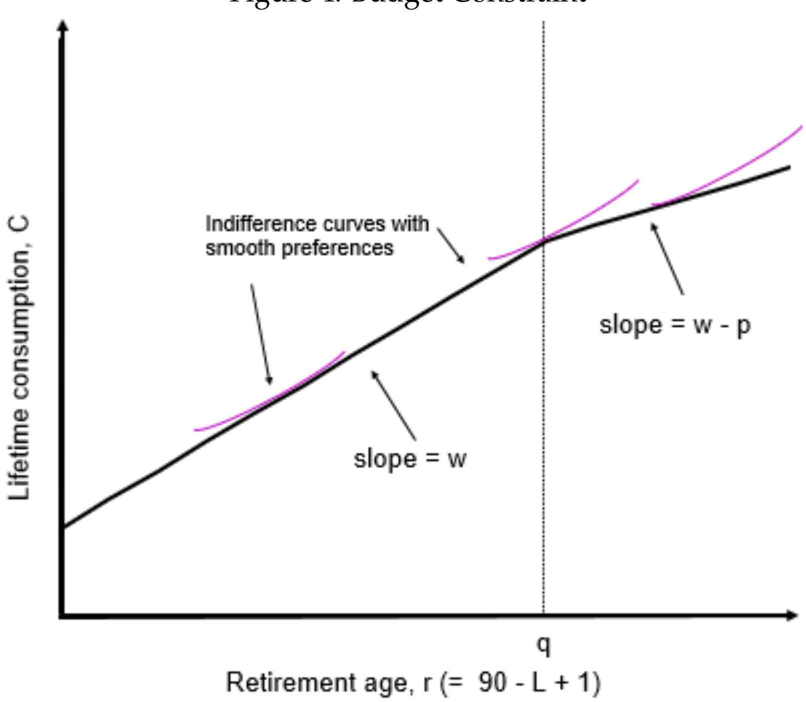
$$C = \begin{cases} (r-21)w + (90-q)p \text{ if } r \leq q \\ (r-21)w + (90-r+1)p \text{ if } r > q \end{cases} \tag{2}$$

$$L = T - r + 1 \tag{3}$$

$$r \in \{21, ..., 90\}$$

This budget constraint has a discontinuity at the access age q for the means tested pension. This 'kink' creates a point at which a large number of individuals are likely to choose to retire, given a smooth distribution of preferences for consumption over leisure within the population (values for α in this model). Figure 4 illustrates this. This figure shows the budget constraint above in r by C space. The economic explanation for the change in behaviour around $r = q$ is as follows. Individuals who retire prior to age q face only a wealth effect from the means-tested pension. Individuals who retire at or after age q face both a wealth effect and a substitution effect. The latter arises because the means test lowers the return from an extra year of work from w to $w - p$. This sharp change in incentives leads to retirement decisions clustering around the access age.

Figure 4: Budget Constraint



The optimal retirement age in this model, r^*, can be found by substituting the budget constraint into the utility function and solving the first order condition. The resulting function, which defines r^* implicity, is shown in Equation 4.

$$(1-\alpha)(90-r^*+1)^{-\alpha} = \begin{cases} \alpha w\Big[(r^*-21)w+(90-q)p\Big]^{\alpha-1} \text{ if } r^* \leq q \\ \alpha(w-p)\Big[(r^*-21)w+(90-r^*+1)p\Big]^{\alpha-1} \text{ if } r^* > q \end{cases} \tag{4}$$

Table 1 below shows a set of stylized parameter values, intended to capture the key differences between non-veterans, and WWII veterans with different pension entitlements and health conditions. Type 1 individuals are non-veterans eligible for the Age Pension and in good health. Types 2-5 are WWII veterans eligible for the Service Pension, with different levels of health and differing access to the DVA Disability Pension. Several points are worth nothing. Service Pension versus Age Pension eligibilities closely match reality: the access ages match the actual ages and five year difference, and the payment for these two means tested pensions is equal. Health differences are modelled as lower wages, with moderate bad health reducing wages by 20% and very bad health reducing wages by 50%. The DVA Disability pension, given it is not means tested, is modelled as an increase in non-labour income. Two levels of this pension are examined - the general rate for individuals with moderate bad health, and the special rate for individuals with very bad health. The amounts are set equal to the wage reduction incurred over forty years of work for each level of bad health.

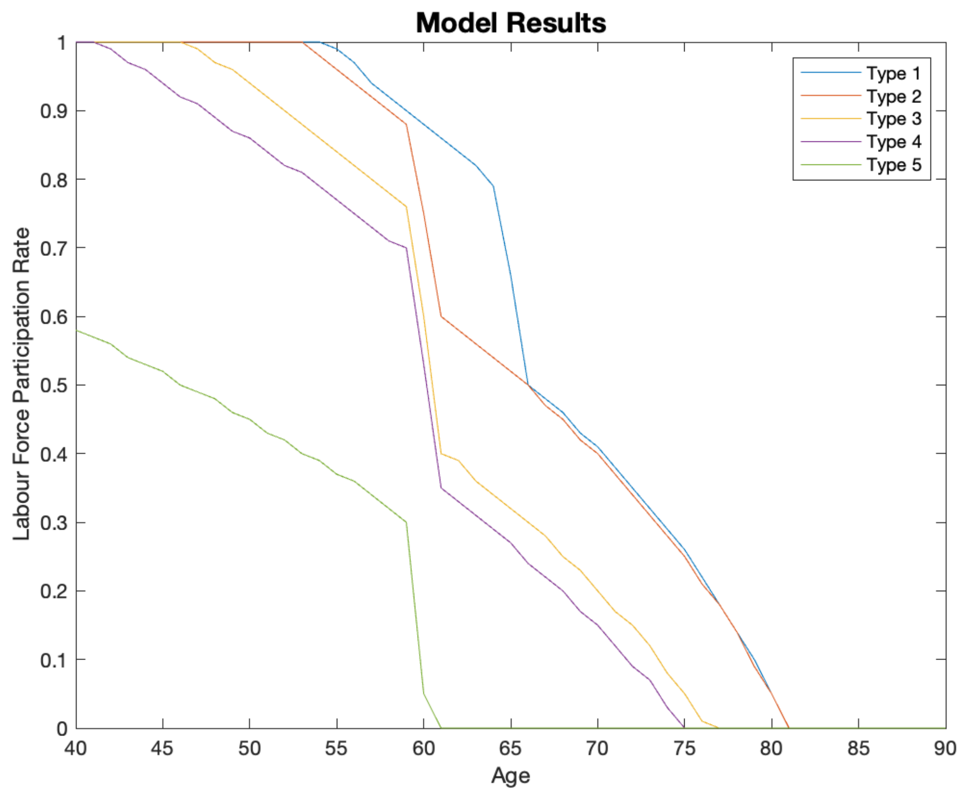
Table 1: Stylized Parameters for Different Individuals

Individual Type	**q**	**p**	**w**	**v**
1. Non-veteran, good health	65	1	2	0
2. Veteran, Service Pension eligible, good health	60	1	2	0
3. Veteran, Service Pension eligible, moderate bad health	60	1	1.6	0
4. Veteran, Service Pension eligible, moderate bad health, DVA Disability Pension - general rate	60	1	1.6	0.4*40
5. Veteran, Service Pension eligible, very bad health, DVA Disability Pension eligible - special rate	60	1	1	1*40

In order to characterise the labour force participation of individuals of these different types, I consider a population of 100 individuals of each type. These individuals have α values evenly spaced between 0.48 and 0.58. For type 1 individuals, these alpha values lead to r^* ranging from 55 to 81. Figure 5 transforms these optimal retirement ages into labour force participation profiles for each type group over the ages 40 to 90.

Consider first the optimal retirement ages and labour force participation of type 1 individuals in this model - non veterans. As noted above, a large share of these individuals choose to retire

Figure 5



at the access age for the Age Pension (65) and this translates to a large fall in labour force participation at this age. Comparing the results for type 1 and type 2 individuals shows the effect of Service Pension eligibility in this model. The earlier access age for the Service Pension (60) causes clustering in retirement ages at this age, and shifts the large fall in participation to this age. Type 2 labour force participation is also slightly lower than type 1 participation over ages less than 60. This difference is caused by a wealth effect coming from five extra years of pension eligibility.

The difference between type 2 and type 3 labour force participation shows the effect of moderate bad health in the model. The lower return to work faced by less healthy individuals causes a fall in labour force participation across all ages. In particular, there is a large increase in the share of the population who retire at the pension access age. This is because the lower wage available to type 3 individuals means their effective wage after the pension access age (wage less pension lost from continuing work) is a smaller share of their pre-pension wage (0.6/1.6 = 37.5% versus 1/2 = 50% for Type 2).

The difference between type 3 and type 4 labour force participation shows the effect of General Rate DVA Disability Pension receipt in this model. This pension enters the model as an increase in non-labour income and thus lifetime wealth. Individuals respond to this increase by purchasing more of the two things they value: consumption and leisure, and thus work less at all ages. This fall in participation is not concentrated around the pension access age.

Comparing type 5 with type 4 shows the effect of very bad health coupled with the (higher rate) Special Rate DVA disability pension in the model. These changes drastically lower participation across all ages. The vast majority of this fall in participation is caused by health (modelled by a wage that is 50% of that of healthy individuals). Consistent with the effects of moderate bad health, very bad health further increases the share of individuals who retire at the pension access age. No type 5 individuals work beyond the age of 61.

Overall, this simple modelling exercise highlights several stylized facts for the effects of pensions and health on participation decisions:

- Substitution effects, driven by pension earnings tests, can cause large changes in participation at pension access ages;
- Wealth effects are likely to drive modest changes in participation. These changes should manifest over a broader range of ages than substitution effects; and
- The effects of health and disability on participation can be large, and can manifest across a range of ages. Health effects that lower economic returns to work may increase the fall in participation at pension access ages.

These stylized facts are useful in interpreting the statistical results presented below.

5 Data

This section explains the main data sources used in the paper. Given that the period of interest is a significant time ago - the late twentieth century - data covering the outcomes of interest is not easily available.

5.1 Population-level data on service and participation

No existing large-scale dataset contains information on both labour force participation and veteran status over the period of interest. Instead, I follow the approach of Cousley et al. (2017) and measure these items for single year birth cohorts by combining a range of different datasets. While there is a statistical justification for using cohort level data (discussed below), it is also one of the few ways to examine the relationship between labour force participation and WWII service.

The first part this dataset comes from the 1933 and 1947 Australian censuses, and the eight five-yearly censuses conducted between 1966 and 2001. These data sources provide counts of Australian men by labour force status, single year of age, marital status, and country of birth. I limit my sample to men born in Australia, as I have no way to measure of the WWII service of men born overseas. The date of each census is known, so each single year age group at each census can be assigned to a particular birth year. Most censuses were conducted on 30 June, so financial years (July to June) are used to define birth cohorts instead of calendar years. These data allow counts of surviving men from each birth cohort to be constructed, as well as the outcome variable, the labour force participation rate at each census date. The five-yearly timing of the censuses conducted from 1966 means that the participation rate of each birth cohort is observed every five years during the latter part of the twentieth century.

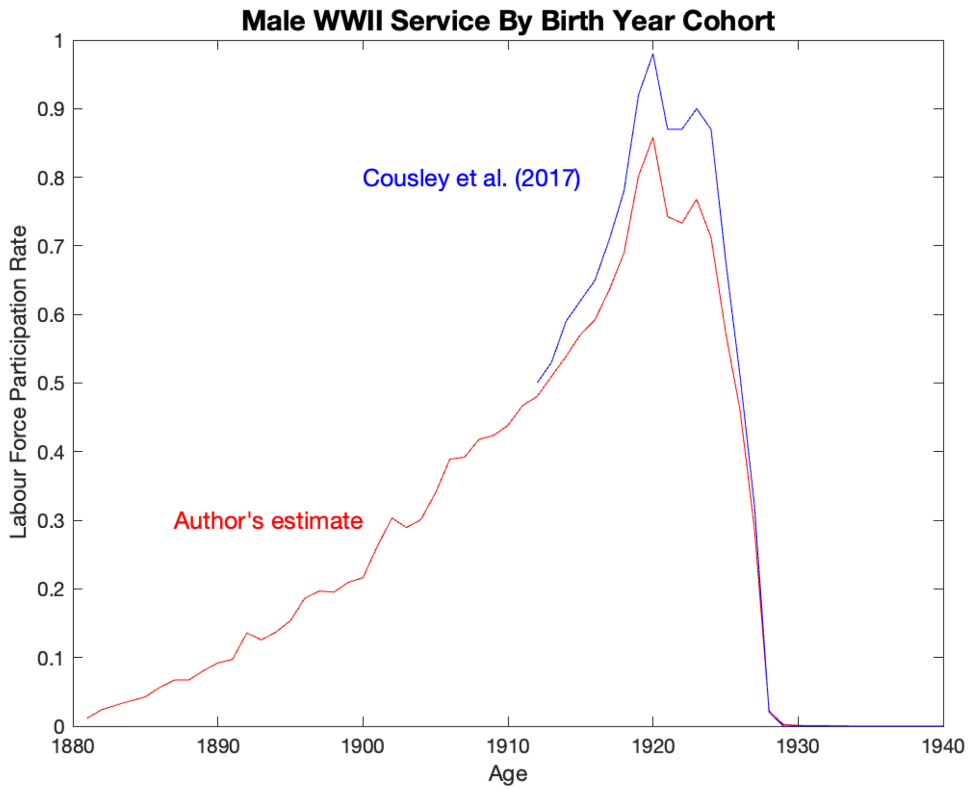
Australian censuses have never asked about veteran status. As done by Cousley et al. (2017), I instead rely on the WWII Nominal Roll, a comprehensive list of all persons who served in Australia's armed forces during this conflict (Department of Veterans' Affairs (DVA) (2018)). The Nominal Roll contains full names, dates of birth, periods of service, place and country of birth, and whether or not an individual died during service. The date of birth data allow counts of the number of individuals from each birth year cohort who served in WWII to be constructed. The country of birth data allows these counts to be limited to men born in Australia (consistent with my approach to the census data). Combining these numbers with estimates of birth cohort size from the 1933 census provides a measure of the share of each male birth year cohort that served in WWII.

My calculated birth cohort service shares are shown in Figure 6, which clearly illustrates the large variation in the proportion of men who joined the armed forces during World War II across a narrow range of Australian birth year cohorts. My birth cohort service shares differ from those calculated by Cousley et al. (2017). This is due to use of different versions of the Nominal Roll, quite different methods used to clean the data, and my focus on Australian-born men (versus men who came to Australia prior to WWII).[6] The largest differences between my shares and those calculated by Cousley et al. (2017) are for the 1919 to 1925 cohorts: differences for these cohorts average 13 percentage points. Most of this difference is driven by my identification of female veterans, who were overwhelming born during these years. Cousley et al. (2017) deflated veteran counts across all birth years by 5% to account for female veterans.

Given one of the key mechanisms through which WWII Service may have affected participation was eligibility for the Service Pension, I need to measure the share of veterans with qualifying service (basically, service overseas, see Section 2). The Nominal Roll does not provide this information, but a number of surveys conducted by the ABS during the second half of the twentieth century do (ABS (1966), ABS (1971), ABS (1979), ABS (1984)). These were large surveys of the Australian population, and they sought to ascertain the number of surviving veterans and dependents from a number of conflicts. The first two of these surveys, conducted in 1966 and 1971 respectively, provide the share of WWII veterans with qualifying service by 5-year age cohorts. The results of these two surveys are reasonably consistent, and indicate that around 73 per cent of WWII veterans surviving to these years had qualifying service. The share with qualifying ser-

[6]The data-mining and text analysis techniques I use to clean the data are detailed in the Supplementary Material.

Figure 6



Sources: Cousley et al. (2017), DVA (2018) and ABS (1933)

vice is between 60% and 80% for all relevant birth cohorts.[7] The share with qualifying service is slightly higher for veterans aged in their 40s in 1966 (born between 1917 and 1926). Such men would have been aged 18-27 in 1944. I apply these five-year age cohort qualifying service shares to my birth cohort service shares to obtain estimated of the share of each birth cohort that undertook qualifying service during WWII.

5.2 Survey data on retirement expectations

To augment my primary results on the labour force participation of veterans, I examine the retirement expectations of veterans prior to middle age. The dataset I use for this approach is individual-level survey data from the 1973 Social Mobility in Australia Project (Broom et al. (1977)). This survey was one of the earliest research-driven household surveys conducted in Australia. It was conducted by academics at the Australian National University, with methodological assistance from the Australian Bureau of Statistics. This survey used a similar methodology (e.g. sample selection and stratification) as the survey used to compile official labour force statistics for Australia, but covered a smaller sample of around 5,000 households. Importantly, it asked about

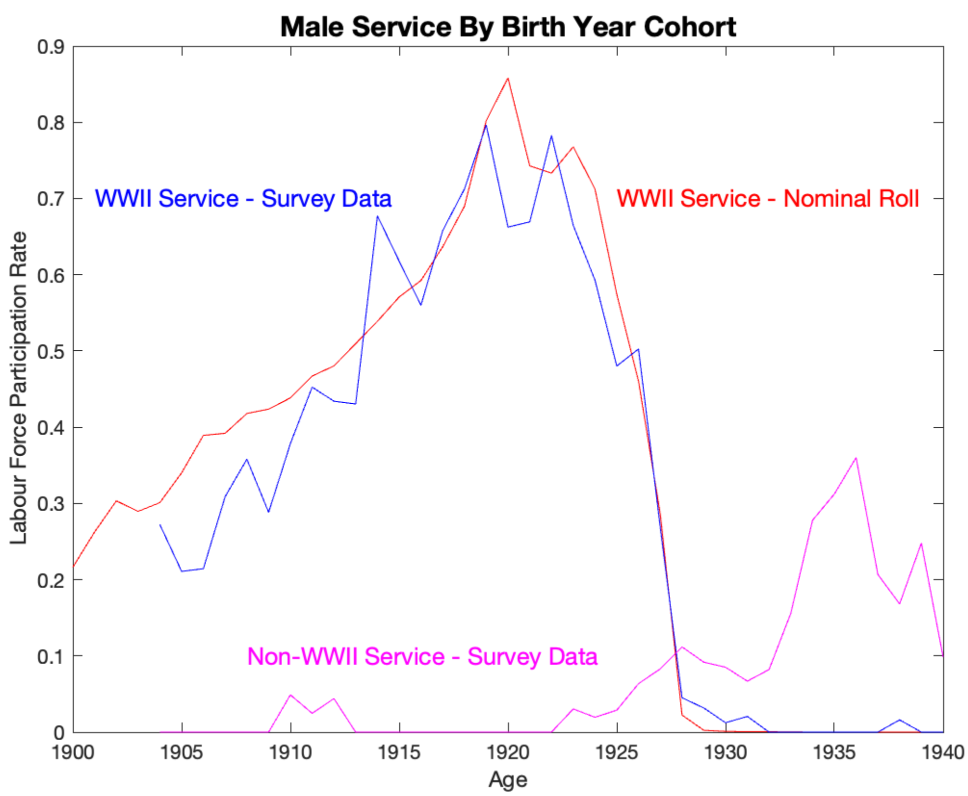
[7] See Supplementary Material for a graph.

both veteran status, period of service, labour force participation, and retirement expectations. The survey contains other useful demographic data, including education data and marital status.

The survey sought detailed responses from men aged 30 to 69 in the surveyed households. Each individual can be assigned to a birth financial year based on the date of each interview and age at interview. Given these two pieces of information leave some uncertainty as birth financial year of some individuals, I adopt a probabilistic approach, which is detailed in the Supplementary Material. The men surveyed were born in financial years from 1904 to 1944. Periods of service provided in the data can be used to check whether each individual served during WWII.

By birth cohort, the share of individuals who served in the armed forces during WWII is reasonably similar to the population level estimates from Section 5.1. This comparison is done in Figure 7. The small divergence for the 1929-1932 cohorts is worth noting. The survey data indicate around 2% of men in these cohorts served, while the nominal roll data indicates that almost none did. One possible explanation for this is falsification of birth dates upon enlistment such that individuals appeared to be above the required age for enlistment. These falsified birth dates would have remained on service records for some individuals, and thus made their way into the Nominal Roll. Measurement error, given the small sample size for the survey, is another possible explanation.

Figure 7



Sources: Broom et al. (1977), DVA (2018) and ABS (1933)

As indicated in Figure 7, a significant share of individuals in the survey indicated that they served in Australia's armed forces during periods other than WWII, particularly among cohorts born in the 1930s. Most served for less than a year, and started their service between the years of 1951 and 1958. This aligns with the parameters of Australia's 1950s National Service Scheme, which required eighteen year-olds to undertake training in the armed forces for six months (AWM 2017). Some of the individuals with service during the 1950s may have served in the Korean War, but likely only a small share given the number of Australians who fought in Korea. The Korean War Nominal Roll has around 18,000 entries - this is equivalent to about 5 per cent of the 1933-40 male birth cohorts (which are those with elevated non-WWII service). National Service did not allow individuals to access the Service Pension, but service in Korea did.

This survey asked (unretired) men about their expected retirement age only if an individual responded in the affirmative to an initial question on whether they had thought about retirement. So there is selection into the retirement expectations dataset. This suggests a need to control for this selection when modelling retirement expectations. To do this well, a variable that influences whether an individual has thought about retirement, but does not influence retirement expectations, is needed. The survey included a range of psychological type questions, and I select three to model this selection. For all questions, individuals were asked to 'select the statement that is more true as far as you are personally concerned'. In the modelling below, I include dummy variables that indicate an individual chose the response highlighted in bold.

- Question 1:
  - I have often found that what is going to happen will happen; OR
  - **Trusting to fate has never turned out as well for me as making a decision to take a definite course of action**.
- Question 2:
  - **In my case getting what I want has little or nothing to do with luck**; OR
  - Many times we might as well decide what to do by tossing a coin.
- Question 3:
  - **What happens to me is my own doing**; OR
  - Sometimes I feel that I don't have enough control over the direction my life is taking.

5.3 Health data

Data on the health of WWII veterans is necessary to measure the magnitude of the effect of WWII service on health, and examine how the health effects of WWII service may have influenced participation. Such data are, unfortunately, very scarce. For this reason, proxy measures of health are used.

The first proxy is mortality, which is well-measured for each single year birth cohort over the period of interest. Mortality data by calendar year birth cohort, single year of age, and sex, are available from the Human Mortality Database (Human Mortality Database, 2018). These data are based on compilations of Australian Bureau of Statistics data, and official data from predecessor statistical agencies. They cover all persons resident in Australia, and cannot be disaggregated into those born in Australia and those born overseas.

The second proxy used, is receipt of the DVA Disability Pension. Receipt of this benefit required ill health or incapacity that was caused by military service. Thus it is a direct measure of the number of WWII veterans with health conditions attributable to their service, albeit one that is likely subject to a range of biases (see Section 8.1). Data on receipt of this pension, broken down by pension type, is available from annual reports of the Department of Veterans' Affairs for most years of the twentieth century. Figure 2 shows the available data.

These proxy measures allow the health effect of WWII service to be quantified. Translating this health effect into an effect on labour force participation needs a dataset that contains data on both participation and health for men over a range of ages. No available Australian dataset from the twentieth century does this. Instead, a more modern dataset is used: the Household Income and Labour Dynamics in Australia ('HILDA') survey over 2001-16 (DSS and Melbourne Institute (2017)). HILDA is the main modern household panel dataset used for economic research in Australia. The health variable I use from this dataset is self-assessed health. This is a reasonably common measure in which individuals are asked to self-assess their health into five categories: Excellent, Very Good, Good, Fair, and Poor. Self-assessed health is a fairly commonly used measure, and one that is highly correlated with objective measures of health (Cai and Kalb, 2006).

6 Labour force participation

The section examines the effect of WWII service on labour force participation using statistical methods.

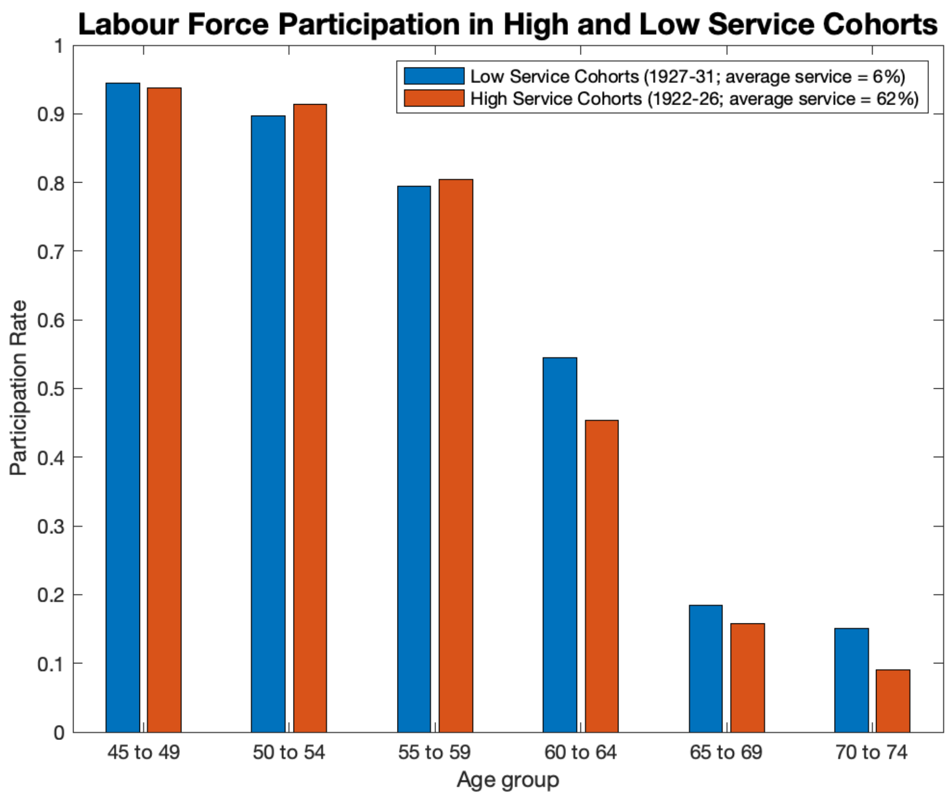
6.1 Statistical Methodology

As is apparent from Figure 6, there is a large discontinuity in the proportion of men who joined the armed forces during World War II across a narrow range of Australian birth cohorts. This variation was first identified by Cousley et al. (2017), and Section 5.1 shows that the same variation exists for qualifying service during WWII. This variation in WWII service was driven by minimum ages for enlistment combined with very high rates of service among cohorts that were eligible. Minimum ages for service ranged from 18 to 20 over the course of the war (Mark Johnston (1996)). Beaumont (1996) highlights that the high rates of enlistment for overseas service were driven by a sense of duty to a British Empire that many Australians still felt a strong connection to. Enlistment to fight overseas spiked after the defeat of France and the isolation of Britain (see Beaumont (1996) p 9).

Conscription also drove some part of the variation. It was introduced in 1939, but initially only required service within Australia and a few Australian-administered territories. In 1943, a change was made that allowed conscripts to be sent to conflict zones in the South Pacific.

This variation in WWII service across birth cohorts is quasi-random, given it was caused by age limits on service and the timing of WWII. It is likely to be uncorrelated with other differences between these birth cohorts. I use this quasi-random variation across cohorts to examine the effect of WWII service on participation, by comparing outcomes across cohorts with high and low participation. Figure 8 provides a simple graphical version of this approach. It uses census data to compare the labour force participation of a range of cohorts with high WWII Service to a range of cohorts with low WWII Service. Consistent with the statistical results I will present below, a large difference in participation is apparent for the age range of 60 to 64.

Figure 8



Sources: DVA (2018) and ABS (1933)

Consistent with the graphical evidence, and the predictions of the theoretical model, I take a statistical approach that allows WWII service to affect labour force participation differently at different ages. To do this, I estimate separate models for each 5-year age group from 45-49 to 70-74. For each age group estimation, I use data from the same range of birth cohorts ('cohort bandwidth'). The baseline cohort bandwidth is 1918 to 1934, which means each regression has only 17 observations. This bandwidth is centred on the largest variation in cohort service levels, and is the same as that used by Cousley et al. (2017).

The statistical model I use for each age group regression is shown in Equation 5: j indexes age groups, b indexes cohorts, and t indexes census years. Each age group model includes a constant (β_0^j), a continuous age variable ($\beta_1^j \times age_b^j$) - capturing the fact that participation falls with age for reasons unrelated to retirement programs, census year dummy variables (δ_t^j), and the service share of each cohort ($\beta_2^j \times service_b$). As noted above, all of the parameters are allowed to differ across the separate regressions for each age group. Different β_2^j's across age groups/models allow the effect of service on participation to differ with age. Allowing β_0 and β_1 to differ across age groups allows the average level and rate at which participation falls with age to differ across age groups, consistent with observed participation rates. Different census year fixed effects for each age group should capture changes in other policies and macroeconomic conditions that may have different effects on different age groups, including other retirement income policies. It is worth noting that the census year effects are equivalent to cohort effects for five-year birth cohorts. I estimate the model via ordinary least squares.

$$LFP_b^j = \beta_0^j + \beta_1^j \times age_b^j + \sum_t \delta_t^j \times 1\{yearObserved_b^j = t\} + \beta_2^j \times service_b + e_b^j$$
$$\text{for } j \in \{45\text{-}49, 50\text{-}54, 55\text{-}59, 60\text{-}64, 65\text{-}69, 70\text{-}74\} \quad (5)$$

This is a somewhat unusual model, and an example can make it more concrete. When estimating this model for the 60-64 age group, the 17 observations come from the 1981, 1986, 1991 and 1996 censuses (so t is a summation over these census years). These are the census years in which the 1918-1934 birth cohorts were observed while aged between 60 and 64.[8]

Identification of the parameters of interest in this statistical model (the β_2^j's) comes from the relationship between participation and service shares within cohorts observed in each census year. The precise identification assumption is that within the range of cohorts observed at each census (usually 5), other influences on participation, other than those related to age, are uncorrelated with differences in service.

Almost all of the reduced form literature cited in Section 3 uses differences in cohort eligibility for programs to measure their effect. The main choice when doing this is the level of control for other differences across cohorts to include. Some of the recent literature uses cohort fixed effects as timely as the cohort variation (e.g. Cribb et al. (2016) and Morris (2019) used single year and six month cohort fixed effects). The equivalent here would be birth cohort year fixed effects. This approach works by identifying the effect of a pension program as the change in participation between before and after the access age. It does not allow the measurement of program effects prior to access ages (e.g. from wealth effects) and may understate their effect after access ages if their are significant earlier effects. The opposite extreme is that of Atalay and Barrett (2015) which

[8] Table 1 in the Supplementary Material shows which parts of the dataset are used for each age group regression.

includes no controls for other differences across birth cohorts. While this allows consideration of effects across a broader range of ages, it could lead to biased estimates when there are other large differences across cohorts.

The census year fixed effects used in the model in this paper are equivalent to having five year birth cohort controls. This, combined with the quasi-random nature of WWII service across birth cohorts likely gives the model better identification than past Australian literature focusing on the rise in the female Age Pension access age (Atalay and Barrett (2015), Morris (2018), Morris (2019)). The cost of this better identification is a less focused research question: this regression measures the effect of WWII service, not eligibility for the Service Pension.

Using birth cohort differences in service, rather than individual-level differences, is often done to alleviate concerns with selection into military service (Angrist and Krueger (1994) and Bedard and Deschenes (2006)). This selection may arise because of health or intelligence requirements for enlistment. The key idea is that differences across cohorts in health or intelligence are likely to be much smaller than differences between individuals. While this argument holds true here, it is less important here given the lack of individual-level data on WWII service.

Table 2 contains key descriptive statistics of the dataset explained in this section.

Table 2: Summary Statistics for Labour Force Participation Dataset

	Mean	Standard deviation	Minimum	Median	Maximum
Labour Force Participation	0.57	0.34	0	1	1
Age	59.56	8.69	45	60	74
Census year	1985.56	10.03	1966	1986	2006
WWII service share	0.37	0.33	0	0.50	0.80
WWII qualifying service share	0.28	0.25	0	0.33	0.61
Birth cohort	1926.00	4.92	1918	1926	1934
Observations	102				

6.2 Results

Table 3 and Figure 9 show the results from the model explained above. The effect of WWII service on labour force participation is significantly different from zero over the age ranges from 45-49 to 60-64. The magnitude of the effect of WWII service increases steadily over early middle age: -1.3 percentage points at ages 45-49, -2.7 ppts at 50-54, -6.6 ppts at 55-59. It then jumps dramatically to -16.7 ppts for the 60-64 age group. [9] Point estimates for older age groups (65-69 and 70-74) are economically meaningful when compared to participation at these ages, but are not statistically significant.

[9]The p-value for a test of whether the effect of service is the same across ages 50 to 59 versus 60 to 64 is 0.15.

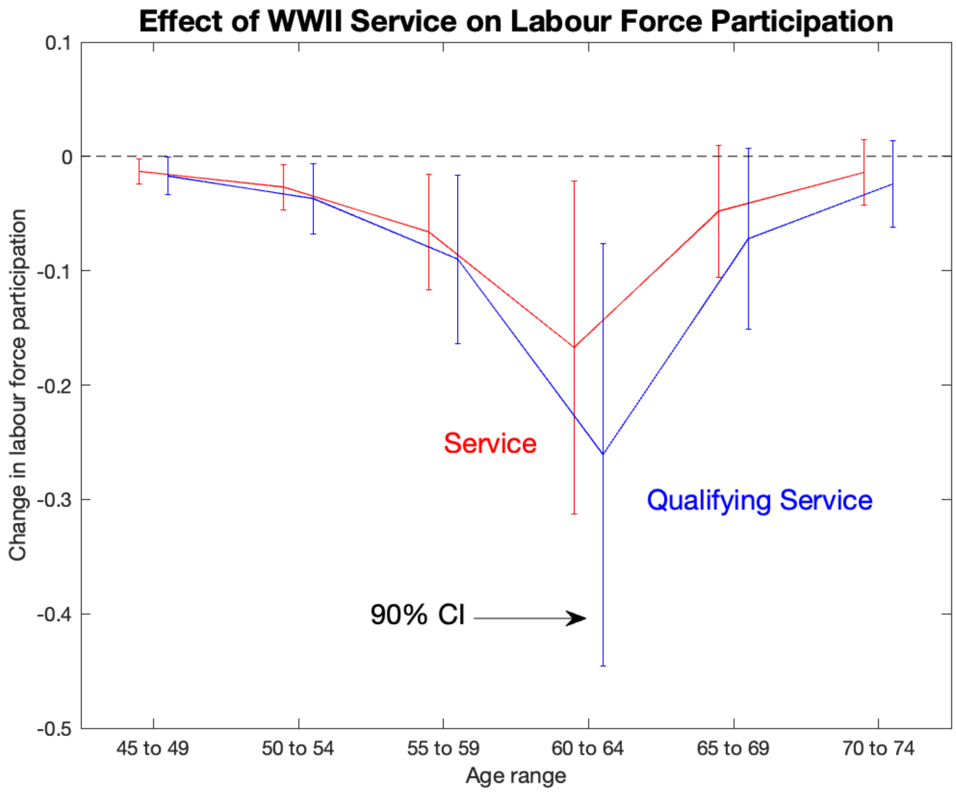
Table 3: Results from Baseline Model using Service

	45-49	50-54	55-59	60-64	65-69	70-74
service	-0.013*	-0.027**	-0.066**	-0.167*	-0.048	-0.014
	(0.006)	(0.011)	(0.028)	(0.081)	(0.032)	(0.016)
age	-0.003***	-0.007***	-0.023***	-0.046***	-0.022***	-0.009***
	(0.000)	(0.001)	(0.003)	(0.002)	(0.003)	(0.001)
Census Year=1971	-0.021***					
	(0.001)					
Census Year=1976	-0.021***	-0.004				
	(0.004)	(0.003)				
Census Year=1981	-0.038***	-0.037***	-0.058***			
	(0.005)	(0.008)	(0.008)			
Census Year=1986		-0.049***	-0.105***	-0.065***		
		(0.010)	(0.020)	(0.010)		
Census Year=1991			-0.151***	-0.064	0.003	
			(0.025)	(0.061)	(0.007)	
Census Year=1996				-0.134**	0.004	-0.002
				(0.059)	(0.024)	(0.003)
Census Year=2001					0.051*	0.051***
					(0.027)	(0.012)
Census Year=2006						0.011
						(0.013)
constant	1.089***	1.282***	2.194***	3.465***	1.633***	0.732***
	(0.016)	(0.043)	(0.129)	(0.155)	(0.168)	(0.063)
Observations	17	17	17	17	17	17
Rsquared	0.986	0.977	0.982	0.977	0.956	0.990

Notes: Estimates from the model explained in Section 6.1 using service. The model for each age group is estimated using birth cohorts from 1918 to 1934. Ordinary robust standard errors are shown in parentheses under each estimate. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels.

Other covariates in this baseline model are consistent with the broad patterns in older age participation in Australia. Labour force participation falls quickly with age between the ages between 55 and 69 (between 2 and 5 percentage points per year). The census year fixed effects

Figure 9

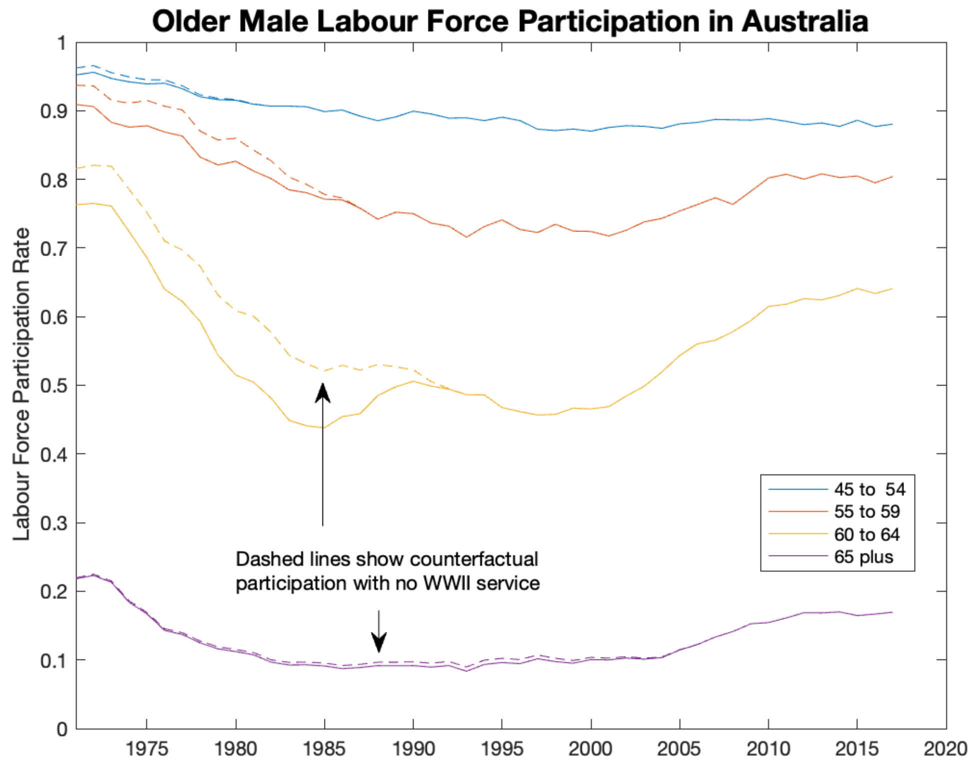


are large and statistically significant, indicating that a large share of the fall in participation was driven by factors other than WWII service. Indeed, these estimates of the effect of WWII service on participation, if translated into effects on the participation of older male age groups during the late twentieth century, accounts for only a modest proportion of the fall in participation during this period. Figure 10 compares actual participation to counterfactual participation profiles calculated assuming zero WWII service. This is done by multiplying the estimated effects of WWII service in Table 3 by the share of WWII veterans in each age group. The largest impact is in the 60 to 64 age group, but even this is a small proportion of the overall fall in participation. Rising WWII service lowered the participation of this group by 3 percentage points between 1970 and 1985; only a small proportion of the 32 percentage point fall in participation among this group over this period. Intriguingly, falling WWII service is responsible for almost all of the 6 ppt rise in participation for this group between 1985 and 1990. This was driven by the WWII veteran share of this age group falling from 50 per cent to 10 per cent between these years.

Figure 9 also shows the results from the version of the model that uses *qualifying* service rather than all WWII service.[10] The effects of qualifying service show a similar age pattern to those for service. They are estimated to be around 40% larger than those of service, which is consistent with

[10] Regression results from this version of the model are in the Supplementary Material.

Figure 10



Sources: ABS (2007), ABS (2015) and ABS (2018)

data indicating that roughly 70 per cent of WWII veterans had qualifying service. In addition, the effect of service increases more between the ages 55 to 59 and ages 60 to 64 in this version of the model: 17 percentage points compared to 10 percentage points in the model using service. The p-value for a test of whether the effect of service is the same across ages 50 to 59 versus 60 to 64 in this model is 0.07.[11]

Overall, these results indicate that WWII service lowered the labour force participation of older men in Australia. The effect of WWII service on participation is modest in early middle age, and then very large over the ages 60 to 64, particularly for veterans with qualifying service. This sharp fall in participation at the age of sixty is consistent with the effects of Service Pension eligibility in the theoretical model in Section 4. In that model, the earnings test applicable to this pension created a strong substitution effect that drives many individuals to retire at the access age. In that model, the size of the fall in participation can be increased by poor health. This could underlie the large estimate here (27 percentage points for eligible veterans). The more modest participation effect of WWII service prior to the age of 60 are could be driven by lower veteran health or wealth effects from the Service Pension have in the theoretical model.

[11]For the model that uses service, the same statistic is 0.15. Both estimates come from regressions that nest multiple age group models.

How comparable are these estimates to other estimates of the effect of military service and pensions on participation in Australia? These participation effects are very different to those found for Vietnam Veterans by Siminski (2013). The participation of Vietnam Veterans with qualifying service was around 33 per cent below non-veterans in their late 50s, and then fell by another 8 per cent at the age of sixty. The effect of WWII service on participation prior to the age of 60 was an order of magnitude lower than this. The earlier fall in the labour force participation of Vietnam Veterans was likely due to the much wider take-up of the Special Rate DVA Disability Pension, perhaps due to a loosening in eligibility that occurred during the early 1990s. Over 50% of Vietnam Veterans received this pension at the ages examined, whereas takeup of this pension was probably below 10% for WWII veterans at similar ages.

The magnitude of the estimated effect of qualifying service on participation over the ages of 60-64 (-27 percentage points) is an order of magnitude larger than one estimate of the rise in participation caused by removing access to the Age Pension for women in the same age group (Morris (2018) and Morris (2019); 1-3 ppts), and roughly 50% larger than the other estimate for this episode (Atalay and Barrett (2015)); 12-18 ppts). Different treated populations and different mechanisms likely underlie my larger estimates. The effect of qualifying service is not just that of eligibility for the Service Pension. Per the theoretical model in Section 4 it is also likely that of ill health, and ill health can also increase the share of the population that retires at the pension access age. Wealth effects from the DVA Disability Pension may also increase the size of the participation effect for WWII veterans. Another part of the explanation for this difference is likely to be the differing shares of affected men and women who worked at younger ages, and thus differing levels of human capital. Around 70 per cent of men aged 55-59 worked during my sample period; during the withdrawal of the Age Pension that Morris (2019) considers, around 50 per cent of women in this age group worked.

6.3 Robustness

A number of tests and alternative estimations aimed at checking the accuracy of the results set out above were undertaken. The first of these was a placebo test in which male labour force participation is replaced by female labour force participation. This was easily passed, with the male WWII service of a birth cohort having no statistically significant relationship with the female labour force participation of the cohort. This indicates that other influences on cohort labour force participation - that influenced both male and female participation - are not driving the estimated relationship between male WWII service and participation. A second robustness check was to widen the range of birth cohorts used. This change had no meaningful effect on the results.[12]

[12] Graphical versions of the results of both of these robustness checks are in the Supplementary Material.

7 Retirement expectations

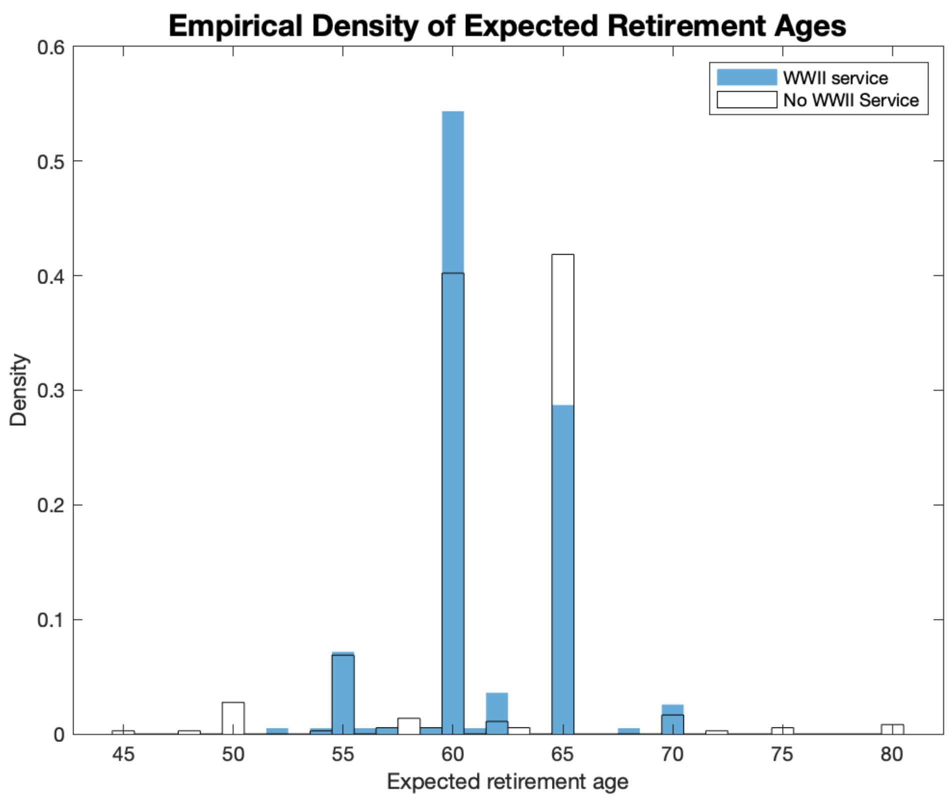
Section 6 showed that WWII service lowered the labour force participation of older men in Australia. This section delves into the mechanism behind this effect by examining the effect of WWII service on male retirement expectations at earlier ages.

7.1 Statistical Methodology

This section explains the statistical approach used for the retirement expectations dataset (see Section 5). Given the purpose is to examine retirement expectations, this dataset is limited to unretired men aged 39 to 54 at the time of the survey. These men were born from 1919 to 1934, making this group very similar to the baseline cohort used in Section 6.

Figure 11 shows the empirical distribution of expected retirement ages in this dataset, separated into those for WWII veterans and those for non-veterans. WWII veterans were around 15 percent more likely to expect to retire at the age of 60 compared to non veterans.

Figure 11



Source: Broom et al. (1977)

There are significant differences between veterans and non-veterans in the sample, so there is a need to go beyond this graphical approach. The simplest example is age: as shown in Figure 7, veterans in the dataset were, on average, born before non-veterans. I use distribution regression to measure the effect of WWII service on retirement age, while also controlling for other factors (Foresi and Peracchi (1992)). Distribution regression involves running a series of regressions where the dependent variable is a binary variable defined by a increasing threshold level of an outcome variable. Effectively, this method seeks to model the cumulative distribution function of the outcome variable. In this case, the outcome variable is expected retirement age, and threshold age levels of 55 to 69 are used. At each threshold age level, a probit model is used to model the resulting binary dependent variable.

The model used is shown in Equation **??** below: i indexes individuals, and Y_a are the threshold age levels used. Φ is the standard normal distribution. Controls in the model include a quadratic of age, and dummy variables for whether an individual is married, employed, and their highest level of education. There are seven education levels, ranging from non-completion of primary school to a university qualification. π_3 measures the relationship between WWII service and retirement expectations: it is the parameter of interest.

$$
\begin{aligned}
Pr(ExpectedRetAge_i \leq Y_a)) = \Phi(\pi_0 + \pi_1 \times age_i + \pi_2 \times (age_i)^2 + married_i \\
+ employed_i + education_i + \pi_3 \times service_i + e_i) \\
Y_a \in \{55, 56, ..., 69\} \qquad (6)
\end{aligned}
$$

It is important to note that the model used with this dataset does not control for selection into service. If individuals who served in WWII are healthier or more intelligent than those within their cohorts who did not serve, this could bias the estimated effects of service in these models. There is no way to control for this type of selection with this small survey dataset. Relying on differences in cohort service to measure the effect of service would likely fail, because the small number of individuals in the sample in each cohort means other differences between cohorts are likely to be large. Summary statistics for the data used are shown in Table 4.

7.2 Results

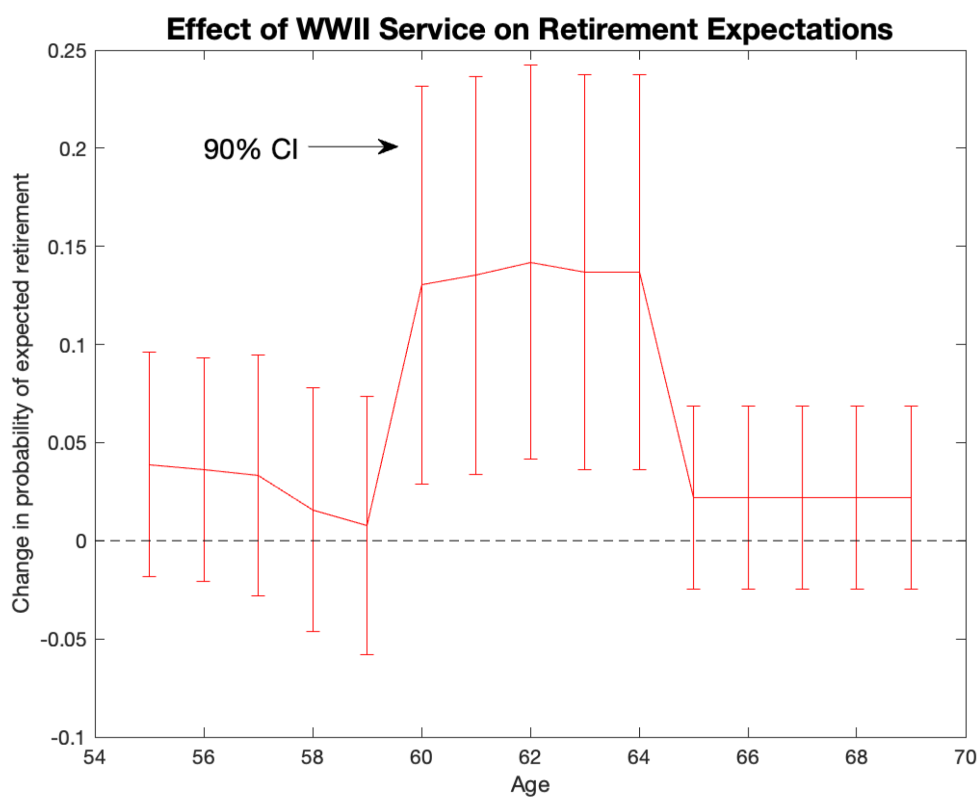
Figure 12 shows estimated values of τ_3 - the effect of WWII service - across the range of expected retirement dates for men who were aged 39 to 54 in 1973. WWII service is estimated to have a large and statistically significant effect on the probability of retirement, but only over the ages of 60 to 64. The effect on retirement from ages of 65 and above, and ages 59 and below, is statistically indistinguishable from zero. The effect of WWII service - a 13 percentage point increase in the probability of expecting to retire by 60 - can be compared directly to the effects of WWII service on actual participation, given this is a sample of unretired men of whom 99 per cent were employed at the time of survey. This estimate is very similar to the estimated effect of WWII service on actual participation over 60-64 (-16.7 ppts).

Table 5 shows results from equations for retiring at or before the ages 55, 60 and 65. Given the clustering of retirement at 5-year ages shown in Figure 11, these results drive the graphical re-

Table 4: Summary Statistics for Retirement Expectations Data

	Mean	Standard deviation	Minimum	Median	Maximum
Expected retirement age	62.59	6.76	48	60	95
Age	46.41	4.34	39	47	54
Married	0.90	0.30	0	1	1
Employed	0.99	0.10	0	1	1
WWII Service	0.35	0.48	0	0	1
non-WWII Service	0.07	0.25	0	0	1
Highest education level:					
Did not complete primary school	0.15	0.36	0	0	1
Primary school	0.17	0.38	0	0	1
Intermediate or junior school	0.13	0.34	0	0	1
High school	0.03	0.16	0	0	1
Apprenticeship	0.13	0.34	0	0	1
Technical college, etc.	0.31	0.46	0	0	1
University	0.08	0.28	0	0	1
Observations	544				

Figure 12



sults in Figure 12. Note that average marginal effects are shown, rather than coefficient estimates. The key purpose of this statistical model is to control for age differences between veterans and non-veterans in the survey sample. But with only a few exceptions, other variables appear to play fairly weak roles in influencing retirement expectations. This is consistent with the similarity between the raw difference in expecting to retire by age 60 (15 percentage points; see Figure 11) and the estimate form the statistical model (13 percentage points). Expected retirement ages appear to increase as individuals age, but at a slow pace. Marriage does not have a statisically signficant relationship with expected retirement age. A university education increases expected retirement ages from the age of 60 onwards, and some forms of secondary education lower the probability of retiring at 65, but most non-university forms of higher education appear not to influence retirement expectations. An above-median level of household income lowers expected retirement ages. For expected retirement ages around 60, this variable is as important as WWII service.

These results support the idea that the lower participation of WWII veterans was driven by the retirement and disability benefits available to these individuals. This is because these benefits would have been known about when these expectations were recorded in 1973. Other factors, such as future changes macroeconomic conditions, and future changes in access to the DVADP, were not known about in 1973. An alternative mechanism that may consistent with these expectations is worse health outcomes for veterans. Veterans may have expected their health to deteriorate, based on the experience of older comrades or current health concerns.

The clustering of veteran retirement expectations at the Service Pension access age of 60 is evidence that this age had salience. Retirement ages in Australia have long clustered around the Age Pension access age of 65 (Chomik et al., 2018). This evidence of retirement decisions being driven by program parameters is consistent with the hypothesis that program parameters can have a strong heuristic influence on decisions. Such 'framing' effects have been used to explain changes in retirement decisions driven by program changes that are accompanied by weak financial incentives (Cribb et al. (2016), Gruber et al. (2020)).

7.3 Robustness

This section estimates some alternative version of the retirement expectations model, in order to test the robustness of the above results. These alternative models address issues of selection bias, model specification, public service pensions, and heterogenous effects.

As discussed in Section 5, individuals were selected into the retirement expectations dataset based on whether they had thought about retirement. If the factors influencing this selection also influence expected retirement date, the distribution regression probit model in Equation **??** may yield biased results. This is the insight of Heckman (1979), and the methods to extend sample selection to a probit model were developed by Van de Ven and Van Praag (1981). I use the model from this latter paper, which is estimated using maximum likelihood methods. Correcting for selection bias requires modeling the selection process sufficiently well. Doing this depends on

Table 5: Results from Expectations Model for Survey Data (Marginal Effects)

	Retire by 55	Retire by 60	Retire by 65
		Average Marginal Effects	
WWII service	0.039	0.130**	0.022
	(0.224)	(0.021)	(0.396)
Age	-0.005*	-0.006	-0.003
	(0.061)	(0.331)	(0.288)
Married	-0.080	-0.086	0.057
	(0.131)	(0.226)	(0.208)
Employed	-0.075	-0.241	dropped
	(0.596)	(0.159)	
Education: primary school	-0.004	-0.036	-0.002
	(0.909)	(0.622)	(0.929)
Education: intermediate or junior school	0.020	-0.048	-0.074**
	(0.643)	(0.546)	(0.049)
Education: high school	-0.009	-0.106	-0.277**
	(0.890)	(0.455)	(0.030)
Education: apprenticeship	0.080	-0.078	-0.051
	(0.104)	(0.322)	(0.131)
Education: technical college etc.	0.062*	-0.029	-0.034
	(0.092)	(0.661)	(0.154)
Education: university	-0.027	-0.198**	-0.118*
	(0.502)	(0.031)	(0.052)
Household income > median	0.043*	0.132***	0.070***
	(0.092)	(0.003)	(0.004)
Non-WWII Service	0.049	-0.020	-0.056
	(0.243)	(0.823)	(0.117)
Observations	544	544	539

Notes: Estimates from the distribution regression model explained in Section 7.1. All estimates shown are average marginal effects; for age this is the marginal effect of a one-year increase. P-values are shown in parenthesis under each estimate. Robust standard errors are used.

finding variables that influence selection but not retirement expectations. Given how closely connected having thought about retirement is with expected retired ages, this is a tall order. The variables that have the most credible claim to doing this are three psychological questions that cover attitudes to planning and beliefs on how life outcomes are influenced by luck. I include dummy variables indicating individuals' answers to these questions in the selection model. The non-base category of the variables indicates whether an individual (1) prefers definitive action over trusting fate; (2) does not rely on luck to achieve outcomes and (3) believes their own actions drive what happens to them (see full questions and alternatives in Section 5).

The selection model models the binary outcomes of having selected into the retirement expectations dataset by having thought about retirement in the past. The selection model otherwise has the same variables as the retirement expectations model, with the exception of the married and employed dummy variables. These variables need to dropped in order for the maximum likelihood algorithm to converge. This is not an uncommon outcome for non-linear models with many categorical variables, and is unlikely to have a major influence on the results given the limited importance of these variables in the baseline model.

Results from this model, and for the other robustness tests detailed below, are in the Supplementary Material. The effect of WWII service in this selection model is very similar to that in the baseline model. The main difference in this model is the lower precision with which the estimates for ages 60 and 61 are estimated: they are not significant at the 10 per cent level. Estimates for 62-64 remain significant at the 10% level. Only one of the psychological variables used in selection model is statistically significant (the 'not luck' variable). Consistent with this, a Wald test is unable to reject the hypothesis that the selection and outcomes equations are independent, which lowers the weight that should be placed on the results of this extension.

As with any statistical work using observational data, there is always a risk that the results obtained are an artefact of the model specification chosen. The demographic variables in the baseline model do have established relationships with labour force participation, but it is fair to say that the variables chosen are heavily influenced by what is available in the dataset being used. And for a relatively small sample size, a relatively large number of variables are being used. A simple test of the dependence of the results on the model used is to a version of the model with the absolute minimum level of controls. A model estimated with the only a quadratic in age as a control (and WWII service) gives results very similar to the baseline model.

Government employees generally had access to more generous employer-provided retirement benefits than private sector workers in Australia during the late twentieth century. WWII veterans were somewhat more likely to be employed in public administration than non-veterans within the sample used here. This may be because of there were some programs that advantaged WWII veterans for entry into the public service. Even absent a causal relationship like this, higher rates of government employment among WWII veterans could affect the relationship between WWII service and expected retirement age. One way to adjust for this is to remove all individuals employed in the 'Government administration and defence' industry from the sample (41 individuals). In this model, the effect of WWII service on retirement expectation probabilities falls by around 1 percentage point over the ages of 60-64.

Individuals with higher incomes or private assets should respond less to the means test attached to the Service Pension. For higher income individuals, this is because the increase in the effective tax rate on labour income caused by the earnings test decreases with income level, due to the fixed maximum pension payment. The assets tests that was applicable to the Service Pension for most of the sample period would have prevented individuals with high levels of assets from receiving a payment regardless of work behaviour. One way to test these predictions is to allow WWII service to effect the retirement expectations of high and low income individuals differently. To do this, a variable interacting above-median houshold income and WWII service is added to the model. This variable does not have an economically or statistically significant effect on retirement expectations.

8 Health

Service in WWII - a protracted and bloody military conflict - is very likely to have worsened the health of veterans, and poor health lowers labour force participation. This section documents some new facts on the health of WWII veterans, and assesses the impact of this on their labour force participation.

8.1 Methodology

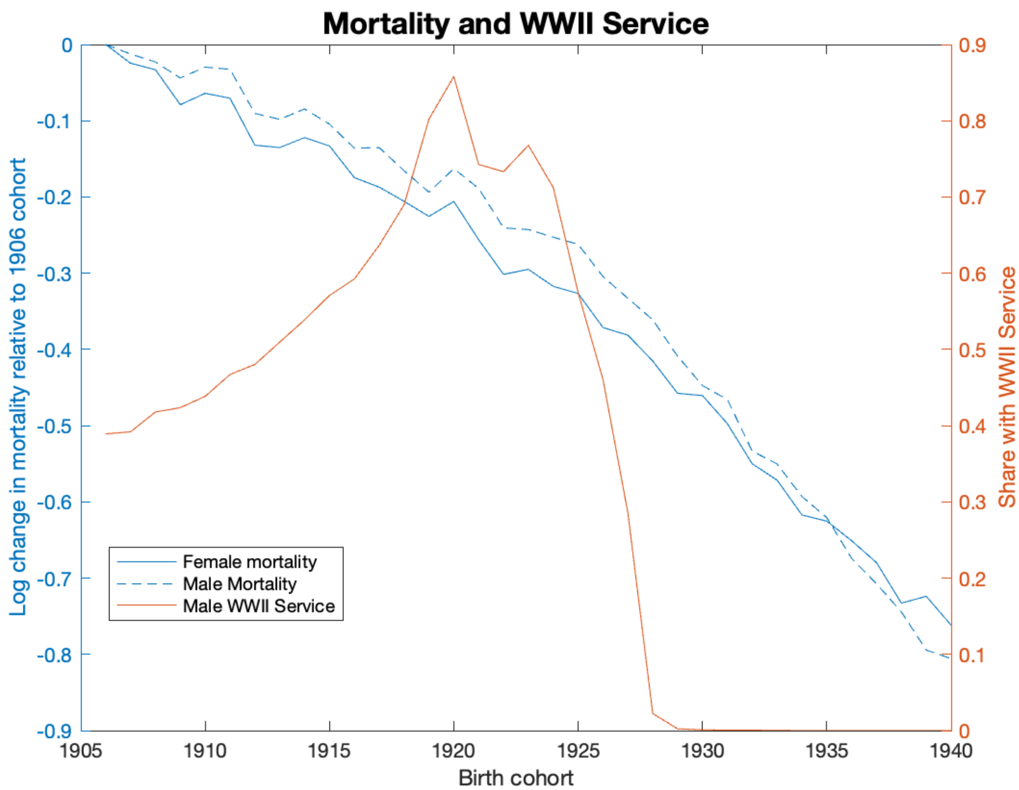
Two different statistical approaches are used to assess the health effects of WWII service, in order to fully utilise the limited data available on this topic. A simple counterfactual exercise is then done, using modern data, to quantify the effect of health differences on veterans' participation.

8.1.1 Mortality Approach

The first approach examines the relationship between WWII service and mortality across cohorts - this is the approach of Bedard and Deschenes (2006). Figure 13 compares residual mortality for the 1906-1940 male and female birth cohorts, over the ages 40 to 75, to the male WWII service shares of these cohorts. Residual mortality is the cohort fixed effects from a regression of log annual mortality on cohort and age dummies. It can be interpreted as (approximately) the percentage average decrease in mortality relative to the 1906 base cohort. Female cohort WWII service shares are not shown, but were no higher than 3 per cent for any cohort.

Figure 13 shows that mortality fell considerably across the male and female cohorts born in the first half of the twentieth century in Australia. Mortality fell more slowly across cohorts born before 1928, which are the male cohorts with WWII service. This suggests WWII service may

Figure 13



Sources: Human Mortality Database (2018), ABS (1933) and DVA (2018) have offset the technological, institutional and environment factors otherwise lowering mortality for these cohorts. The chief challenge to this is that mortality changed similarly for males and females, despite the latter having very little exposure to WWII service. Apart from this difference, males and females in each cohort likely had similar exposure to other influences upon health (e.g. disease prevalence, health system development, economic conditions). For this reason, I use the differences in the evolution of male and female mortality across cohorts to measure the effect of WWII service. Graphically, there is some suggestion in Figure 13 that male mortality improved more slowly than female mortality for cohorts with high male WWII service, and that this difference reversed for subsequent cohort with low male WWII service.

The statistical methodology of Bedard and Deschenes (2006) is used to precisely measure this relationship. The model used is shown in Equation 7. The log of mortality rates is used as the dependent variable, given these are generally very small positive numbers, and none are below zero. b indexes cohorts, t calendar years, and s sex. $\lambda_{t-b,s}$ are sex-specific age dummies (age equals the current year minus the birth year of a cohort). ω_s is a sex dummy variable. δ_b and σ_t are cohort and time dummy variables. κ_1 is the coefficient of interest. This variable is identified by the comovement between the WWII service differences and mortality rate differences between male and female cohorts. $serviceShare_{b,s}$ is set to zero for all female cohorts.

$$ln(mortalityRate_{b,t,s}) = \kappa_0 + \lambda_{t-b,s} + \omega_s + \delta_b + \sigma_t + \kappa_1 \times serviceShare_{b,s} + e_{b,t,s} \quad (7)$$

A version of this model which allows the effect of service to differ across ages is also estimated. Bedard and Deschenes (2006) found that the mortality effect of WWII service increased significantly with age for US veterans.

$$\begin{aligned} ln(mortalityRate_{b,t,s}) = {} & \kappa_0 + \lambda_{t-b,s} + \omega_s + \delta_b + \sigma_t \\ & + \sum_j \kappa_1^j \times 1\{t-b \in j\} \times serviceShare_{b,s} + e_{b,t,s} \\ & j \in \{30-39, 40-49, 50-59, 60-69, 70-74\} \end{aligned} \quad (8)$$

8.1.2 Disability Pension Approach

The DVA Disability Pension was explicitly intended to compensate for ill health or incapacity caused by military service. As noted in Section 2, this means that the rate of receipt of this pension provides a direct measure of the share of veterans with health conditions attributable to their service. This measure may, of course, be affected by a range of biases. Difficulties in applying, including in proving linkages between service and health conditions, may mean that some veterans with war-caused conditions did not receive pensions. Conversely, some veterans may have exaggerated health conditions to receive the benefit. Overall though, it is hard to believe that DVA

Disability Pension receipt is not a reasonable indicator of the share of veterans impacted by ill health caused by their service.

As can be seen in Figure 2, the share of veterans receiving this pension rose almost continually over time. Given that the vast majority of Australian WWII veterans did not participate in post-WWII conflicts, this suggests that receipt of the DVA Disability Pension, and thus the health effects of service, were associated with the ageing of the veteran cohort. The statistical approach used with this dataset examines the extent to which this rise in receipt can be explained by ageing of the veteran cohort. Pension receipt that rises with veteran age indicates a health effect of service that worsens with age. The regression model used is given below. This model relates the number of recipients of a particular type of DVADP in a given year (t) to the number of veterans in each age range (j) in that year. Results from this model show the extent to which statistics on total DVA Disability Pension numbers are consistent with ageing worsening the health of veterans.

$$pensionRecipients_t = \sum \beta_j * veteransInAgeRange_{j,t} + e_t$$
$$j \in \{11-20, 21-30, ..., 81-90, 91-100\} \tag{9}$$

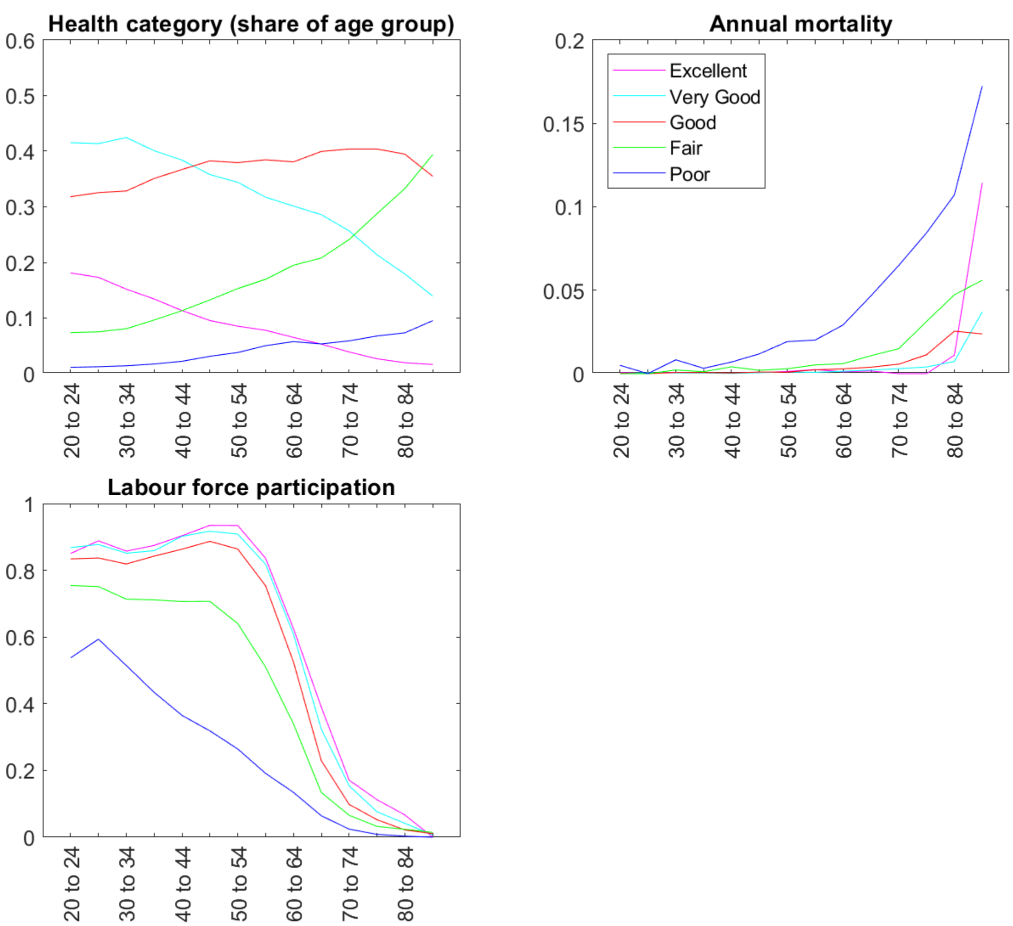
As noted in Section 2, legislative and judicial changes loosened the eligibility for DVA disability pensions during the 1980s and 1990s. Given this happened when the vast majority of WWII veterans were already quite old, this means the model above may overstate the impact of ageing upon pension receipt and implied health.

8.1.3 Quantify participation effects using modern data

The above approaches attempt to measure the effect of WWII service on health, and to measure how the health effects of service change with age. This third approach is an accounting exercise that uses modern data to quantify how the lifecycle health changes implied by the two statistical approaches may have changed veterans' participation.

The starting point is the relationship between self-assessed health, mortality, and participation of all men in HILDA survey over 2001-16. These data are taken as a starting point that is representative of the health and participation outcomes of non-veterans during the latter part of the twentieth century. There are some problems with this assumption: overall health and participation were definitely higher during the first decades of the 21st century. Importantly, it is the relationships between these variables, rather than their level, that matter for this exercise. For each age category, j, and self-assessed health level, i, this dataset provides a mortality rate, $MR_{j,i}$, and a labour force participation rate, $PR_{j,i}$. The relationship between these variables and the participation and mortality rates for the whole age group is given by equations 10 and 11 below; $Share_{j,i}$ is the share of age group j made up by self-assessed health category j. Figure 14 shows these variables in the HILDA data.

Figure 14: **Self-assessed health, mortality and participation in HILDA data**



Source: DSS and Melbourne Institute (2017)

$$MR_j = \sum_{i \in I} MR_{j,i} \times Share_{j,i} \tag{10}$$

$$PR_j = \sum_{i \in I} PR_{j,i} \times Share_{j,i} \tag{11}$$

$$I = \{\text{Excellent, Very Good, Good, Fair, Poor}\}$$

$$j \in \{30-34, 35-39, ..., 70-74, 75-79\}$$

To measure the participation effects of military service, the self-assessed health of individuals in the sample is lowered in order to match the health effects of service measured by the two statistical approaches. To incorporate the measured mortality differences, the share of the population in the Poor (Excellent) health category in each age group is raised (lowered) to the extent necessary to generate the measured mortality differences between veterans and non-veterans in each age range. Let $\overline{MR}_j$ represent the HILDA mortality rate increased by the estimated age-specific increase in mortality caused by veteran status (as measured by the statistical approach outlined above). Then the share of the age group that must be shifted from the Excellent health group to the Poor health group is given by $\phi_{j,EP}$ in equation below. A condition for this method to work is that the share of an age group in Excellent health is sufficient to adjust whole age group mortality to the required level ($\phi_{j,EP} < Share_{j,E}$). This is satisfied age groups up to and including 70 to 74.

$$\overline{MR}_j = MR_j + \phi_{j,EP}(MR_{j,P} - MR_{j,E}) \tag{12}$$

$$\phi_{j,EP} = \frac{\overline{MR}_j - MR_j}{MR_{j,P} - MR_{j,E}} \tag{13}$$

The result of interest from this approach is the estimated counterfactual participation profile over age groups with the new distribution of health within each age group. Denoting this by $\overline{PR}_j$, it is given by the below expression. Comparing this participation profile to that in the baseline HILDA dataset provides an indication of how the health effects of WWII service may have influenced veterans' participation over their lives.

$$\overline{PR}_j = PR_j + \phi_{j,EP}(PR_{j,P} - PR_{j,E}) \tag{14}$$

To apply this method to the results from the DVA Disability Pension approach, it is necessary to equate pension receipt with particular self-assessed health levels. This is done using arbitrary but conservative assumptions. The second-worst self-assessed health level, 'Fair', is assumed to be equivalent to the health required to receive the General Rate pension. Similarly, the worst self assessed health level, 'Poor', is assumed to represent the same level of health as the Special and Intermediate Rate pensions. These assumptions are used, together with the estimated rates of pensions receipt by age (from the approach described above), to shift individuals from the higher health categories to these lower categories. When shifting shares of age groups between categories, the healthiest part of the age group is moved. For some age groups, this involves shifting shares out of all three of the higher health categories ('Excellent', 'Very Good', and 'Good'). The transition rates used to match the estimated age-specific rates of receipt of the Special and Intermediate Rate pension, denoted by $SIRR_j$, are given below. The transitions used for General Rate pension receipt are analogous.

$$\phi_{j,EP} = SIRR_j \text{ if } Share_{j,E} \geq SIRR_j \tag{15}$$

$$\phi_{j,EP} + \phi_{j,VP} = SIRR_j \text{ if } Share_{j,E} < SIRR_j \leq Share_{j,E} + Share_{j,V} \tag{16}$$

$$\phi_{j,EP} + \phi_{j,VP} + \phi_{j,GP} = SIRR_j \text{ if } Share_{j,E} + Share_{j,V} < SIRR_j \leq Share_{j,E} + Share_{j,V} + Share_{j,G} \tag{17}$$

8.2 Results

8.2.1 Mortality Approach

Table 6 shows estimates from the model given by Equation 7 above, for two different ranges of cohorts. For the range of cohorts used in Bedard and Deschenes (2006), 1920 to 1940, the model indicates that WWII service leads to an 4 per cent increase in the annual mortality rate. The average marginal effect - the marginal effect of service averaged across all cohorts and years in this bandwidth - is 0.3 extra deaths per thousand individuals per year. This is a relatively small increase when compared to the average annual mortality rate for the estimation sample, which is 8.7 deaths per thousand individuals per year. Using the same bandwidth as in the labour force participation work (1918 to 1934) changes the estimated effect of WWII service on mortality to be negative, but very small and not statistically significant.

Table 7 shows estimates from Equation 8 - the version of the model that allow the effect of service on mortality to differ by age. These results tell a different story to the age-invariant model. WWII service appears to have lowered mortality during veterans' early lives (30-39), and then raised mortality at older ages (mortality is higher from the 50-59 age group onwards). Mortality is around 8 per cent higher over the ages of 50-59, and then 13 per cent higher over the ages of 70-74. The absolute size of the effect increases more sharply, given the sharp rise in baseline mortality across age groups: 0.4 extra deaths per thousand per year at ages 50 to 59 and 2.2 extra deaths per thousand over ages 70-74. The size of these estimated effects are around 40 per cent smaller when estimate using the 1918-34 cohort, but are otherwise similar.

While these increases in mortality are meaningful, they are much smaller than those found for US WWII veterans by Bedard and Deschenes (2006). The average increase in mortality for the 40-75 age group in that paper due to veteran status was 3 extra deaths per thousand individuals per year. This suggests that WWII service for the United States had a larger negative health effect

Table 6: Results from Mortality Model

	1920-1940	1918-1934
Service Share	0.039***	-0.006
	(0.000)	(0.535)
Male Average Mortality	8.664	9.710
Marginal Effect Male	0.337	-0.062
Observations	1930.000	1564.000
Rsquared	0.996	0.996

Notes: P-values are shown in parenthesis under each estimate of κ_1. Standard errors have been clustered by cohort. Average mortality and marginal effect are expressed as annual deaths per thousand persons.

than WWII service for Australia. The effect of WWII service on mortality does increase between the ages of 50-59 and 60-69, rising by roughly 0.6 extra deaths. An F-test of the hypothesis that the underlying coefficients for these age groups are the same has a p-value of 0.089.

8.2.2 DVA Disability Pension Approach

Table 8 shows the estimated time-invariant rates of pension receipt by age. DVADP receipt is estimated to rise with age. Receipt of the General Rate pension rises from around 6 per cent when veterans are in their twenties to around 23 per cent when they are in their sixties. Receipt of the Special or Intermediate Rate pension rises from around 1 per cent when veterans are in their twenties, to around 4 per cent when they are in their sixties. This simple model of pension receipt by age closely fits the data, explaining almost all of the variation in the total number of DVA Disability Pensions over time.

Importantly for the labour force participation results in Section 6, receipt of Special and Intermediate Rate pensions does increase sharply between the 50-59 and 60-69 age groups, with an estimated rise of around 3 percentage points (and this difference is statistically significant, p= 0.00). Receipt of the General Rate pension does not appear to rise between these age groups. The health of three percent of the veteran population declining sufficiently to qualify them for Special and Intermediate rate pensions is insufficient to explain roughly 10 per cent of veterans retiring around the boundary of these age groups. The modern data approach below makes this point in a more concrete manner, using the relationship between health and participation in the HILDA dataset.

Table 7: Results from Mortality Model with Age Differences

	1920-1940	1918-1934
Service Share × age 30 to 39	-0.105***	-0.126***
	(0.000)	(0.000)
Service Share × age 40 to 49	0.003	-0.032
	(0.876)	(0.122)
Service Share × age 50 to 59	0.088***	0.033**
	(0.000)	(0.026)
Service Share × age 60 to 69	0.115***	0.061***
	(0.000)	(0.000)
Service Share × age 70 to 74	0.131***	0.058***
	(0.000)	(0.000)
Male Average Mortality 30 to 39	1.212	1.309
Marginal Effect Male 30 to 39	-0.126	-0.164
Male Average Mortality 40 to 49	2.507	2.763
Marginal Effect Male 40 to 49	0.008	-0.087
Male Average Mortality 50 to 59	4.801	5.322
Marginal Effect Male 50 to 59	0.423	0.177
Male Average Mortality 60 to 69	9.417	10.437
Marginal Effect Male 60 to 69	1.082	0.632
Male Average Mortality 70 to 74	17.344	19.149
Marginal Effect Male 70 to 74	2.270	1.109
Observations	1930	1564
Rsquared	0.996	0.996

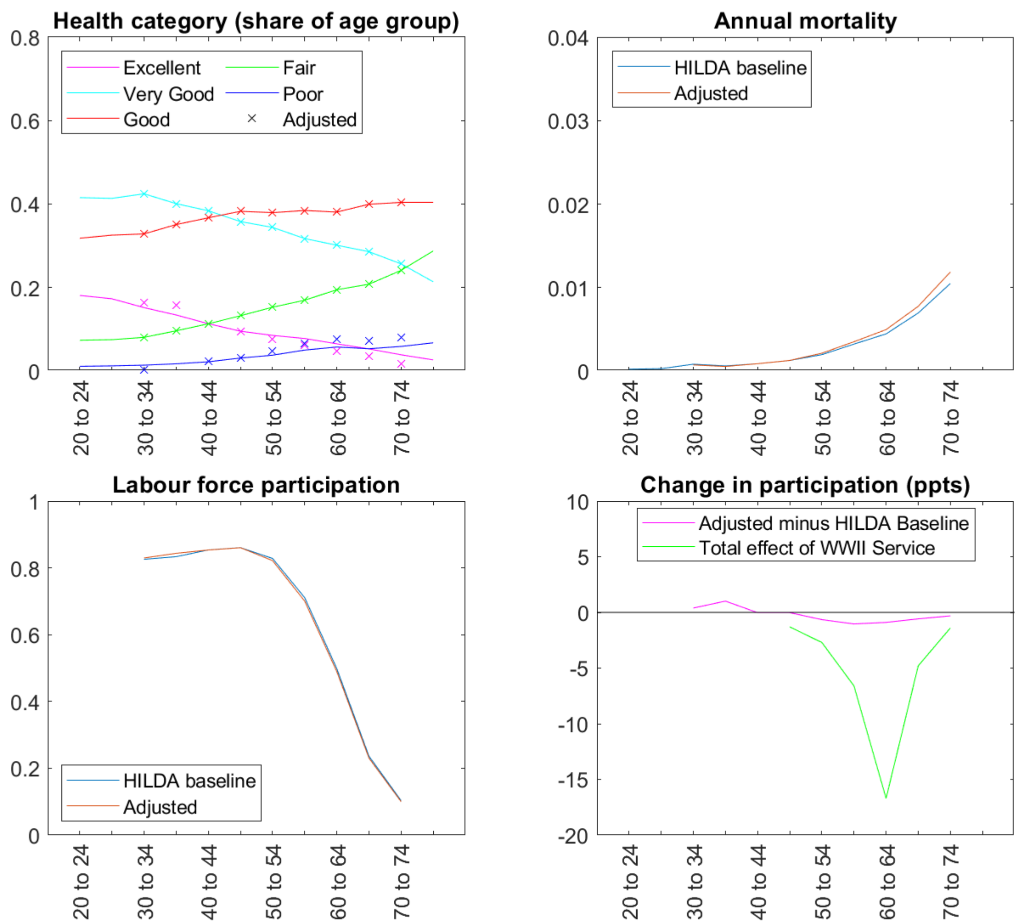
Notes: P-values are shown in parenthesis under each estimate of κ_1^j. Standard errors have been clustered by cohort. Average mortality and marginal effects are expressed as annual deaths per thousand persons.

Table 8: Results from Pension Receipt Model

	General Rate	Special or Intermediate Rate
20to29 count	0.053***	0.007**
	(0.000)	(0.023)
30to39 count	0.103***	-0.001
	(0.000)	(0.410)
40to49 count	0.209***	0.017***
	(0.000)	(0.000)
50to59 count	0.262***	0.014***
	(0.000)	(0.000)
60to69 count	0.229***	0.034***
	(0.000)	(0.000)
70to79 count	0.310***	0.054***
	(0.000)	(0.000)
80to89 count	0.582***	0.147***
	(0.000)	(0.000)
Observations	45.000	45.000
Rsquared	1.000	0.993

Notes: P-values are shown in parenthesis under each estimate of β_j.

Figure 15: **Results of Modern Data Approach Using Mortality**



Source: DSS and Melbourne Institute (2017)

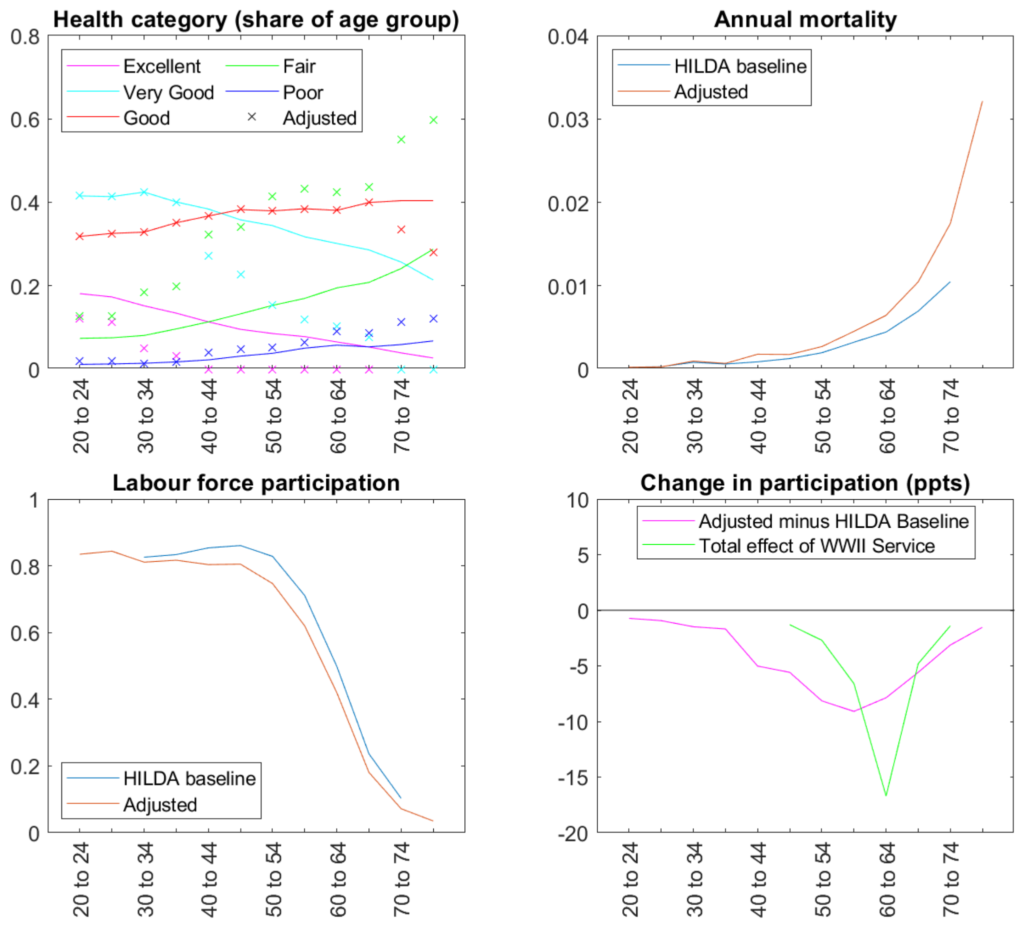
8.2.3 Modern data approach

Figure 15 below shows the results under the modern data approach, attempting to match the increase in mortality associated with WWII veterans. Over the age groups where WWII service raised mortality (the 50 to 54 age group and older) shifts in sample shares between the Excellent and Poor health groups generate the measured mortality increase (see top panels of Figure 15). The shift for the 50-54 age group is around 1 per cent of the sample; for the 70 to 74 age group it is around 2 per cent. As noted above, this exercise is only done up to the 70-74 age group, as this is the last age group for which the baseline share of the Excellent group is large enough to generate the required mortality increase. The bottom two panels show the effect this worsening is sample health has on participation. The change in participation is small: it peaks at around 1 per cent for the 55-59 age group.

Figure 16 shows results from the modern data approach, using estimated rates of DVA Disability Pension receipt to drive health adjustments. This method leads to much larger shifts in health status. Both the 'Excellent' and 'Very good' health categories are driven to zero shares for some age groups. The worst health group, 'Poor', becomes significantly larger than in the baseline (recall, this category is expanded to match the rate of Special or Intermediate Rate pension receipt). The second worst health group is much larger, given it is expanded to match the (much higher) rate of receipt of the General Rate pension. These changes lead to an increase in mortality of around 40 per cent over the ages of 20 to 80; this is much larger than the increase in mortality measured by the statistical approach. This result may indicate that this approach is overstating the health impact of WWII service.

The large health differences under this approach generate a significant fall in labour force participation for veterans (lower panels of Figure 16). This rises from around 2 percentage points between the age of 30 and 39, peaks at around 9 percentage points between the ages of 50 to 59, and then declines. The age profile of this participation effect, does not, however, align with the age profile of the total effect of WWII service on labour force participation (as measured in Section 6).

Figure 16: **Results of Modern Data Approach Using DVA Disability Pension**



Source: DSS and Melbourne Institute (2017)

9 Conclusion

This paper examines the effect that high rates of WWII service had on older male participation during the latter part of the twentieth century in Australia. This effect can be measured because of the sharp quasi-random variation in WWII service across birth cohorts in Australia that was driven by the timing of WWII and minimum ages for service. These estimates show that WWII service lowered labour force participation mildly during early middle age, and then sharply from the age of 60.

A range of evidence indicates these participation effects were driven by the retirement and disability benefits given to WWII veterans. The largest effect on participation occurred immediately after the age of 60, which was the access age for one benefit, the Service Pension. The earnings test for this pension means that individuals working after this age face a strong substitution effect, and a simple theoretical model suggests a large share of eligible individuals will retire at the access age. Survey data show that veterans expected to retire earlier than non veterans when they were aged in their 40s and early 50s. These earlier expected retirements were clustered around the age of 60.

I use mortality and disability pension receipt data to document that WWII service had a negative effect on veterans' health in Australia. To the best of my knowledge, this is the first time this has been done in the published literature. While the health effects of service appears to have worsened with age, their timing does not accord with the timing of participation effects found. In addition, a simple exercise using modern data suggests that the health effects of WWII service were not large enough to generate the participation effects I have uncovered.

Despite the substantial effect of WWII service on participation, macro level estimates indicate it explains only a small share of the fall in older male participation during the late twentieth century. This implies that other factors, such as poor macroeconomic conditions (Stricker and Sheehan, 1981) and other changes to retirement income systems (Blundell et al., 2016), must have driven this fall in participation. It is striking that a convincing explanation for the late twentieth century decline older male participation remains elusive even almost thirty years after it ceased.

This paper contributes to the literature on lifecycle labour supply reponses to retirement and disability programs. Consistent with a growing literature, they indicate that changes in early retirement ages cause large changes in retirement behaviour when they are accompanied by significant financial incentives to retire at that age (Hernaes et al. (2016) and Staubli and Zweimuller (2013)). The results are also consistent with a potentially competing mechanism: the effect of program parameters in 'framing' retirement decisions and thus changing behaviour even absent financial incentives. Several recent contributions to the literature show large effects of this type (Cribb et al. (2016) and Gruber et al. (2020)).

The results provide indirect evidence on the labour supply responses to the Age Pension in Australia, given the similarity between this and the Service Pension. The measured effect of WWII service enabling access to the Service Pension (-27 ppt over 60 to 64) can be viewed as an upper bound on the effect Age Pension access has on older male participation. This is because other factors influencing veterans are also likely to lower veterans' participation (health and access to the DVA Disability Pension). Understanding the effects of changes in pension eligibility ages is of particular relevance in Australia at present, given the Age Pension access age is currently being raised.

These results indicate that WWII veterans had starkly higher liftime labour force participation than Vietnam veterans in Australia (via comparison with the work on this group by Siminski (2013)). Vietnam service lowered participation by around 30 percentage points when a veteran was in his fifties, whereas WWII service lowered participation by around 5 percentage points over these ages. This stark difference is unlikely to be explained by the different service experience of these two groups, suggesting it was instead driven by the differences in rules for accessing disability benefits and developments in medical practice.

References

Adair, T., Hoy, D., Dettrick, Z. and Lopez, A. D. (2011), 'Reconstruction of long-term tobacco consumption trends in Australia and their relationship to lung cancer mortality', *Cancer Causes & Control* **22**(7), 1047–1053.
URL: *http://www.jstor.org/stable/41485181*

Angrist, J. and Krueger, A. B. (1994), 'Why Do World War II Veterans Earn More than Nonveterans?', *Journal of Labor Economics* **12**(1), 74–97.
URL: *http://www.jstor.org/stable/2535121*

Atalay, K. and Barrett, G. (2015), 'The Impact of Age Pension Eligibility Age on Retirement and Program Dependence: Evidence from an Australian Experiment', *The Review of Economics and Statistics* **97**(1), 71–87.
URL: *https://EconPapers.repec.org/RePEc:tpr:restat:v:97:y:2015:i:1:p:71-87*

Australian Bureau of Statistics (ABS) (1933), 'Census of the Commonwealth of Australia - June'.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/2110.0*

Australian Bureau of Statistics (ABS) (1967), 'Survey of Australian Ex-service Personnel - November 1966'.

Australian Bureau of Statistics (ABS) (1973), 'Ex-service Personnel, Widows and Children - November 1971'.

Australian Bureau of Statistics (ABS) (1980), 'Ex-service Personnel, Widows and Children - October 1979 Preliminary'.

Australian Bureau of Statistics (ABS) (1985), 'Ex-service Personnel, Widows and Children, Australia, June 1984, Preliminary'.

Australian Bureau of Statistics (ABS) (2007), '6204.0.55.001 - Labour Force Historical Timeseries, Australia, 1966 to 1984', pp. Labour force status by sex, age and marital status – 1966–1977.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6204.0.55.0011966%20to%201984?OpenDocument*

Australian Bureau of Statistics (ABS) (2015), '6291.0.55.001 - Labour Force, Australia, Detailed - Electronic Delivery, Feb 2015', p. Table LM8.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.001Feb%202015?OpenDocument*

Australian Bureau of Statistics (ABS) (2018), '6291.0.55.001 - Labour Force, Australia, Detailed - Electronic Delivery, April 2018', p. Table LM9.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.001April%202018?OpenDocument*

Australian Parliamentary Library (2011), 'Social security payments for the aged, people with disabilities and carers 1901 to 2010'.

Australian War Memorial (AWM) (2017), 'National Service Scheme'.
URL: *https://www.awm.gov.au/articles/encyclopedia/conscription/vietnam*

Autor, D. H., Duggan, M., Greenberg, K. and Lyle, D. S. (2016), 'The Impact of Disability Benefits on Labor Supply: Evidence from the VA's Disability Compensation Program', *American Economic Journal: Applied Economics* **8**(3), 31–68.
URL: *http://www.aeaweb.org/articles?id=10.1257/app.20150158*

Baker, M. and Benjamin, D. (1999), 'Early Retirement Provisions and the Labor Force Behavior of Older Men: Evidence from Canada', *Journal of Labor Economics* **17**(4), 724–756.
URL: *https://doi.org/10.1086/209937*

Beaumont, J., ed. (1996), *Australia's War 1939-45*, Allen and Unwin.

Bedard, K. and Deschenes, O. (2006), 'The Long-Term Impact of Military Service on Health: Evidence from World War II and Korean War Veterans', *American Economic Review* **96**(1), 176–194.
URL: *http://www.aeaweb.org/articles?id=10.1257/000282806776157731*

Blundell, R., French, E. and Tetlow, G. (2016), Retirement Incentives and Labor Supply, *in* J. Piggott and A. Woodland, eds, 'Economics of Population Ageing', Elsevier.

Broom, L., Duncan-Jones, P., Jones, F., McDonnell, P. and Williams, T. (1977), *Investigating social mobility. Departmental Monograph No. 1*, Canberra: Department of Sociology, Research School of Social Sciences, The Australian National University.

Cai, L. and Kalb, G. (2006), 'Health status and labour force participation: evidence from Australia', *Health Economics* **15**(3), 241–261.
URL: *https://onlinelibrary.wiley.com/doi/abs/10.1002/hec.1053*

Chomik, R., Bateman, H., Yan, S., Graham, S. and Piggott, J. (2018), 'Retirement Income in Australia: Part II - Public Support', *Centre for Excellence in Population Ageing Research - Research Brief* .
URL: *https://cepar.edu.au/resources-videos/research-briefs/retirement-income-australia-part-2*

Clarke, P., Gregory, R. and Salomon, J. (2015), 'Long-term Disability Associated With War-related Experience Among Vietnam Veterans', *Medical Care* **53**(5).
URL: *https://www.ncbi.nlm.nih.gov/pubmed/25768060*

Costa, D. L. (1995), 'Pensions and Retirement: Evidence from Union Army Veterans', *The Quarterly Journal of Economics* **110**(2), 297–319.
URL: *https://doi.org/10.2307/2118441*

Cousley, A., Siminski, P. and Ville, S. (2017), 'The Effects of World War II Military Service: Evidence from Australia', *The Journal of Economic History* **77**(3).

Cribb, J., Emmerson, C. and Tetlow, G. (2016), 'Signals matter? Large retirement responses to limited financial incentives', *Labour Economics* **42**, 203 – 212.
URL: *http://www.sciencedirect.com/science/article/pii/S0927537116301245*

Department of Social Services and Melbourne Institute of Applied Economic and Social Research (2017), 'The Household, Income and Labour Dynamics in Australia (HILDA) Survey, RESTRICTED RELEASE 16 (Waves 1-16)'.
URL: *https://dataverse.ada.edu.au/dataverse/hilda*

Department of Veterans' Affairs (DVA) (1945-2000), 'Annual Reports'.

Department of Veterans' Affairs (DVA) (2018), 'World War Two Nominal Roll'.
URL: *http://nominal-rolls.dva.gov.au/ww2*

Fetter, D. K. (2013), 'How Do Mortgage Subsidies Affect Home Ownership? Evidence from the Mid-Century GI Bills', *American Economic Journal: Economic Policy* **5**(2), 111–47.
URL: *https://www.aeaweb.org/articles?id=10.1257/pol.5.2.111*

Fetter, D. and Lockwood, L. (2018), 'Government Old-Age Support and Labor Supply:Evidence from the Old Age Assistance Program', *The American Economic Review* **108**(8).

Foresi, S. and Peracchi, F. (1992), 'The Conditional Distribution of Excess Returns: An Empirical Analysis'.

French, E. and Song, J. (2014), 'The Effect of Disability Insurance Receipt on Labor Supply', *American Economic Journal: Economic Policy* **6**(2), 291–337.
URL: *http://www.aeaweb.org/articles?id=10.1257/pol.6.2.291*

Gruber, J., Kanninen, O. and Ravaska, T. (2020), Relabeling, Retirement and Regret, Working Paper 27534, National Bureau of Economic Research.
URL: *http://www.nber.org/papers/w27534*

Gruber, J. and Wise, D. (1998), 'Social Security and Retirement: An International Comparison', *The American Economic Review* **88**(2).

Heckman, J. J. (1979), 'Sample Selection Bias as a Specification Error', *Econometrica* **47**(1), 153–161.
URL: *http://www.jstor.org/stable/1912352*

Hernaes, E., Markussen, S., Piggott, J. and Razed, K. (2016), 'Pension reform and labor supply', *Journal of Public Economics* **142**, 39 – 55.
URL: *http://www.sciencedirect.com/science/article/pii/S0047272716300974*

Human Mortality Database (2018), 'Death Rates - Australian Males'.
URL: *https://www.mortality.org/*

Lloyd, C. (1994), *The last shilling: a history of repatriation in Australia*, Melbourne University Press.

Maestas, N., Mullen, K. J. and Strand, A. (2013), 'Does Disability Insurance Receipt Discourage Work? Using Examiner Assignment to Estimate Causal Effects of SSDI Receipt', *American Economic Review* **103**(5), 1797–1829.
URL: *http://www.aeaweb.org/articles?id=10.1257/aer.103.5.1797*

Mark Johnston (1996), 'The Civilians Who Joined Up, 1939-45', *Journal of the Australian War Memorial* .
URL: *https://www.awm.gov.au/index.php/articles/journal/j29/civils*

Morris, T. S. (2018), 'Large Response to Delayed Eligibility or a Pre-existing Trend in Female Participation? Re-examining Australian Pension Reform', *Working Paper - University of Melbourne* .
URL: *https://toddmorris.net/wp-content/uploads/2018/10/Morris_Large_response_or_pre-existing_trends_Oct_2018.pdf*

Morris, T. S. (2019), 'Unequal Burden of Retirement Reform: Evidence from Australia', *Working paper, University of Melbourne* .
URL: *https://toddmorris.net/wp-content/uploads/2019/01/Todd_Morris_JMP_Jan28.pdf*

Payton, P. (2018), 'Repat - A Concise History of Repatriation in Australia'.
URL: *https://www.dva.gov.au/sites/default/files/files/publications/corporate/P03428.pdf*

Siminski, P. (2013), 'Employment Effects of Army Service and Veterans Compensation: Evidence from Australian Vietnam-Era Conscription Lotteries', *The Review of Economics and Statistics* **95**(1), 87–97.

Staubli, S. and Zweimuller, J. (2013), 'Does raising the early retirement age increase employment of older workers?', *Journal of Public Economics* **108**, 17 – 32.
URL: *http://www.sciencedirect.com/science/article/pii/S0047272713001734*

Stricker, P. and Sheehan, P. (1981), *Hidden Unemployment: The Australian Experience*, Institute of Applied Economic and Social Research, University of Melbourne.

Van de Ven, W. P. and Van Praag, B. M. (1981), 'The demand for deductibles in private health insurance: A probit model with sample selection', *Journal of Econometrics* **17**(2), 229 – 252.
URL: *http://www.sciencedirect.com/science/article/pii/0304407681900282*

Vestad, O. L. (2013), 'Labour supply effects of early retirement provision', *Labour Economics* **25**, 98 – 109. European Association of Labour Economists 24th Annual Conference, Bonn, Germany,

20-22 September 2012.
URL: *http://www.sciencedirect.com/science/article/pii/S0927537113000432*

Warren, D. and Freebairn, J. (2010), 'Retirement Incomes and Employment Decisions of the Mature Aged', *The Australian Economic Review* **43**(3).

Supplementary Material for *Pensions and Participation: Evidence from WWII Veterans in Australia*

David Rodgers

February 16, 2021

1 Introduction

This document contain supplementary material for *Pensions and Participation: Evidence from WWII Veterans in Australia*. It contains a range of Figures, some further explanation of the data used, and an explanation of one of the regressions used.

2 Figures

Figure 1: Qualifying Service Among WWII Veterans

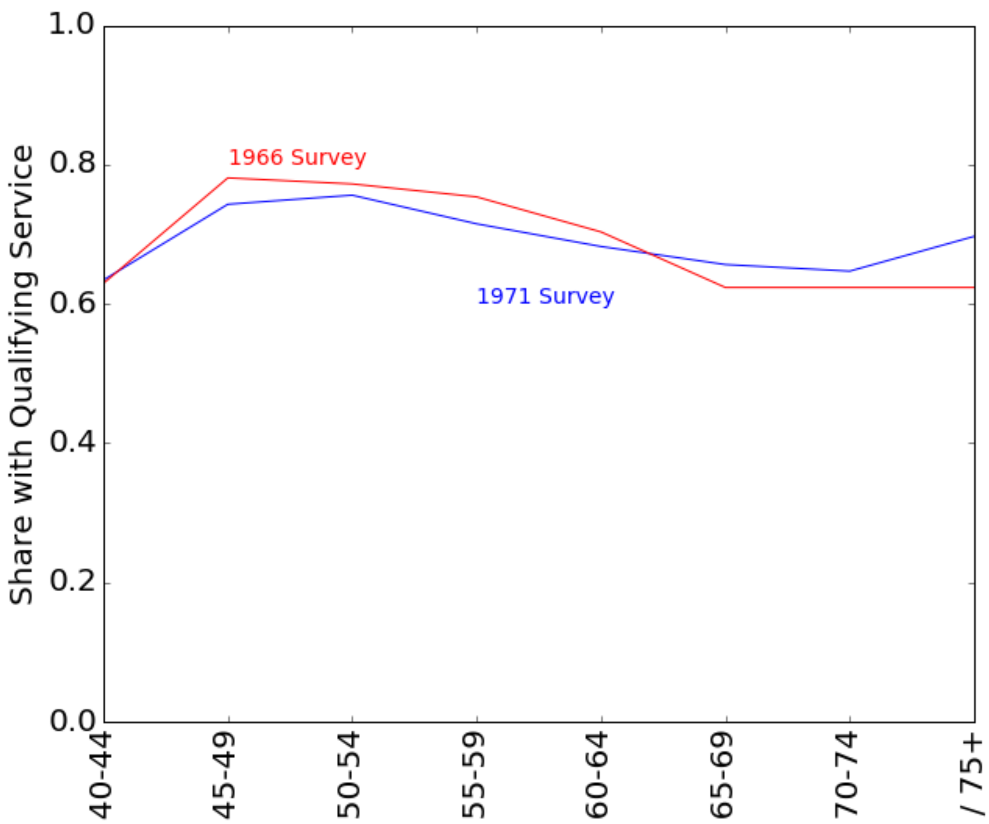


Table 1: Ages of Birth Cohorts in Each Census Year

Birth cohorts	Censuses							
	1966	**1971**	**1976**	**1981**	**1986**	**1991**	**1996**	**2001**
1912	54	59	64	69	74	79	84	89
1913	53	58	63	68	73	78	83	88
1914	52	57	62	67	72	77	82	87
1915	51	56	61	66	71	76	81	86
1916	50	55	60	65	70	75	80	85
1917	49	54	59	64	69	74	79	84
1918	48	53	58	63	68	73	78	83
1919	47	52	57	62	67	72	77	82
1920	46	51	56	61	66	71	76	81
1921	45	50	55	60	65	70	75	80
1922	44	49	54	59	64	69	74	79
1923	43	48	53	58	63	68	73	78
1924	42	47	52	57	62	67	72	77
1925	41	46	51	56	61	66	71	76
1926	40	45	50	55	60	65	70	75
1927	39	44	49	54	59	64	69	74
1928	38	43	48	53	58	63	68	73
1929	37	42	47	52	57	62	67	72
1930	36	41	46	51	56	61	66	71
1931	35	40	45	50	55	60	65	70
1932	34	39	44	49	54	59	64	69
1933	33	38	43	48	53	58	63	68
1934	32	37	42	47	52	57	62	67
1935	31	36	41	46	51	56	61	66
1936	30	35	40	45	50	55	60	65
1937	29	34	39	44	49	54	59	64
1938	28	33	38	43	48	53	58	63
1939	27	32	37	42	47	52	57	62
1940	26	31	36	41	46	51	56	61

Note: The baseline range of birth cohorts is boxed. Observations used for the regression involving 60-64 year olds are shown in red.

Table 2: Results from Baseline Model using Qualifying Service

	45-49	50-54	55-59	60-64	65-69	70-74
service	-0.017*	-0.037*	-0.090*	-0.261**	-0.072	-0.024
	(0.009)	(0.017)	(0.041)	(0.103)	(0.044)	(0.021)
age	-0.003***	-0.007***	-0.023***	-0.045***	-0.022***	-0.009***
	(0.000)	(0.001)	(0.002)	(0.002)	(0.003)	(0.001)
Census Year=1971	-0.021***					
	(0.001)					
Census Year=1976	-0.021***	-0.005				
	(0.005)	(0.003)				
Census Year=1981	-0.038***	-0.038***	-0.059***			
	(0.005)	(0.009)	(0.008)			
Census Year=1986		-0.050***	-0.106***	-0.070***		
		(0.011)	(0.023)	(0.009)		
Census Year=1991			-0.152***	-0.087	0.002	
			(0.027)	(0.058)	(0.007)	
Census Year=1996				-0.158**	-0.000	-0.002
				(0.056)	(0.025)	(0.003)
Census Year=2001					0.047	0.048***
					(0.028)	(0.012)
Census Year=2006						0.008
						(0.013)
$\hat{\beta}_0^j$	1.091***	1.285***	2.205***	3.450***	1.633***	0.728***
	(0.016)	(0.042)	(0.127)	(0.147)	(0.167)	(0.060)
Observations	17	17	17	17	17	17
Rsquared	0.985	0.976	0.981	0.981	0.957	0.990

Estimate from the model explained in Section VI using qualifying service. The model for each age group is estimated using birth cohorts from 1918 to 1934. Ordinary robust standard errors are shown in parentheses under each estimate. ***, **, and * indicate statistical significance at the 1%, 5% and 10% levels.

Figure 2: The effect of WWII service on labour force participation: Robustness Checks

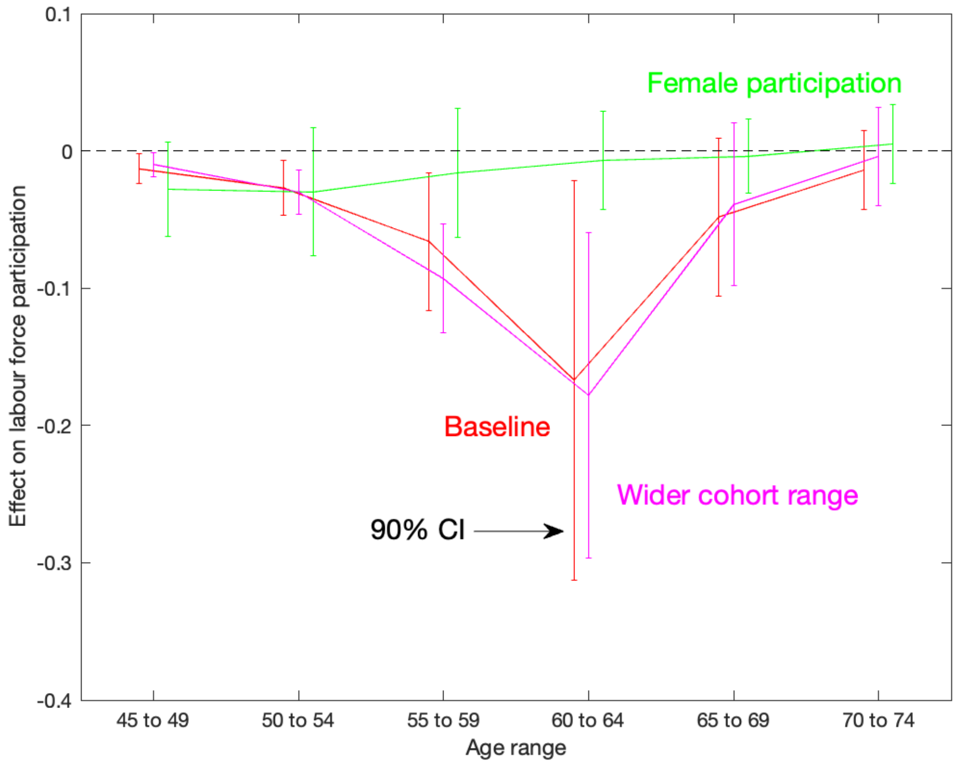
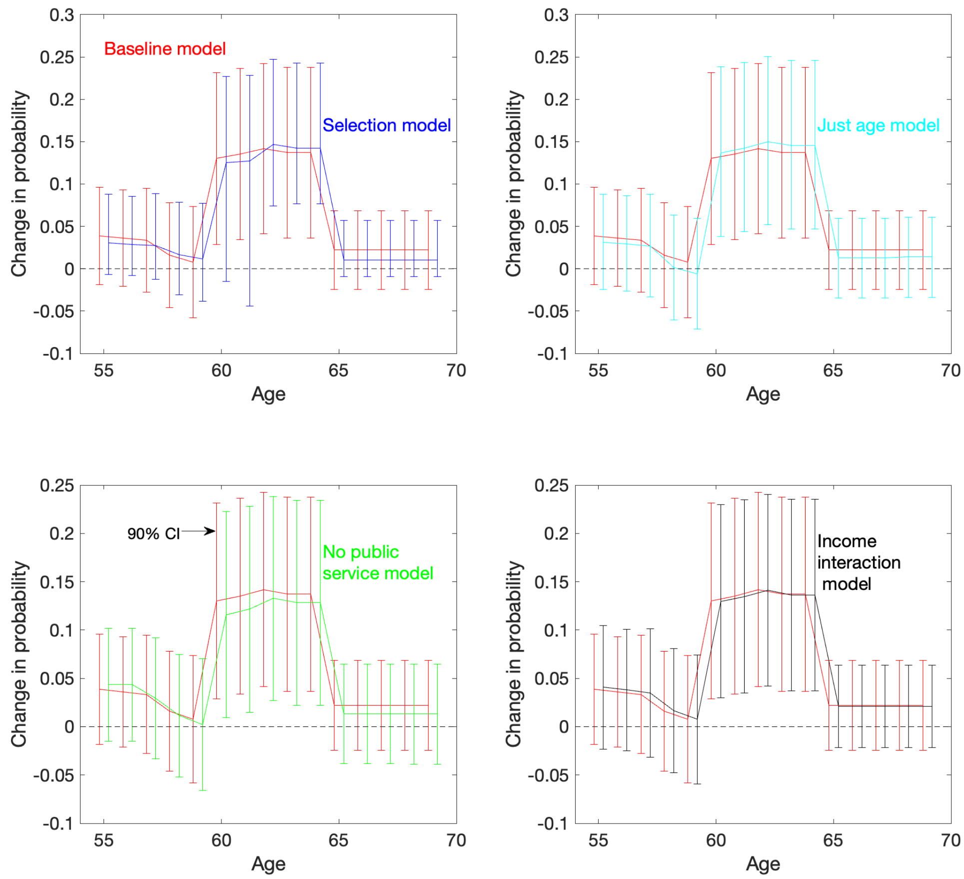


Figure 3: Effect of WWII Service on Retirement Expectations



3 Data

3.1 Census Data

3.1.1 1933 and 1947 census data

Data on counts of men in each single year birth cohort are extracted from the 1933 census. These data come from Table 1 of Volume I, Part IX Age, of ABS (1933) . The 1933 census was conducted on 30 June 1933, so counts by single year of age translate directly into birth financial years.

Data in a similar format can be found in the same Table, Volume and Part of the 1947 census (ABS (1947)), which was conducted on 30 June 1947. For cohorts in my baseline range, 1918 to 1934, the 1947 counts are around 5 per cent below the 1933 counts. This is likely due to deaths during WWII service, and the effect of continuing overseas service (for example, of occupation forces in Japan). For this reason, the 1933 counts are used as the primary way of measuring service shares at the end of WWII.

3.1.2 1966 to 2001 census data

The data from these censuses was assembled by the Australian Bureau of Statistics as part of a special (purchased) request. The dataset provides counts of men by single year of age, marital status, country of birth, and labour force participation status.

The 1966 to 1981 censuses were conducted on 30 June; later censuses were conducted in early August. The August date for the later censuses introduces some measurement error for these years.

The labour force participation variable changed across census years, but not in a way that affects the participation rate.

3.2 Nominal Roll Data

The WWII nominal roll was compiled by a consulting firm under contract to the Department of Veterans' Affairs. Significant care was been taken to ensure its accuracy. However, given it is based on historical, often hand-written service records, some inaccuracy may have crept in.

The process used to clean the data was as follows:

1. The version of the Nominal Roll obtained from the Department of Veterans Affairs contained 1,121,547 service records. 15,186 of these records lacked name or date of birth data, so were discarded.

2. The Nominal Roll is known to contain multiple records for individuals who had breaks during their service, or changed from one branch of the armed forces to another. I use simple text analytics to measure the extent of this duplication. My first step is to identify duplicates based on exact matches of first name, last name and date of birth. This leads to the removal of 46,610 records.

3. There were upper and lower age limits for enlistment during WWII. This gave some enlistees a strategic reason to provide an inaccurate date of birth (Mark Johnston (1996)), and

prevents duplicate records from being uncovered from matching on date of birth. For this reason, I also classify as duplicates any service records with the same first and last name, no conflicting information on other names and place of birth, birth dates within 10 years, and non-overlapping months of service. This process identifies a further 9,135 duplicate records, which I remove.

4. I identify women using the lists of 'male' and 'female' first names assembled by Mark Kantrowitz (1994). As an adjunct, I also classify records as female if an 'F' is present in their service number, in line with practice in assigning army numbers (Australian War Memorial (AWM) (2018)). This process identifies 63,595 females, which is close to estimates provided by other sources.

5. I remove records where the country or place of birth indicates an individual was not born in Australia. This leads to the removal of 100,971 records.

6. I remove servicemen who died during their service. This removes 38,525 records.

3.3 Social Mobility Survey Dataset

27 men who answered either 'Never' or 'Will work as long as able' when asked about their retirement expectations were removed from the regression dataset.

3.4 Labour force data

The data in Figure 1 of the paper are drawn from Australian Bureau of Statistics (ABS) (2007), Australian Bureau of Statistics (ABS) (2015), and Australian Bureau of Statistics (ABS) (2018). These are version of the detailed data from the ABS's Labour Force Survey that cover different periods (in some case overlapping).

3.5 Department of Veterans' Affairs Data

These data have been hand collected by the author from Annual Reports of the Department of Veterans' Affairs and its predecessor the Repatriation Commission (Department of Veterans' Affairs (DVA), 1945-2000).

4 Regressions

4.1 Residual mortality

The model used to estimate residual mortality is shown in equation 1 below. Cohort dummies, $\delta_{c,s}$, are included for all years other than the first year, 1906. By-sex cohort residual mortality estimates shown in the Figure in the paper are the estimated values of $\delta_{c,s}$.

$$ln(mortalityRate_{b,t,s}) = \kappa_0 + \lambda_{t-b,s} + \omega_s + \delta_{c,s} + e_{b,t,s} \tag{1}$$

References

Australian Bureau of Statistics (ABS) (1933), 'Census of the Commonwealth of Australia - June'.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/2110.0*

Australian Bureau of Statistics (ABS) (1947), 'Census of the Commonwealth of Australia - June'.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/mf/2109.0*

Australian Bureau of Statistics (ABS) (2007), '6204.0.55.001 - Labour Force Historical Timeseries, Australia, 1966 to 1984', pp. Labour force status by sex, age and marital status – 1966–1977.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6204.0.55.0011966%20to%201984?OpenDocument*

Australian Bureau of Statistics (ABS) (2015), '6291.0.55.001 - Labour Force, Australia, Detailed - Electronic Delivery, Feb 2015', p. Table LM8.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.001Feb%202015?OpenDocument*

Australian Bureau of Statistics (ABS) (2018), '6291.0.55.001 - Labour Force, Australia, Detailed - Electronic Delivery, April 2018', p. Table LM9.
URL: *https://www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.001April%202018?OpenDocument*

Australian War Memorial (AWM) (2018), 'Army Numbers'.
URL: *https://www.awm.gov.au/articles/encyclopedia/numbers/army*

Department of Veterans' Affairs (DVA) (1945-2000), 'Annual Reports'.

Mark Johnston (1996), 'The Civilians Who Joined Up, 1939-45', *Journal of the Australian War Memorial* .
URL: *https://www.awm.gov.au/index.php/articles/journal/j29/civils*

Mark Kantrowitz (1994), 'Name Corpus: List of Male, Female, and Pet names'.
URL: *http://www.cs.cmu.edu/Groups/AI/util/areas/nlp/corpora/names/0.html*