

ISSN 1440-771X



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January 2010

Working Paper 01/10

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Abstract

The recent debate on alcohol tax reform and recommendations from the Henry Tax Review in Australia have highlighted the need for quantifying externalities of excessive alcohol consumption by beverage types. This paper presents micro-level information from the Australian National Drug Strategy Household Surveys to examine the association between risky drinking behaviour, drinker characteristics, health and labour market status, and types of alcohol beverages consumed. Drinkers of regular strength beer (RSB) and RTDs in a can (RTDC) have the highest incidences of heavy bingeing, and low alcohol beer and fortified and bottled wine least likely. Bottled spirits (BS), RSB and RTDC are most likely linked to risky behaviour such as property damage and physical abuse under alcohol influence. All three spirit products are overwhelmingly the favourable drinks for the underage and young drinkers. Risky drinking behaviour is not found to be strictly associated with the alcohol strength of the products.

Keywords: Alcohol consumption, alcohol tax, binge drinking, beer, wine and spirits

JEL Classification: C10, D10, H20, I10, J10

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1. Introduction

The recent media focus and debate among social commentators, industry groups and health professionals in Australia on alcohol tax reform and recommendations from the Henry Tax Review (2010) have highlighted the need for quantifying externalities of excessive alcohol consumption by beverage types. Among a range of other policy instruments including education and regulations on underage and drink driving, liquor licensing, and advertising, economists consider alcohol taxation an important tool to correct negative externalities of alcohol abuse due to market failure (Clarke 2008, Freebairn 2010). Such externalities include external social costs as a result of road accidents, violence, crimes, unemployment, suicides, and extra burdens to the health care system.

Australia currently has a complex alcohol tax system, with beer and spirits taxed by differentiated volumetric excise rates according to alcohol strength and wine levied an *ad valorem* wine equalisation tax (WET) based on wholesale value (Zhao and Wittwer 2007). The Henry Review is believed to have recommended a change to a flat volumetric tax across all alcohol drinks with six stepped rates according to alcohol strength (The Age 2010). This seems to endorse the notion of ‘equal alcohol, equal tax’ regardless of product types, and also seems to associate the amount/degree of negative externalities with the strength of alcohol in a product.

Crucial to the discussion of alcohol policies is information on harmful drinking behaviour and its association with drinker characteristics and types of alcohol products consumed. With the aim of providing empirical evidence on potential negative social costs of harmful drinking by beverage types, and in conjunction with alcohol strengths of the products, this paper summarises micro-level information from the Australian National Drug Strategy

Household Surveys (NDSHS) to examine the association between risky drinking behaviour, drinker characteristics, health and labour market outcomes, and the types of alcohol beverages consumed. We examine trends in consumer tastes by alcohol types over the period of 1991 to 2004.¹ We also study the demographic and socioeconomic characteristics of consumers by drinking patterns and by types of alcohol product forms. We do this for four types of beer, three types of wine and three types of spirits products including two forms of ready-to-drink (RTD) pre-mixed spirits. The paper also explores the association between risky activities such as drink driving and physical abuse with drinking patterns and beverage types consumed. In addition, the paper examines the link between alcohol consumption and health and labour market outcomes. The NDSHS is a nationally representative survey of the non-institutionalised civilian population aged 14 and above in Australia. The survey has been conducted every two or three years since 1985. It collects information on individuals' behaviour, awareness and opinion in relation to a range of licit (such as alcohol and tobacco) and illicit (such as marijuana) recreational drugs. Up to 30,000 individuals were involved in each of the more recent surveys.

2. Harmful Drinking in Australia

Alcohol consumption is an integral part of Australian lifestyle. According to the World Drink Trends (WDT 2002), Australia was 19th in the world in terms of per capita alcohol consumption, with 7.8 litres of pure alcohol consumed per person per year. This ranked Australia behind major European countries but ahead of the US, Canada and New Zealand. When broken down to specific alcohol types, an average Australian consumed 95 litres of beer (9th in the world), 19.7 litres of wine (18th in the world) and 1.3 litres of pure alcohol from spirits (34th in the world) in the year.

Statistics show that consumption of alcohol at harmful levels is on an increasing trend in Australia. In 2004, 6.8 million Australians (41% of the population) drank at least weekly and 1.5 million (9%) consumed alcohol on a daily basis (NDSHS 2005). Much of this drinking takes the form of bingeing that is the act of drinking heavily over a short period of time.

¹ Data from the 2007 survey has recently been released and we are currently in the process of analysing them.

Nearly 35% of the population binged² at least once a year, with one out of five of them bingeing frequently at least three days a week (Srivastava 2008). Adding to the concern is anecdotal evidence of a binge epidemic among the young and an increasing popularity of pre-mixed RTD (or ‘alcopop’) spirits, especially among young females (Ramful and Zhao 2008). There has been much outcry in the media by social commentators and health professionals, urging authorities to take a careful stance on alcohol policies.

Irresponsible drinking takes a heavy toll on the society. Risky alcohol consumption has resulted in significant numbers of hospital episodes and deaths (Chikritzhs et al. 2003), and alcohol abuse is also a major contributor to road accidents, violence, crimes, unemployment and suicides. Whilst there is a notion of health benefit from moderate alcohol consumption, excessive drinking is associated to a range of physical and mental long term health conditions. In addition, there are also concerns of polydrug³ use and heavy drinking being potential gateway to other psychoactive substances. According to Collins and Lapsley (2008), the annual tangible cost for alcohol-related problems to Australia in 2004-05 was AUD\$10.8 billion, including costs via workplace productivity loss, road accidents, crime and health.

3. Trend in Consumer Taste by Alcohol Types

Table 1 presents the proportions of the population who have consumed particular types of alcohol drinks in the 12 months prior to the surveys over the period of 1991-2004. It is obvious that participation rates for wine and spirits have increased consistently over the fourteen year period, while participation for beer has started to decline since 1998. The percentage of wine drinkers increased steadily from 27.7% in 1991 to 52.3% in 2004. The percentage of beer drinkers has increased from 31.9% in 1993 to 46.2% in 1998, and then decreased to 42.2% by 2004. Notably, prevalence for spirits has risen dramatically from 14.4% in the early 1990’s to 43.9% in 2004. The significant increase in spirits consumption is

² Bingeing is defined as males consuming 7 or more standard drinks and females consuming 5 or more standard drinks on any one day, which is described as risky to high risky drinking in the short term according to the NHMRC 2001 Australian Alcohol Guidelines.

³ Polydrug usage refers to the use of a variety of psychoactive substances, either concurrently or sequentially. These can include licit and/or illicit drugs.

due to the increasing popularity of pre-mixed ‘alcopops’ that has been the attention of recent government policy and media reports.

Unfortunately, detailed information on types of alcoholic drinks did not become available until the 1998 survey. Looking at the changes in the components of spirits since 1998 when the data first became available, we find that while bottled spirits have shown a declining participation, participation rates for RTDs in cans and in bottles have both increased steadily since 1998. In 2004, 34% of the population drank bottled spirits, 17% drank RTDs in a can and 15% drank RTDs in a bottle. The decline in beer participation is reflected in all beer types. Participation rates for regular, mid strength beer have both declined steadily since 1998. Participation in low alcohol beer and home-brewed beer has also declined between 2001 and 2004.

Table 1: Participation Rate by Types of Alcohol Drinks

	1991	1993	1995	1998	2001	2004
Beer (B)	34.9%	31.9%	41.9%	46.2%	43.9%	42.2%
Regular strength beer (RSB)				29.6%	27.6%	24.3%
Mid strength beer (MSB)				13.7%	12.5%	11.2%
Low alcohol beer (LAB)				17.3%	18.5%	16.3%
Home-brewed beer (HBB)				n.a	3.5%	2.9%
Wine (W)	27.7%	29.3%	40.0%	49.9%	51.5%	52.3%
Cask wine (CW)				18.2%	17.1%	16.6%
Bottled wine (BW)				45.4%	46.2%	46.6%
Fortified wine (FW)				9.3%	13.8%	11.6%
Spirits (S)	17.6%	14.4%	29.6%	42.9%	42.6%	43.9%
RTD in a can (RTDC)				12.4%	14.0%	16.9%
Bottled spirits (BS)				37.1%	35.3%	34.0%
RTD in a bottle (RTDB)				10.3%	13.5%	15.1%
Other (O)	3.4%	2.4%	4.3%	11.4%	5.5%	4.5%

Source: NDSHS (2004).

The small increase in wine participation rate since 1998 has been led by the increase in the consumption of bottled wine. A rise in participation rate was also noted in fortified wine between 1998 and 2001 but the trend was not maintained in 2004. On the other hand, regardless of much discussion by commentators regarding the relative low tax on cask wine, a steady decline was noted in cask wine consumption between 1998 and 2004. The figures clearly indicate individuals’ preference for bottled wine. In 2004, 47% of the population drank bottled wine, in comparison to 16% and 12% for cask wine and fortified wine

respectively. Putting in the context of a 52% overall wine participation rate for 2004 and without looking further into the cross correlation for different wine types, it seems that individuals tend to stick to a particular wine type and only a small proportion of the population jointly consumes more than one type of the wine products. Similar story emerges for beer products; while 42% of the population drank beer in 2004, 24% of the population drank regular strength beer, 11% mid strength, 16% low alcohol beer, and 3% of the population drank home-brewed beer.

4. Consumer Characteristics and Drinking Behaviour by Alcohol Types.

Next, we report consumer socio-economic and demographic characteristics for individual types of alcohol drinks. As an example, we identify differences between drinkers of bottled wine, cask wine and fortified wine. The data also confirm the link of RTDs with young students and RTD bottles with young females. We also look at binge drinking and underage drinking by alcohol types.

4.1 Who Drinks What?

Table 2 presents participation rates for various types of alcohol drinks by socio-economic and demographic characteristics, using data from the 2004 NDSHS. Focusing on wine first in Table 2, 57% of women drank wine in 2004 relative to only 46% of men, resulting in a 52% participation rate for the whole population. In terms of individual wine types, females are more likely to drink both cask wine (17.6% of women) and bottled wine (51.1% of women) than men (15.3% and 40.9%), but less likely to drink fortified wine (10.3% of women versus 13.3% of men). Married or partnered individuals are more likely to drink all three wine types than singles. With relation to main activities, those who work and those who are retired or home makers (OTHERACT) are most likely to drink bottled wine and fortified wine, while retiree/home-makers and unemployed are most likely to drink cask wine. People who mainly study are least likely to drink all types of wine products. All three wine types are shown to be positively linked to education levels; those with tertiary education are most likely to drink all wine products. Lower proportions of aboriginals and Torres Strait Islanders (ATSI) drank all wine types than the rest of the population, and people living in capital cities are less likely to drink cask wine but more likely to drink bottled or fortified wine. Single-parents are less

likely to drink all wine types than the rest. Finally, people with pre-school age children are less likely to drink cask or fortified wine but more likely to drink bottled wine.

Without discussing detailed results for individual beer types, we can clearly see from Table 2 that beer is more likely to be associated with males and those who work or are unemployed relative to those who study or are in other activities. The story emerging from consumer characteristics for spirits is also consistent with the anecdotal observation. In particular, females are more likely to consume RTD in a bottle (21%) relative to men (8%). All three types of spirits products are more popular among single people and those with lower level of education in general. Students are notably more likely to consume RTDs and higher proportions of aboriginals and Torres Strait Islanders (ATSI) drank all spirits types than the rest of the population. People living in capital cities are less likely to drink RTD in a can but more likely to drink bottled spirits and RTD in a bottle. Single-parents are more likely to drink all spirits types than the rest of the population.

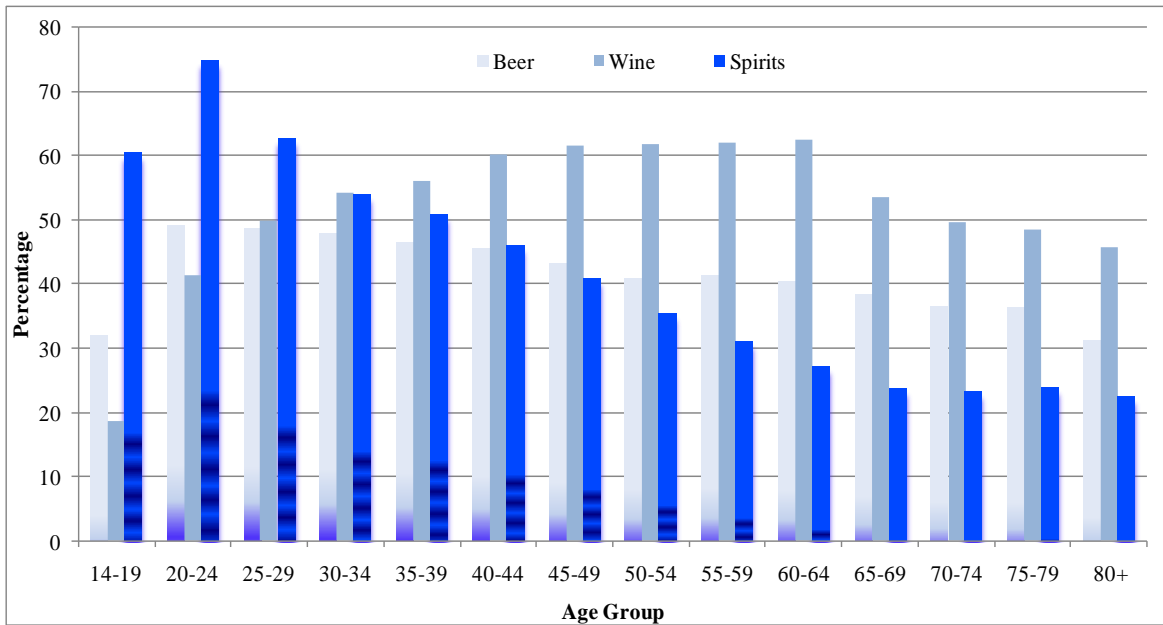
Figure 1 shows the age profile for beer, wine and spirits using data from 2004. It is clear that teenagers and young adults have a much higher prevalence rate for spirits, while beer and wine are more evenly spread across the age groups, though beer is most popular for the 20-40 groups and wine is most popular for the middle aged of 40-65. Figure 2 depicts the age profile of consumers of cask wine, bottled wine and fortified wine. Clearly bottled wine is more popular among middle aged individuals whereas cask wine and fortified wine is more highly consumed by older cohorts. The age profile of those who drank RTD in a can, RTD in a bottle and bottled spirits is depicted by Figure 3. Clearly, all three types of spirits drinks are most popular among young individuals. Pre-mixed RTDs are notably highest in the 14-24 age groups. The bottled straight-spirits participation rate is particularly high among young adults in the age-groups of 24-29 years. This is consistent with anecdotal evidence that young individuals self-mix dry spirits with sweet soft drinks such as coke. The shift of highest participation rate for RTDs in a can for the 14-19 group to the highest participation rate for dry spirits for the 20-24 group may also suggest a potential longitudinal shift from teenagers experimenting RTDs to young adult buying straight spirits to self-mix.

Table 2: Participation Rate by Demographic Groups for 2004

	B	RSB	MSB	LAB	HBB	W	CW	BW	FW	S	RTDC	BS	RTDB	O
<i>Overall</i>	42.2%	24.3%	11.2%	16.3%	2.9%	52.3%	16.6%	46.6%	11.6%	43.9%	16.9%	34.0%	15.1%	4.5%
MALE	67.4%	40.3%	18.6%	24.9%	5.0%	46.4%	15.3%	40.9%	13.3%	41.2%	17.4%	32.8%	8.2%	4.1%
FEMALE	22.6%	11.8%	5.4%	9.6%	1.2%	57.0%	17.6%	51.1%	10.3%	46.0%	16.4%	34.8%	20.5%	4.8%
MARRIED	43.6%	22.6%	11.7%	19.0%	2.9%	58.4%	18.1%	52.5%	12.7%	40.4%	12.2%	31.7%	11.1%	3.8%
SINGLE	40.3%	26.8%	10.6%	12.6%	2.7%	44.7%	14.6%	39.2%	10.2%	48.9%	23.3%	37.3%	20.8%	5.5%
WORK	49.3%	30.5%	13.7%	18.1%	2.9%	58.2%	14.9%	54.4%	11.5%	49.2%	19.6%	37.7%	16.6%	4.9%
STUDY	34.2%	26.0%	10.7%	8.8%	2.8%	28.8%	9.0%	25.6%	6.0%	55.7%	32.0%	39.5%	34.5%	6.5%
UNEMPL	48.3%	34.9%	11.5%	9.5%	4.7%	42.8%	17.6%	35.2%	10.4%	50.6%	26.6%	39.9%	19.8%	6.8%
OTHERACT	33.1%	13.5%	7.6%	16.2%	2.6%	51.3%	21.5%	42.0%	13.7%	31.7%	7.4%	26.2%	7.2%	3.1%
DEGREE	43.9%	27.1%	12.0%	18.5%	2.5%	73.9%	17.5%	70.3%	14.5%	40.8%	9.0%	35.3%	11.1%	5.1%
DIPLOMA	48.1%	26.8%	12.9%	18.7%	3.5%	52.1%	17.5%	46.0%	13.0%	45.9%	18.6%	35.1%	14.6%	4.4%
YR12	43.1%	29.9%	11.2%	12.5%	3.2%	51.0%	15.4%	45.5%	10.1%	54.4%	25.2%	42.3%	26.0%	5.4%
LESSYR12	34.6%	17.5%	8.9%	13.7%	2.3%	37.9%	15.4%	31.0%	8.9%	39.8%	17.3%	28.6%	14.2%	3.8%
PRESCHOOL	44.1%	28.3%	13.2%	14.8%	3.6%	52.2%	11.2%	49.9%	9.2%	51.4%	24.1%	35.5%	20.6%	5.0%
NO-PRESCHOOL	42.1%	23.9%	11.0%	16.5%	2.8%	52.7%	17.2%	46.6%	11.9%	43.2%	16.1%	34.0%	14.6%	4.5%
ATSI	42.9%	28.3%	12.9%	10.9%	4.0%	22.7%	9.8%	19.9%	7.3%	53.5%	34.3%	36.9%	21.5%	5.2%
NON-ATSI	42.2%	24.3%	11.2%	16.4%	2.8%	53.1%	16.7%	47.4%	11.7%	43.9%	16.6%	34.0%	15.1%	4.5%
CAPITAL	40.9%	25.2%	10.1%	15.9%	2.5%	56.9%	16.3%	51.8%	12.0%	43.8%	14.8%	35.1%	15.0%	4.5%
NON-CAPITAL	44.3%	22.8%	13.0%	17.0%	3.4%	44.7%	17.0%	38.0%	11.0%	44.0%	20.3%	32.1%	15.4%	4.3%
SIN-PARENT	34.7%	23.6%	10.7%	11.8%	3.0%	43.9%	14.8%	39.3%	9.1%	56.6%	30.0%	39.5%	28.3%	6.4%
OTHERHHL	43.1%	24.6%	11.2%	16.7%	2.8%	53.8%	16.9%	47.9%	11.9%	43.0%	15.7%	33.8%	14.1%	4.3%
Alcohol Strength (%)		4.7%	3.4%	2.6%	-		12.6%	12.6%	15-20%		5.0%	36%	5.5%	

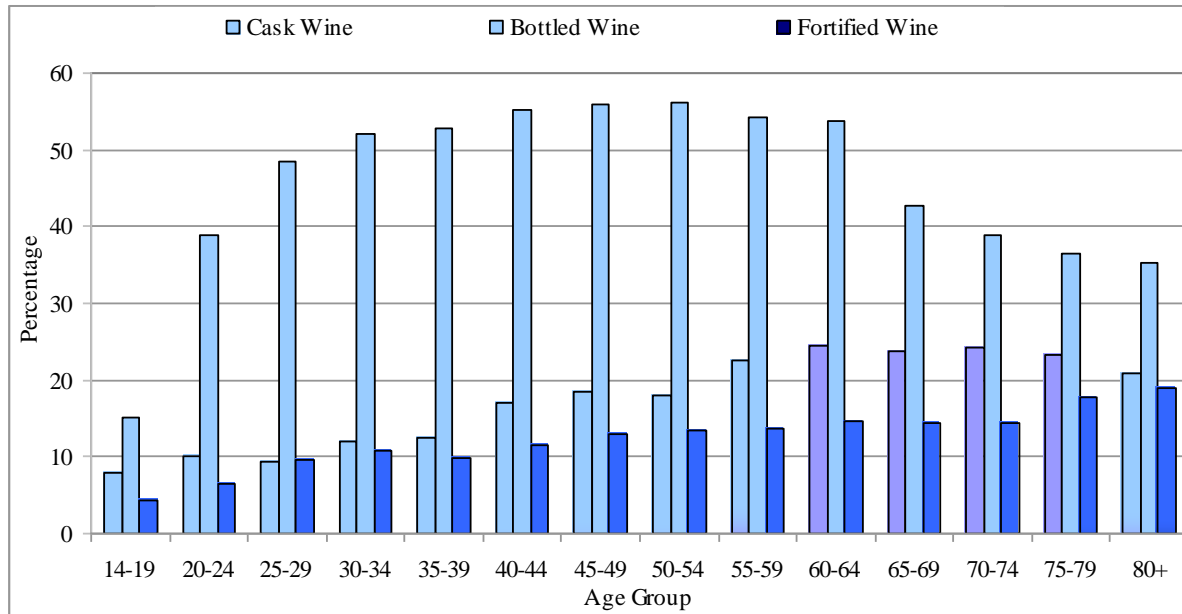
Note: **B** - Beer; **RSB** - Regular strength beer; **LAB** - Low alcohol beer; **HBB** - Home-brewed beer; **W** - Wine; **CW** - Cask Wine; **BW** - Bottled wine; **FW** - Fortified wine; **S** - Spirits; **RTDC** - RTD in a can; **BS** - Bottled Spirits; **RTDB** - RTD in a bottle; **O** - Other.
Source: NDSHS (2004).

Figure 1: Participation^a in Beer, Wine and Spirits Consumption, by Age Groups



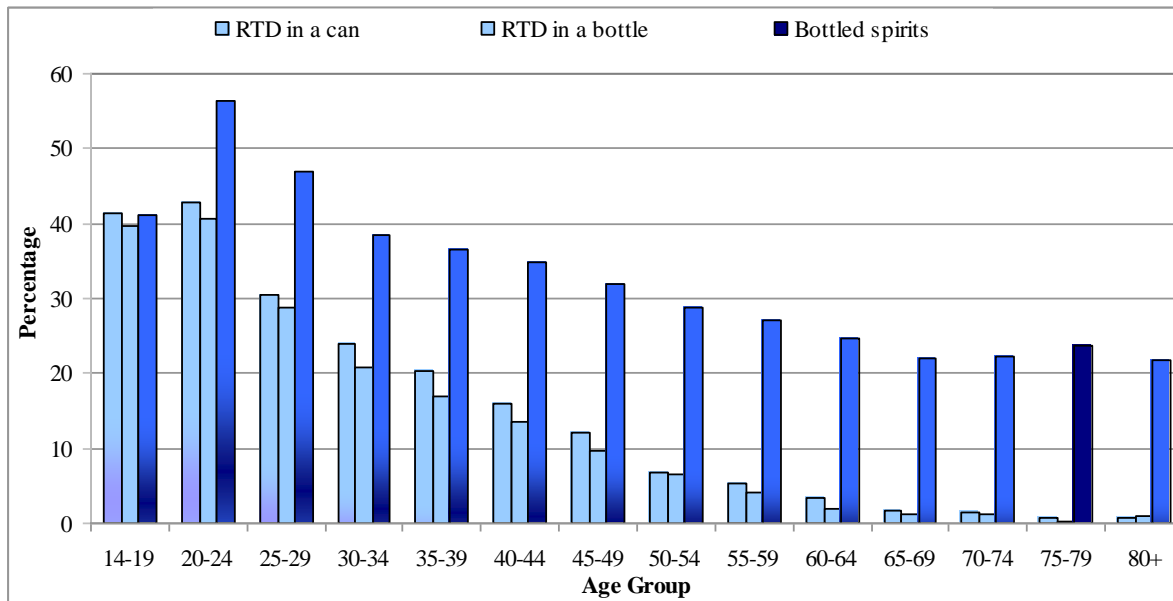
^a Proportions of consumers within each age group. Note that the proportions do not add up to a 100 for a given age group because drinkers may consume multiple alcohol types. Source: NDSHS (2004).

Figure 2: Participation^a in the Consumption of Cask Wine, Bottled Wine and Fortified Wine, by Age Groups



^a Proportions of consumers within each age group. Note that the proportions do not add up to a 100 for a given age group because drinkers may consume multiple alcohol types. Source: NDSHS (2004).

Figure 3: Participation^a in the Consumption of RTD in a can, RTD in a bottle and Bottled Spirits, by Age Groups



^a. Proportions of consumers within each age group. Note that the proportions do not add up to a 100 for a given age group because drinkers may consume multiple alcohol types. Source: NDSHS (2004).

3.2 Who Are the Bingers and What Do They Drink?

The adverse consequences of alcohol consumption are generally linked to heavy or binge drinking. Heavy episodic or binge drinking, more common among young people, has been a major concern for policymakers worldwide. Young people generally consider intoxication as being fashionable while others simply give in to peer pressure. In Australia, where drinking is an entrenched part of the individuals’ lifestyle, heavy sessional intake imposes a huge toll on the society. Alarmed by the increasing rate of binge drinking among young Australians, the Rudd Government has announced a new national strategy to address the binge drinking epidemic. Several measures, such as community level initiatives, early intervention and advertising, have been earmarked in order to help reduce alcohol misuse and binge drinking among young Australians.

Although binge drinking is a term widely recognised as the act of drinking heavily on an occasion, there appears to be a lack of consensus on its definition worldwide. Much of the difference in the definitions has been driven by variations in the units of

measurement of alcoholic beverages and in other instances, the number of drinks. A problematic feature of these definitions is that very often neither the duration of an occasion nor the drink sizes and strength are defined. In Australia, the National Health and Medical Research Council (NHMRC) recommends guidelines for the maximum number of standard drinks to be consumed in order to minimise risks in the short and long terms and maximise any potential health benefits. They indicate three risk levels - low, medium and high - based on both the amount (i.e. number of standard drinks consumed on any one day) and frequency of consumption (NHMRC 2001).

In the absence of a standard measure of binge drinking, risk levels for short-term harms associated with drinking as defined by the NHMRC are used to separate individuals into different drinking categories (NHMRC 2001)⁴. Using the 2001 guidelines, we define bingers as those indulging in medium to high risk drinking, that is to say men drinking at least seven and women drinking at least five drinks on a single occasion. This is also consistent with the definition of binge or heavy drinking in the literature.

Based on their drinking patterns, individuals are grouped into four categories: abstainers; non bingers; occasional bingers; and frequent bingers. *Abstainers* are defined as those who have not consumed any alcohol in the past year; *non bingers* refer to those who drink but do not binge (consumption in a day of less than seven drinks by males and less than five drinks by females); *occasional bingers* are those who binge less than three days a week; and *frequent bingers* are those who binge at least 3 days a week.

Table 3 reports the pattern of drinking across the three most recent surveys to demonstrate, in particular, Australians' bingeing behaviour. Australians' drinking pattern has remained rather stable in the period of 1998 to 2004. In 2004, 31.8% of males and 27.2% of females binged occasionally while 10.1% of males and 6.2% of females binged at least 3 days a week.

⁴ The analysis here is based on the 2001 NHMRC definition for binge drinking. Note that a new set of guidelines has recently been released by the NHMRC in 2009.

Table 3: Pattern of Recent Alcohol Consumption (Percent)

	1998		2001		2004		Pooled		All
	Male	Female	Male	Female	Male	Female	Male	Female	
<i>Abstainers</i>	16.9	22.2	14.9	20.4	12.9	18.6	13.9	19.5	17.1
<i>Non Binger</i>	44.1	45.2	46.9	47.5	45.2	48.1	46.1	47.8	47.1
<i>Occasional Binger</i>	29.7	26.0	29.6	26.3	31.8	27.2	30.7	26.7	28.5
<i>Frequent Binger</i>	9.4	6.7	8.6	5.7	10.1	6.2	9.3	5.9	7.4
Drinking Participation^a	83.1	77.8	85.1	79.6	87.1	81.4	86.1	80.5	82.9
Binge participation	39.1	32.6	38.2	32.0	41.9	33.3	40.0	32.7	35.9

^a Used in the last 12 months. Source: NDSHS (2004).

Table 4: Bingeing Behaviour and Types of Drinks ^a

	<i>Alcohol %</i>	Non bingers	Occasional bingers	Heavy bingers	Total
Beer		47.0%	40.2%	12.8%	100%
Regular strength beer	4-5%	33.7%	49.0%	17.3%	100%
Mid strength beer	3-4%	44.4%	43.6%	12.0%	100%
Low alcohol beer	2-2.5%	62.0%	32.7%	5.3%	100%
Home-brewed beer	-	33.8%	49.9%	16.3%	100%
Wine		57.8%	34.7%	7.5%	100%
Cask wine	12-13%	56.6%	32.7%	10.7%	100%
Bottled wine	12-13%	57.1%	35.8%	7.1%	100%
Fortified wine	15-20%	61.8%	31.4%	6.8%	100%
Spirits		47.5%	42.0%	10.5%	100%
RTDs in a can	5-8%	33.1%	50.5%	16.4%	100%
Bottled spirits	35-40%	46.2%	42.9%	10.9%	100%
RTDs in a bottle	5-8%	40.7%	47.9%	11.4%	100%
Other		45.8%	41.2%	13.0%	100%

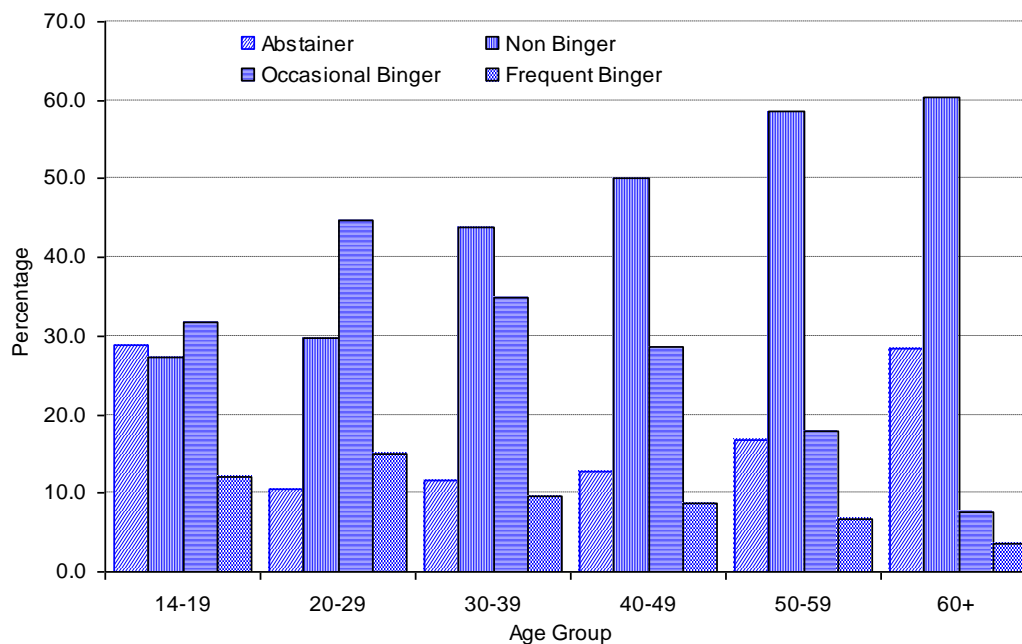
^a Alcohol content is obtained from various sources on the internet. Source: NDSHS (2004).

Table 4 presents Australians' drinking pattern by types of alcohol. Notably, regular strength beer (17.3%), home-brewed beer (16.3%) and RTDs in a can (16.4%) have the highest incidences of heavy bingers, while low alcohol beer (5.3%), fortified (6.8%) and bottled (7.1%) wine drinkers have the lowest proportions of heavy bingeing. Conversely, in the case of non bingers, the highest proportions of non-bingeing come from those who drink low alcohol beer and the three types of wines, while the lowest proportions of non-bingeing comes from those who drink RTD in a can, regular beer or home-brewed beer. Interestingly, cask wine drinkers ranked 7th for the highest heavy bingeing rate out of the 10 drink types, behind all spirits and beer drinks except for low alcohol beers. The results in Table 4 also indicate that binge drinking is not strictly associated with the alcohol strength in alcoholic

drinks. Anecdotal evidence shows that often binge drinkers would mix drinks starting from beer and moving on to ready-to-drink products (SIRC 2004).

Figure 3 depicts drinking patterns within various age groups based on the pooled sample of the last three surveys. The highest proportion of frequent bingeing occurs in the 14-29 age group. Thereafter, bingeing seems to decrease progressively over older cohorts.

Figure 3: Pattern^a of Alcohol Use by Age



^a Proportions of abstainers, non bingers, occasional bingers and frequent bingers within each age group. Source: NDSHS (2004).

3.3 Early Onset, Underage Drinking and Types of Drinks

The early onset of drinking is known to be linked to a higher risk of later alcohol abuse and dependence. A study on the drinking behaviour of Australian secondary students aged between 12 and 17 years shows that in 2005 around 86 percent of students had tried alcohol by the age of 14, and by the age of 17, 70 percent had consumed alcohol in the month prior to the survey (White and Hayman 2006). Of current drinkers, almost 30 percent had binged in the previous week, peaking at 44 percent among 17-year olds.

Table 5 shows that early onset is highly associated with heavy bingeing. In particular, the average age of onset among heavy bingers was 15 years in 2004 as compared to non bingers whose age of onset was on average 18 years. The average age of onset among occasional bingers was somewhere between the two (16 years). Underage drinking is a common phenomenon worldwide. A fairly high proportion of young Australians under the age of 18 were found to binge occasionally (23%) in 2004, 6% binged frequently, and about 30% were non bingers.

Table 5: Age of Onset and Underage Alcohol Participation by Binge Types

	Abstainer	Non Binger	Occasional Binger	Heavy Binger	
Average age of onset (years)		18	16	15	
Underage (%)	36.8	29.8	23.1	6.1	<i>100</i>

Source: NDSHS (2004).

Table 6: Underage Participation^a by Alcohol Types

	Underage
Beer	25.1%
Regular strength beer	17.3%
Mid strength beer	10.3%
Low alcohol beer	7.6%
Home-brewed beer	2.4%
Wine	13.3%
Cask wine	5.9%
Bottled wine	10.1%
Fortified wine	3.4%
Spirits	48.1%
RTD in a can	32.6%
Bottled spirits	30.4%
RTD in a bottle	30.6%
Other	5.8%

^a Proportions of consumers by alcohol types among those who are under 18 years old.

Source: NDSHS (2004).

To shed light on the underage drinkers' choice of alcohol drinks, we report in Table 6 the rate of participation by alcohol types among those who are below the minimum legal drinking age of 18. As expected, the highest rate of participation among underage individuals was noted for spirits (48%), pointing out the imminence of the problem with RTDs among young people. As mentioned before, alcopops or RTDs are particularly appealing to young females. Beer is the second choice (25%) of alcoholic drink for young underage individuals. In

particular, regular strength beer is preferred to mid strength beer or low alcohol beer. On the other hand, wine is among the least favoured drinks for underage drinkers; about 13% of the 18 or under 18 year olds were found to drink wine on average, favouring bottled wine to cask wine or fortified wine.

3.4 Risky Behaviour and Types of Drinks

There is also ample evidence pointing out that individuals under the influence of alcohol engage in risky behaviours such as drink driving, risky sexual activities and violence. Table 7 depicts some risky and/or unlawful activities that individuals undertake under the influence of alcohol and their association with drinking patterns. Clearly, there is a strong correlation between bingeing and such activities as swimming, driving, damage to property, and physically abusing someone under the influence of alcohol. For instance, heavy bingers are more likely to drive under the influence of alcohol (38%) than occasional bingers (25%) or non bingers (7%). Relative to non-bingers and occasional bingers, heavy bingers are also most likely to be involved in swimming, damage to property and physical abuse under the influence of alcohol. While breastfeeding is negatively correlated with bingeing, the proportions of women who drank when pregnant is higher among heavy bingers (14%) than among non bingers (9%).

Table 7: Risky and/or unlawful activities carried out under the influence of alcohol, by drinking pattern (Per cent)^a

	Non Binger	Occasional Binger	Heavy Binger
Swimming	1.3	9.8	20.5
Driving	7.4	24.7	37.5
Damage to property	0.3	2.4	7.2
Physically abused someone	0.2	1.6	5.8
Pregnant (<i>females only</i>)	9.1	9.4	13.6
Breastfeeding (<i>females only</i>)	11.5	8.7	5.4

Note: ^a Proportions of consumers who carry out the risky activities out of all drinkers within each drinking pattern group.

Table 8 shows the association of risky and/or unlawful activities with the alcohol types the offenders drink. It appears that bottled spirits, regular strength beer and RTD in a can are the three most likely alcohol types for individuals involved in drink-driving, drink-swimming, damage to property or physical abuse under the influence of alcohol. Driving and swimming

after drinking are also more likely to be the behaviour of bottled wine drinkers. For instance, those who said that they caused damage to properties are more likely to consume bottled spirits (66%), regular strength beer (63%) and premixed spirits in a can (59%). Pregnant women and those who breastfeed under the influence of alcohol are more likely to drink bottled wine (71% and 81%, respectively).

Table 8: Risky and/or unlawful activities carried out under the influence of alcohol, by alcohol types (Per cent)^a

	CW	BW	FW	RSB	MSB	LAB	RTDC	BS	RTDB
Swimming	17.7	48.2	11.4	55.9	21.4	13.4	43.1	55.5	28.7
Driving	18.8	59.2	13.5	47.7	18.8	19.2	27.9	47.1	17.9
Damage to property	19.6	32.8	12.3	63.3	18.5	8.1	58.5	65.5	37.8
Physically abused someone	14.6	29.1	11.1	51.3	18	8.4	59.8	53.3	33.3
Pregnant (Females only)	16	70.7	9.8	38.7	8.6	12.5	25.8	29.7	46.9
Breastfeeding (Females only)	15.6	80.9	12.9	34.4	9.4	12.5	18.4	22.3	42.6

Note: ^a Participation rates by alcohol types out of those who carry out each of the risky activities while drinking. **CW** - Cask Wine; **BW** - Bottled wine; **FW** - Fortified wine; **RSB** - Regular strength beer; **LAB** - Low alcohol beer; **RTDC** - RTD in a can; **BS** - Bottled Spirits; **RTDB** - RTD in a bottle. Source: NDSHS (2004).

3.5 Places of Consumption and Types of Drinks

Environmental stimuli or cues (such as people and places) are considered to have a significant influence on alcohol consumption and relapse to heavy drinking. Table 9 presents the places where alcohol is commonly consumed in Australia. In general, all three alcoholic types, beer, wine and spirits, are mostly consumed at one's own home. Other than own home, beer is most commonly consumed at licensed premises such as pubs and clubs (62.5%) and a friend's place (59.6%); spirits are mostly consumed at a friend's house (64.9%) and pubs/clubs (62.6%), and wine is more frequently consumed at restaurants/cafes (69.2%) or a friend's house (64.8%).

Table 9: Place of Consumption by Alcohol Types^a

	Beer	Wine	<i>Cask Wine</i>	<i>Bottled Wine</i>	<i>Fortified Wine</i>	Spirits	<i>Pre-mixed Spirits</i>	<i>Bottled Spirits</i>
In my own home	86.5%	90.3%	95.0%	89.9%	92.9%	83.0%	79.0%	85.2%
At a friend's house	59.6%	64.8%	62.9%	68.2%	68.9%	64.9%	67.5%	67.6%
At a party at someone's house	49.0%	49.6%	49.2%	52.2%	54.8%	57.4%	63.6%	59.7%
At licensed premises (e.g., pubs, clubs)	62.5%	52.5%	53.4%	54.4%	58.4%	62.6%	66.7%	64.1%
At restaurants/cafes	54.5%	69.2%	62.5%	73.8%	68.8%	57.4%	52.5%	61.6%
At my workplace	8.4%	6.5%	4.8%	7.2%	8.1%	7.2%	8.0%	7.6%
At raves/dance parties	5.5%	3.6%	4.2%	3.8%	4.4%	7.4%	11.1%	8.0%
In public places (e.g., parks)	4.0%	3.1%	3.8%	3.1%	5.0%	4.0%	5.1%	4.6%
In a car or other vehicle	3.3%	1.5%	2.5%	1.4%	2.6%	3.3%	5.3%	3.6%
Somewhere else	2.7%	1.5%	1.9%	1.5%	3.1%	2.6%	3.6%	2.9%
At school, TAFE, University, etc	1.6%	1.2%	1.6%	1.3%	1.5%	1.5%	1.9%	1.7%

^a Percentage of drinkers for each alcohol type who consume at each place. Source: NDSHS (2004).

4. Alcohol Consumption and Health

The misuse of alcohol causes significant harm to individuals and society. Alcohol is second only to tobacco as a preventable cause of death and hospitalisation in Australia. Alcohol harm was responsible for 2 per cent of the total burden of disease and injury in Australia in 2003 (Begg, et al. 2007). Its hazardous and harmful use led to the deaths of more than 3000 Australians in 2003, which represented almost 3 per cent of all deaths. These deaths were primarily related to road accidents, stroke, alcoholic liver cirrhosis and suicide. Alcohol is also responsible for a significant level of crime, violence and sexual assaults (AIHW 2007).

Whilst excessive drinking is often associated with acute health consequences, crime, violence, road fatalities and various other adverse social and psychological outcomes, moderate drinking is widely recognised to provide health benefits. Several studies have found that light and moderate drinking are associated with a lower incidence of stroke. There has been evidence linking wine consumption to some positive health outcomes among middle-aged and older people. In particular, regular and moderate use of red wine has been associated with a reduced risk of heart disease. Alcohol was found to prevent 0.9 percent of the total burden in 2003 (Begg, et al. 2007). The study also reported that in females over the age of 65, the benefits of alcohol consumption outweighed its harmful effects.

4.1 Types of Drinks and Health Status

Table 10 reports some health statistics by individual alcohol types. Individuals' self-reported health statuses across various alcohol types consumed indicate that wine drinkers enjoy the highest overall health status, whilst beer drinkers report the lowest health status. A finer disaggregation of the alcohol types indicates a remarkably high proportion of individuals (56%) reporting a very good to excellent health status among those who drink bottled wine as compared to cask wine or fortified wine consumers.

Table 11 presents some incidences of chronic conditions across individual alcohol types. Overall, spirits appear to be correlated with the lowest incidence of diabetes, heart disease, hypertension, cancer, presumably due to the link of spirits with young drinkers; wine is correlated with the lowest incidence of STD; and beer with the lowest incidence of mental disorders and other conditions.

Table 10: Self Reported Health by Types of Drinks

	Very good/ Excellent	Good	Fair	Poor	
Overall	50.7%	34.7%	12.2%	2.4%	100%
Beer	48.6%	36.7%	12.6%	2.1%	100%
Regular strength beer	50.1%	35.9%	11.8%	2.1%	100%
Mid strength beer	49.7%	37.1%	11.6%	1.7%	100%
Low alcohol beer	49.2%	35.7%	13.0%	2.0%	100%
Home-brewed beer	49.9%	36.6%	11.7%	1.8%	100%
Wine	54.2%	33.8%	10.2%	1.8%	100%
Cask wine	49.0%	35.9%	12.5%	2.7%	100%
Bottled wine	55.7%	33.3%	9.5%	1.5%	100%
Fortified wine	49.1%	36.3%	12.4%	2.2%	100%
Spirits	50.5%	35.7%	11.9%	1.8%	100%
RTD in a can	49.7%	36.9%	11.7%	1.6%	100%
Bottled spirits	49.5%	36.2%	12.3%	2.0%	100%
RTD in a bottle	53.2%	35.4%	10.2%	1.2%	100%
Other	48.3%	36.1%	13.2%	2.4%	100%

Source: NDSHS (2004).

Table 11: Chronic Conditions by Types of Drinks

	Diabetes	Heart disease	HBP	STD	Cancer	Mental	Other Conditions
Overall	4.3%	3.8%	14.8%	1.2%	2.6%	9.9%	17.2%
Beer	4.1%	4.2%	15.6%	1.1%	2.7%	8.8%	14.2%
Regular strength beer	2.7%	2.6%	10.6%	1.5%	1.7%	9.1%	13.5%
Mid strength beer	3.6%	3.2%	11.9%	1.0%	2.5%	8.1%	14.2%
Low alcohol beer	6.0%	5.7%	19.2%	0.8%	3.6%	8.0%	14.9%
Home-brewed beer	3.7%	2.7%	15.2%	1.0%	4.0%	9.1%	13.9%
Wine	3.6%	3.7%	14.7%	1.0%	2.6%	9.7%	16.7%
Cask wine	4.4%	5.2%	20.1%	0.8%	3.2%	11.4%	18.3%
Bottled wine	3.4%	3.3%	14.6%	1.0%	2.4%	9.3%	16.4%
Fortified wine	4.0%	5.2%	19.1%	1.0%	3.3%	9.9%	19.1%
Spirits	3.0%	2.7%	11.5%	1.4%	2.0%	10.9%	18.3%
RTD in a can	1.4%	1.1%	5.8%	2.1%	1.1%	11.4%	17.9%
Bottled spirits	3.3%	3.1%	13.0%	1.4%	2.2%	10.9%	18.5%
RTD in a bottle (RTDB)	1.8%	0.6%	5.4%	1.8%	1.1%	11.6%	20.1%
Other	2.6%	3.0%	11.0%	1.6%	2.1%	12.9%	21.8%

Nb: Percentages represent prevalence of chronic conditions overall and in each drinking group. **HBP**: hypertension (high blood pressure); **STD**: sexually transmitted infection including hepatitis; **Mental**: mental disorders such as depression, anxiety disorder, schizophrenia, bi-polar disorder, eating disorder and other form of psychosis; **Other Conditions**: iron deficiency and asthma. Source: NDSHS (2004).

Note however, the incidence across all chronic conditions for those who consume wine is lower than those in the general population (first row). In contrast, beer consumers have a higher incidence of heart disease, hypertension and cancer than the general population. The incidence of mental disorders and other conditions is highest among those who consume spirits - generally the younger segment of the population. An econometric model can be used to isolate the partial correlation between types of drinks and chronic conditions controlling for other factors such as age.

4.2 Bingeing and Health

Bingeing behaviours also appear to be correlated with self-reported health. Table 12 shows that those who binge heavily report a lower general health status relative to abstainers, non bingers and occasional bingers. Interestingly, occasional bingers and non bingers report a higher health status than abstainers. However, this may also reflect the reverse causal relationship between health and drinking where those with poor health might have quit drinking. Again, formal econometric models are needed to separate these effects.

Table 12: Bingeing and Self Reported Health

	<i>Overall</i>	Abstainer	Non Binger	Occasional Binger	Heavy Binger
Very good/Excellent	50.7%	48.4%	51.1%	54.1%	40.1%
Good	34.7%	32.1%	34.9%	34.2%	41.1%
Fair	12.2%	15.1%	11.8%	10.3%	15.7%
Poor	2.4%	4.4%	2.2%	1.4%	3.2%
	100.0%	100.0%	100.0%	100.0%	100.0%

Source: NDSHS (2004).

Table 13 presents the incidences of chronic conditions across the four drinking statuses. The incidences of mental disorders and STD are clearly the highest among heavy bingers and also higher than in the general population. The high incidences of the other chronic conditions across abstainers and non bingers could again reflect the reverse causal relationship of health on drinking behaviour.

Table 13: Bingeing and Chronic Conditions

	<i>Overall</i>	<i>Abstainer</i>	<i>Non Binger</i>	<i>Occasional Binger</i>	<i>Heavy Binger</i>
Diabetes	4.3%	7.9%	4.9%	1.9%	2.5%
High BP	14.8%	20.1%	17.8%	7.7%	11.6%
Mental	9.9%	9.5%	9.3%	9.9%	13.8%
STD	1.2%	0.9%	0.8%	1.6%	2.4%
Cancer	2.6%	3.4%	3.0%	1.5%	2.2%
Heart	3.8%	6.6%	4.3%	1.7%	2.7%
Other Conditions	17.2%	20.1%	17.2%	15.7%	16.3%

Note: Percentages represent prevalence of chronic conditions overall and by drinking status. **HBP**: hypertension (high blood pressure); **STD**: sexually transmitted infection including hepatitis; **Mental**: mental disorders such as depression, anxiety disorder, schizophrenia, bi-polar disorder, eating disorder and other form of psychosis; **Other Conditions**: iron deficiency and asthma. Source: NDSHS (2004).

5. Alcohol Consumption and Labour Market Outcomes

Drinking is widely argued to have an adverse impact on labour market outcomes usually through impaired health, absenteeism and poor job performance. Where workers receive wages that reflect their productivity, heavy drinking or bingeing is likely to have an adverse effect on their earnings. In 2004-05, alcohol abuse related loss of productive capacity in the Australian paid workforce was estimated at around AUD\$3.6 billion. This represented loss in productive capacity due to deaths and illnesses causing premature retirement, absenteeism from sickness or injury, and reduced productivity (Collins and Lapsley 2008).

On the other hand, it is believed that moderate drinking can increase social capital which in turn can enhance labour market outcomes. The relationship between alcohol use and abuse, and labour market outcomes has received growing attention in the international literature, more so in the last decade. While excessive drinking has been associated with lower earnings through adverse health effects, absenteeism and low productivity, light, or moderate, alcohol consumption is believed to generate positive wage effects (Barrett 2002, Srivastava 2008). These positive wage premiums are expected to arise from the beneficial health effects of drinking in moderation. As mentioned earlier, moderate drinking is related to some health benefits such as lower incidence of stroke. It is also believed that alcohol reduces stress and tension levels and plays a networking role. A Dutch study has found that moderate drinkers under stress were less likely to be absent from work than were either abstainers or heavy

drinkers under stress (Vasse et al., 1998). Peters and Stringham (2006) has shown that individuals derive benefits from the ‘networking’ effect of alcohol consumption.

5.1 Average Days of Lost Productivity and Types of Drinks

Table 14 illustrates the average number of days of work, school, TAFE or university missed because of alcohol consumption in the last three months before the survey. Those drinking beer and spirits have on average 0.177 day lost work or study as compared to 0.131 day for wine. In terms of the ten specific types of drinks, the average days absent from work or study are the highest among those who consumed home-brewed beer (0.376 day) and bottled spirits (0.317 day), followed by regular strength beer (0.261), RTD in a bottle (0.249) and cask wine (0.233).

Table 14: Days of Work/Study Missed Because of Alcohol Consumption^a

	Average Days absent
Beer	0.177
Regular strength beer	0.261
Mid strength beer	0.172
Low alcohol beer	0.055
Home-brewed beer	0.376
Wine	0.131
Cask wine	0.233
Bottled wine	0.126
Fortified wine	0.113
Spirits	0.176
RTD in a can	0.178
Bottled spirits	0.317
RTD in a bottle	0.249

Note: ^a Average number of days absent from work or study, for drinkers of each alcohol type. Source: NDSHS (2004).

5.2 Labour Market Status and Types of Drinks

In Table 2 discussed earlier, the four rows relating to the four types of main activities (Work, Study, Unemployed and Other Activities) show the participation rates for various alcohol types within the four employment sub-populations in comparison to the ‘Overall’ participation rates for the general population on the top row of that table. Workers, retirees or

home makers (OTHERACT) are most likely to drink bottled wine and fortified wine, while retirees/home-makers and unemployed are most likely to drink cask wine. Among the unemployed, wine consumption has the lowest prevalence (43%) and spirits consumption the highest (51%), a very different picture in comparison to the general population who prefer wine over spirits.

To provide further insights into the relationship between job types and drink types, we present in Table 15 the participation rates for the sub-population of white collar workers versus blue collar workers. Among those who are employed in white jobs, wine appeared to be the most popular type of alcohol consumed (66%), with a distinct preference for bottled wine (62%). Spirits was the second choice of alcoholic drink (49%) with a higher preference for bottled spirits (39%) while the least consumed drug was beer.

On the other hand, beer is clearly the first choice of alcoholic drink across blue job workers (64%), with again a preference for regular strength beer (40%). The second most favourite drink is spirits (52%) while wine is the least favoured drink (36%), with the highest participation in bottled wine (32%).

Table 15: Participation by Types of Drinks across Unemployed and Employed with White/Blue Type Jobs

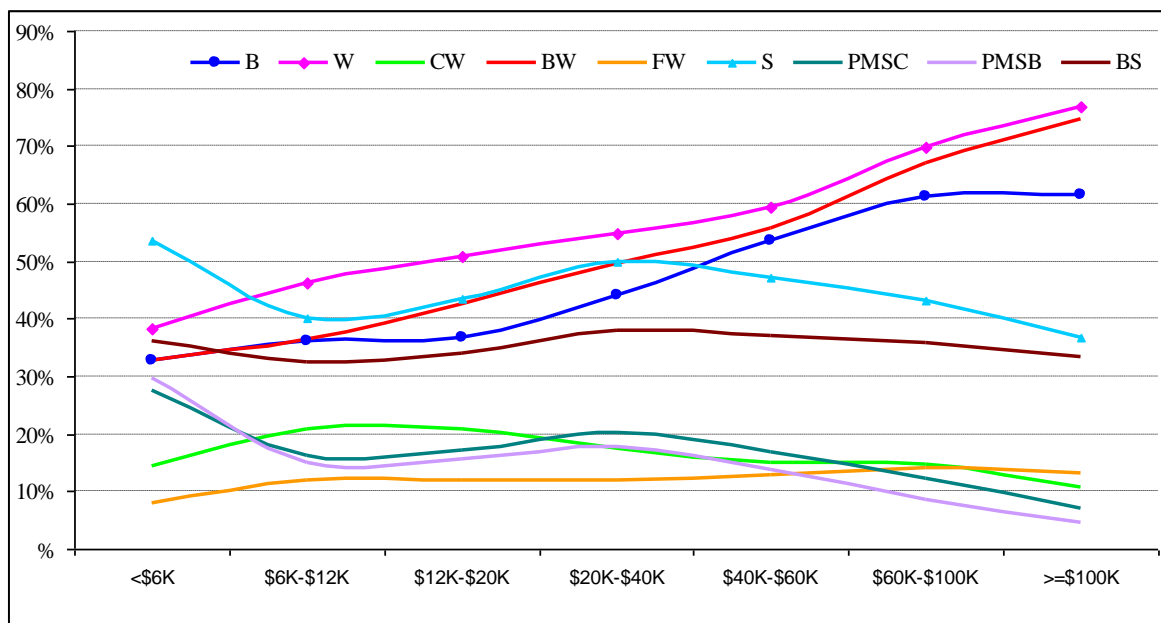
	White jobs %	Blue jobs %
Beer	44.6	63.8
Regular strength beer	27.4	40.2
Mid strength beer	12.1	18.6
Low alcohol beer	18.0	18.7
Home-brewed beer	2.6	4.3
Wine	66.1	35.6
Cask wine	16.3	10.9
Bottled wine	62.3	31.8
Fortified wine	12.1	10.2
Spirits	49.0	51.5
RTD in a can	16.6	28.7
Bottled spirits	38.6	36.3
RTD in a bottle	17.3	14.6
Other	5.1	4.8

Note: Percentages represent participation by types of drinks among those who are employed in white/blue collar jobs. Source: NDSHS (2004).

5.3 Earnings and Types of Drinks

Figure 4 depicts Australians' earnings profile by alcohol types. Among those in the lowest earnings band, spirits has the highest prevalence and beer the lowest. On the other hand, among those with the highest earnings, wine has the highest prevalence while the prevalence of spirits is markedly low. Both beer and wine are positively correlated with earnings while spirits consumption does not appear to be particularly related with earnings. At a more disaggregated level, neither cask wine nor fortified wine consumption appears to be correlated with earnings. However, bottled wine consumption is positively correlated with earnings. Consumption of RTDs, on the other hand, seems to be negatively correlated with earnings while bottled spirits consumption is more or less constant at all levels of earnings.

Figure 4: Earnings by Types of Drinks



Note: Participation rate by type of drink within each earning band. Note that the proportions do not add up to a 100 for a given earning band because drinkers may consume multiple alcohol types. Note: **B** - Beer; **W** - Wine; **CW** - Cask Wine; **BW** - Bottled wine; **FW** - Fortified wine; **S**- Spirits; **RTDC** - RTD in a can; **BS** - Bottled Spirits; **RTDB** - RTD in a bottle. Source: NDSHS (2004).

6. Conclusions

This paper summarises the microeconomic evidence on alcohol consumption in Australia. In particular, it examines changes in consumer tastes, risky drinking behaviour, and socioeconomic and demographic drinker characteristics by alcohol types.

Participation rates for both wine and spirits are found to have increased steadily since 1991. The increasing popularity of pre-mixed spirits drinks in recent years is clearly shown in the significant increase in participation rates in RTDs. Beer has seen a slight decline since 1998. In 2004, wine is still the most popular alcohol drink for Australians.

In terms of drinker characteristics, wine consumers are more likely to be female, educated, married and middle aged. Bottled wine is linked to white collar workers and retirees/housekeepers, while cask wine is more likely to be associated with retirees/housekeepers and unemployed. Beer drinkers are significantly over represented by males, while spirits are most likely to be consumed by young (less than 24 years of age), single individuals who are studying. Pre-mixed RTDs in bottles (light RTDs) are mostly associated with young female drinkers, while pre-mixed RTDs in cans (dark RTDs) are linked to both young males and females.

Heavy bingeing behaviour is most likely to be linked to regular strength beer, home-brewed beer and dark RTDs, but least likely to be linked to low alcohol beer, bottled and fortified wine. Alarmingly, under-aged drinkers are overly represented by spirits drinkers; as high as 48% of under-aged individuals consume spirits relative to 13% for wine. Drinkers of regular strength beer, bottled spirits, dark RTDs and light RTDs are also more likely to be involved in risky and/or unlawful activities such as drink driving, damage to properties and physical abuse relative to drinkers of other alcohol types. Bottled wine drinkers are also more likely to be drink-driving or drink-swimming. Most likely places for wine consumption are own homes, cafes and restaurants. RTD drinkers are more likely to be drinking in public places and in cars and other vehicles.

Wine consumers enjoy the highest self-reported overall health status, especially bottled wine drinkers, whilst regular beer consumers report the lowest health status. In terms of major chronic diseases, beer drinkers report the highest proportions of most of the major chronic conditions including diabetes, heart diseases and high blood pressure, while spirits consumers report the highest chance for mental health problems. Spirits consumers report lower proportions of many chronic conditions than wine drinkers due to the link between youth and spirits consumption. Investigation into the relationship between drinking behaviour and labour market outcomes shows that wine consumption is linked

to employment in white collar jobs and lower numbers of days of work or study lost due to drinking relative to spirits and beer consumers.

A range of policy tools are necessary to address the adverse effects of alcohol consumption including education, regulation and taxation. Information on the external costs of alcohol consumption is crucial in designing an effective alcohol tax system, but quantifying the negative externalities of drinking by alcohol product types is a huge task. Using individual level nationally representative data, this paper provides empirical evidence on some of the harmful drinking behaviours by alcoholic types to shed light on differences in such externalities by product forms. While the paper has focused on presenting descriptive relationships between key variables of interest, formal econometric analyses are necessary to separately identify the marginal effects of individual factors contributing to drinking behaviour, the intrinsic correlation across consumption of different alcohol types, relationship to other related licit and illicit products, and any causality between health, labour market behaviour and drinking behaviour. See Zhao and Harris (2004), Harris, Ramful and Zhao (2006), Ramful and Zhao (2008), and Srivastava (2008) for related econometric studies. Full evaluation of any proposed alcohol tax changes on the consumption of various alcohol drinks of course will also require assumption of consumer price responsiveness and substitution behaviour across products, as well as producers' response in restructuring product mix. Zhao and Wittwer (2007) specified a system of demand and supply equations to simulate the impacts of potential alcohol tax reform scenarios in Australia on the consumers and producers of differentiated alcoholic products. The revenue neutral tax rates are solved endogenously via simulation in some tax reform scenarios allowing both producers and consumers to adjust.

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