AUSTRALIAN PHARMACY WORKFORCE:

PREFERENCES AND SATISFACTION

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Abstract

Pharmacists are an integral part of the healthcare system. As the population's health needs increase due to an aging population and chronic disease epidemic, a better understanding of the preferences and motivations of pharmacists is required to best utilise the skills of this workforce. This thesis presents a thorough investigation of several aspects of a policy proposal to increase the contribution of community pharmacists in primary care. The thesis makes several distinct and original empirical contributions to the literature and provides important new insights for policymakers in both Australia and internationally.

Using qualitative research methods, the first study presented in Chapter Three seeks to understand the reasons why the integration of community pharmacists (CPs) in primary healthcare has not been addressed at the national level in Australia by investigating the issue through the lens of a policy process framework—the Multiple Stream Framework (MSF)– using data generated via interviews with healthcare leaders across relevant disciplines. It highlights that one of the obstacles to better pharmacist integration in primary care is inter-organisational tensions, not only between pharmacy and other health professions, but also between pharmacy professional associations.

Despite the importance of the pharmacy workforce in Australia, there has been little empirical evidence examining the characteristics of this workforce beyond descriptive statistics. The lack of detailed and comprehensive pharmacist workforce data in Australia necessitated the collection of survey data for use in this thesis. The survey and resulting dataset named *"Pharmacy in Australia: Measuring Employment, Labour Decision and Activities"* (PAMELA) was used to answer the research questions in three empirical Chapters: Four, Five and Six.

To investigate the possible effects of a policy reform that expand the role of community pharmacists, Chapter Four examines the employment preferences of Australian pharmacy degree holders (PDHs). This chapter adopted a labelled discrete choice experiment (DCE) to elicit what PDHs value when making choices between various employment options in the labour market including extended roles for community pharmacy jobs. Chapter Four not only provides evidence on the dynamics of the labour market for PDHs but also quantifies movements under multiple policy reform scenarios. Building on the literature around factors that influence the job satisfaction of pharmacists, the last study presented in Chapter Six explores the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia using Herzberg's Two Factor Principles as a conceptual framework. It is found that involvement in clinical activities was significantly associated with increased job satisfaction, but only among community pharmacists.

This thesis also makes a number of important methodological contributions in the area of DCEs. Harnessing the case study using labelled DCEs, Chapter Four provides a comparison between forced and unforced choices in the context of a dual response DCE, to better understand the external validity of the DCE method. It found that the forced and unforced choice datasets produce different preference estimates and welfare measures, leading to the recommendation that future research should adopt the dual response for opt-out/status quo questions. In addition, Chapter Five of this thesis explores, for the first time, the influence of choice set size in labelled discrete choice experiments. This chapter presents empirical evidence on how a partial choice set design with three alternatives can capture the same preferences for attributes/attribute levels as a full choice set design with six alternatives while reducing the cognitive burden, producing lower choice variances. Thus, the results of this study significantly contribute to a promising future use of an emerging stated preference design where choice task complexity is likely a burden for respondents.

Lay summary

This thesis explores several aspects of the Australian pharmacist workforce to support better integration and possible role expansion of community pharmacists in primary care. Firstly, it investigates the reasons why community pharmacists have not been better integrated into the Australian primary healthcare system to date. The preferences of community pharmacists for an expanded role in primary care are then explored, alongside policy implications of employment decisions, such as the likely effect on the geographic distribution of the workforce. As part of this analysis, a less burdensome way of asking about employment preferences is trialled. Lastly, the thesis explores the relationship between different roles in pharmacy and job satisfaction.

Presentations

The following presentations at national/international conferences were developed as part of this thesis:

Thai T., *A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment*, International Health Economics Association Congress (oral presentations), July 2021

Thai T., *Intrinsic or Extrinsic Characteristics? What Motivates Australian Pharmacy Degree Holders to work?,* International Health Economics Association Congress (oral presentations), July 2021

Thai T., *A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment*, International Academy of Health Preference Research (oral presentations), June 2021

Thai T., *Intrinsic or Extrinsic Characteristics? What Motivates Australian Pharmacy Degree Holders to work?*, Europe ISPOR (Poster presentation), December, 2020

Thai T., *Intrinsic or Extrinsic Characteristics? What Motivates Australian Pharmacy Degree Holders to work?*, 41st Australian Health Economics Society Conference (Australia), September, 2019

Thai T., *The Integration of Community Pharmacists in the Australian Primary Health Care – A Qualitative Study*, 40st Australian Health Economics Society Conference (Australia), September, 2018

Thai T., *The Integration of Community Pharmacists in the Australian Primary Health Care – A Qualitative Study* , (Australia), Monash University Doctoral Colloquium, Monash University, Australia, November, 2018.

Thai T., *Intrinsic or Extrinsic Characteristics? What Motivates Australian Pharmacy Degree Holders to work?,* (Australia), Monash University Doctoral Colloquium, Monash University, Australia, November, 2019

Declaration

This thesis is an original work of my research and contains no material which has been accepted for the award of any other degree or diploma at any university or equivalent institution and that, to the best of my knowledge and belief, this thesis contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

Signature: Thao Thai

Print Name: Thao Thi Hong Thai

Date: 24th November 2021

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"A good rabbit never gives up"

Peter Rabbit

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To Dad, thanks for being my Dad. To Mom, I hope you'd be proud of me.

Chapter 1 Introduction

1.1. Background and motivation

1.1.1. An overview of the labour market for pharmacists in Australia

Pharmacists are the third largest health profession after the medical and nursing workforces and are an integral part of the Australian healthcare system. With rigorous training in medicine and pharmacology, pharmacists use their expertise to optimise medicine use and minimise medication-related problems for patients. The practice of pharmacy is often defined as including “the custody, preparation, dispensing and provision of medicines, together with systems and information to assure quality of use” (Health Workforce Australia, 2014)

In Australia, pharmacists must be registered with the Australian Board of Pharmacy and satisfy registration standards to practice in clinical practice settings. To obtain pharmacist registration, students must complete one year of supervised practice in an approved practice setting following either a 4-year Bachelor of Pharmacy or a 2-year Master of Pharmacy from one of 17 accredited pharmacy schools or hold an overseas degree recognised by the Australian Pharmacy Council (Australian Government, 2019c). In Australia, registered pharmacists are the most common authorised practitioners to supply medications direct to patients although other health professionals such as doctors, dentists, nurses can obtain medication supply authorization under certain circumstances.

Australian pharmacy degree holders (PDHs) work in many practice settings. Registrant data from the Australian Board of Pharmacy (Australian Government, 2019c), recorded annually from pharmacists renewing their registration, show the majority of registered pharmacists work in community pharmacies (63%), followed by hospital pharmacies (22%) in 2019. A small proportion of registered pharmacists (2%) work in emerging practice settings such as aged care facilities or medical centres as non-dispensing pharmacists (Australian Government, 2019c). Outside clinical settings, pharmacy degree holders (PDHs) work in universities, governments departments, and the pharmaceutical industry where they undertake various roles such as regulatory affairs, drug sales and marketing and research & development (Health Workforce Australia, 2014).

As of 2019, Australia has 32,258 registered pharmacists, of which almost one third do not practice as a clinician, defined as providing direct services to patients (Australian Government, 2019c). Figure 1.1 presents the number of registered pharmacists and clinicians between 2015 and 2019. Compared to OECD [1] countries, Australia has a slightly higher number of pharmacists per capita (2019). Indeed, the growth of pharmacist graduates is growing at a higher pace than the population, resulting in a decreasing ratio of Australian persons per pharmacist (Figure 1.2). However, a closer investigation on the ratio of Australians aged 65 and over per pharmacist show an increase over the period of 2015 and 2019, suggesting an increasing demand for pharmacists due to the rapid aging population (Figure 1.3).

[1] OECD data include not only pharmacists providing direct services to patients, but also those working in the health sector as researchers, and for pharmaceutical companies, etc.

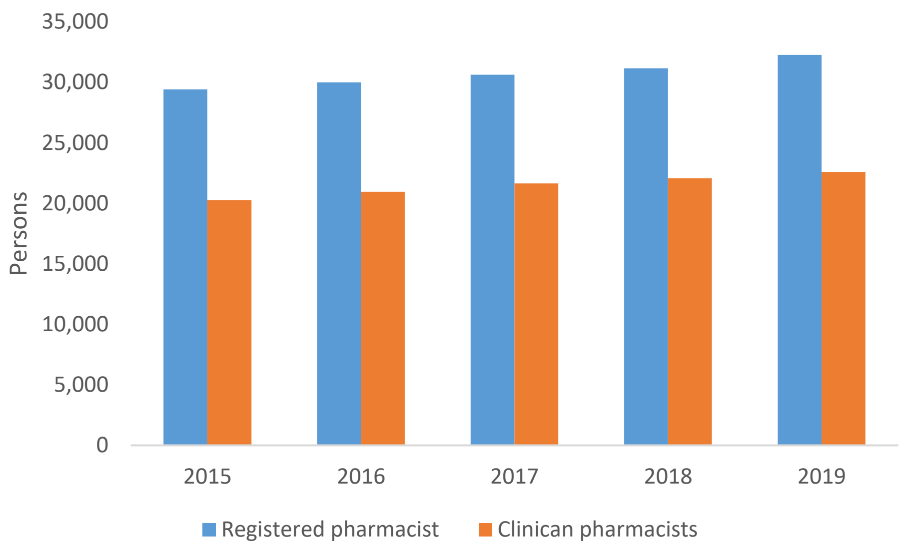

Figure 1.1: Number of registered and clinician pharmacists (i.e. pharmacists provide direct services to patients (Australian Government, 2019c)) in Australia (2015-2019)

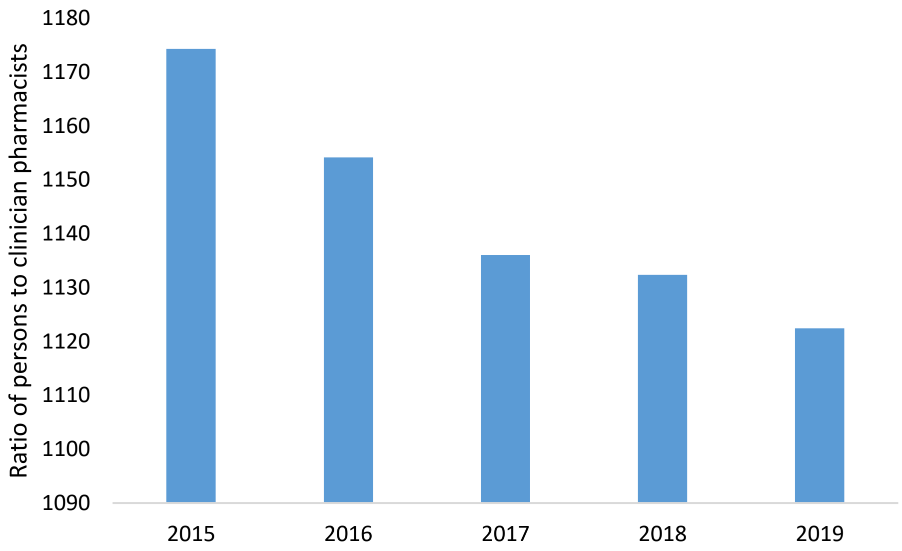

Figure 1.2 Ratio of persons in Australia to clinician pharmacists (2015-2019)

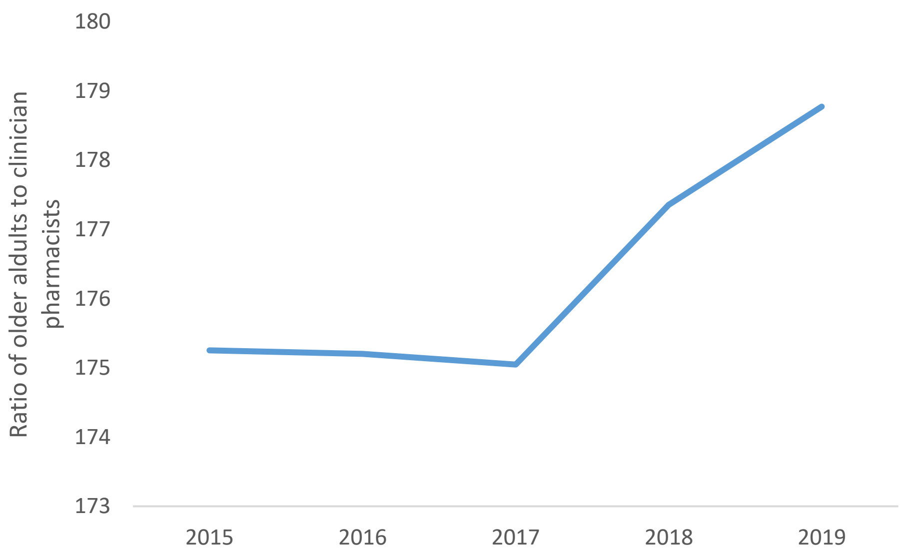

Figure 1.3: Ratio of older adults to clinician pharmacists

Furthermore, there are several issues to note regarding the recruitment and retention of new graduates into the pharmacy profession. Registrant data from the Pharmacy Board of Australia shows that the number of pharmacy graduates has increased without any commensurate increase in the number of practising pharmacists between 2012 and 2019. The total number of pharmacy schools increased from six pharmacy schools in 1985 to nineteen schools in 2012, which produced six times more pharmacy graduates in 2012 than in 1985 (Professional Pharmacists Australia, 2015). Data from the Pharmacy Board of Australia shows that approximately 14,135 new graduates were produced between 2012 and 2019 (Pharmacy Board of Australia, 2019). Meanwhile, the number of general registrations (which allow full pharmacy practice), have increased by 5,125 between 2012 and 2019. As such, attribution was an important unknown in the pharmacy profession (Jackson et al., 2021). Furthermore, a closer investigation of the pharmacist registration reveals some interesting observations. Specifically, Figure 1.4 shows a sharp drop in pharmacist registrations from the 30-40 age group, followed by a gradual decline from the 40-44 age group, using the standardised mean of annual registration numbers between 2011 and 2019. Whilst Figure 1.5 comparing the registrant data of pharmacists to other health professions show the number of pharmacist registrations drops by half at age group 40-44, suggesting a high attrition rate. By contrast, the medical and dental professions do not show a large decrease (by half) until the 60-64 age group (Figure 1.5). Indeed, a recent analysis of the pharmacist workforce also suggests a decrease in the proportion of young registered pharmacists aged 20-34 years against the backdrop of an increase in the 20-34 years cohort in the overall health workforce (Jackson et al., 2021). In addition, the pharmacist workforce grew at a substantially lower rate than the six largest registered health professions (Jackson et al., 2021). The low growth rate of the profession and the decrease in the recruitment and retention of young pharmacists gives rise to a need to understand the employment decisions of pharmacists.

Another issue is the geographical distribution of pharmacists. A shortage of pharmacists is reported not only in rural/remote areas but also in urban areas. The 2019 data from the Australian Department of Jobs and Small business shows a shortage of hospital and community pharmacists in all areas of South Australia, New South Wales, Tasmania and Northern Territory and the regional areas in Victoria, Queensland, and Western Australia (2019b). The mal-distribution of pharmacists in rural and remote areas has also been reported in the literature (Smith et al., 2013).

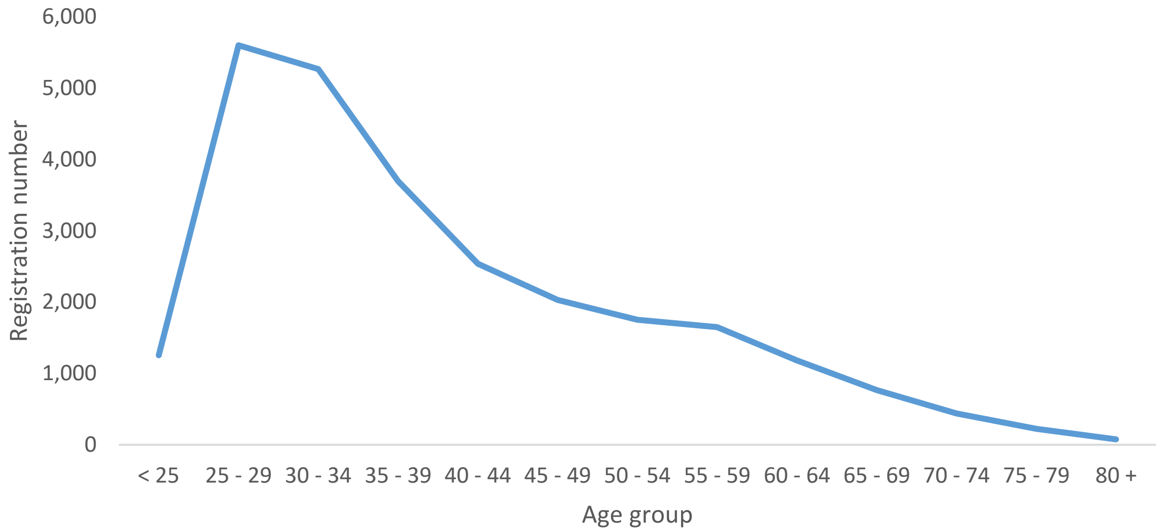

Figure 1.4: Registrations by age groups from 2011 to 2019 (Data sources: Pharmacy Board of Australia)

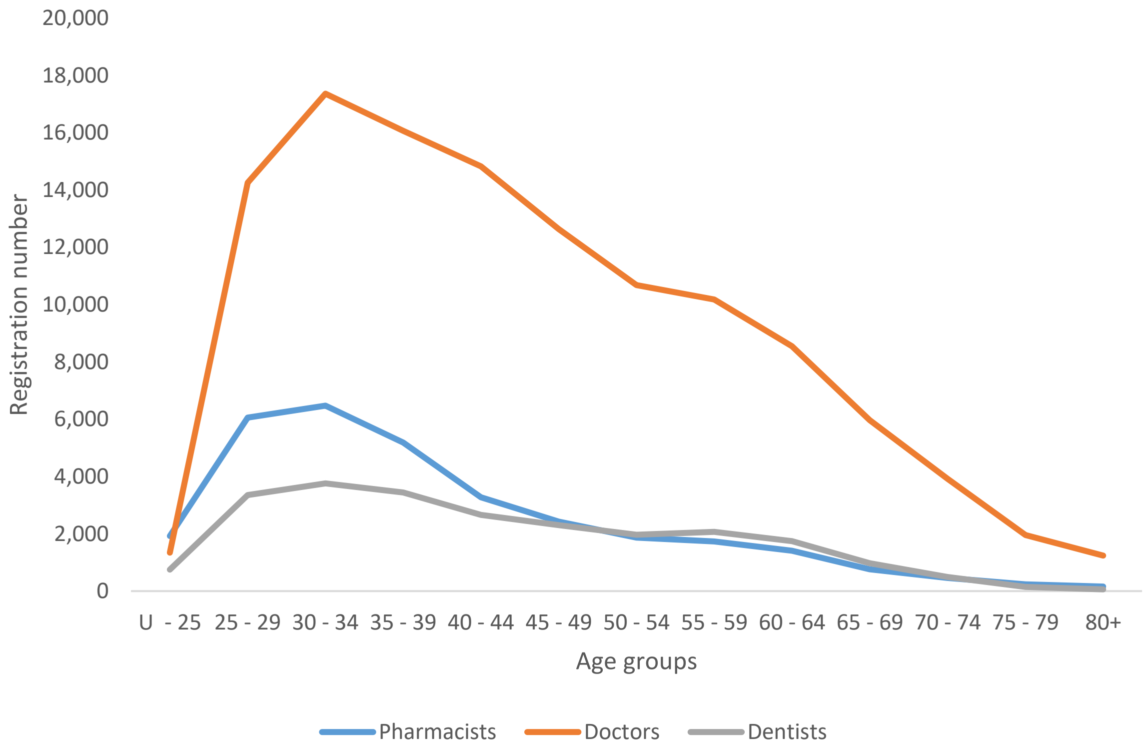

Figure 1.5: Registration number by age groups and professions (Data sources: Pharmacy Board of Australia; Medical Board of Australia; Dental Board of Australia at June 2019)

1.1.2. The increasing demand for pharmacists

The rising demand for healthcare is inevitably impacting all health workforces, including pharmacists. An aging population coupled with the increasing prevalence of chronic diseases have caused a surge in the consumption of healthcare services (WHO, 2015). The proportion of the population aged 65 years and over in Australia, for example, increased from 12% to 15.3% between 1995 and 2015, a trend which is expected to accelerate over the next decade (ABS, 2016). Additionally, lifestyle factors such as obesity, smoking and alcohol consumption have increased the prevalence of chronic diseases and multi-comorbidity (AIHW, 2016). Almost half of Australians had at least one chronic condition in 2017-18 and chronic diseases account for two-third of the total disease burden and 50% of hospitalisations (AIHW, 2020). Many chronic conditions require lifelong treatment with medication necessitating medication management to be integrated with disease management undertaken by the patient and other healthcare providers, as well as coordinating transitions across the care continuum.

The increasing usage of medicines can also cause harm through medication-related problems, due to non-optimized medication regimens and/or polypharmacy (Spinks et al., 2020). Worldwide, it is estimated that medication errors alone account for USD42 billion per year or around 1% of total global health expenditure (2017). Arguably, medication errors represent only a proportion of the broader category of medication-related problems which can include over-treatment, under-treatment, inappropriate treatment or a lack of therapeutic monitoring or care coordination (2017). In Australia, the rate of medication-related hospital admissions was estimated at 250,000 cases with the cost being AUD 1.2 billion annually (2013). This amount is equivalent to 15% of total medicine expenditure (PBS expenditure) in Australia (Australian Digital Health Agency, 2019). These figures only represent the most serious or urgent issues and do not, for example, include the long-term harms of poor compliance to long-term medications.

Medication-related problems may occur throughout the care continuum, including in hospital, after discharge from hospital, in aged care facilities and the community. An Australian randomised controlled trial conducted in 2015 shows that 61.5% of hospital discharge summaries prepared without the involvement of pharmacists have at least one medication error (Tong et al., 2017). Furthermore, 400,000 emergency presentations are likely to be due to medication-related problems (PSA, 2019). In residential aged care, medication-related problems are even more prevalent than in the community. It has been estimated that 98% of residents have at least one medication-related problem with an average of 3.2 problems per person (Gheewala et al., 2014). Among residents with chronic kidney disease, almost 16% are prescribed inappropriate doses (Gheewala et al., 2014). In the community, 1 in 5 people are suffering an adverse medication reaction at the time they receive a Home Medicines Review (Alderman et al., 2013; Roughead et al., 2004) and about 1.2 million Australians have experienced an adverse medication event in the last 6 months (Britt et al., 2016). For the disadvantaged population in the community and aged care, almost 28% of older people with poor kidney function are prescribed an excessive dose (Khanal et al., 2015). The economic, clinical and humanistic burden of medication-related problems, most of which can be prevented, has led the Australian Government to classify medicine safety as a national health priority (Australian Government, 2019a). Pharmacists are trained as medication specialists, with rigorous training in pharmacology and therapeutics. Inevitably, in many countries, including Australia, stakeholder groups (Duckett & Swerissen, 2017; Duckett, 2005; King et al., 2016; Sarah et al., 2020; Wells, 2018) have called for pharmacists to contribute more to ensure the quality use of medicines and reducing medication-related harm (Roughead et al., 2013).

1.1.3. The trend of pharmacists' role expansion

The scope of practice of pharmacists has changed substantially over the past decades. Moving from compounding and dispensing medication, pharmacists' role has transformed to engage more in medication safety, disease management and health promotion and education. The change of pharmacists' role began in the 1950s when hospital pharmacists' first engaged in clinical activities. However, it was not until the 1970s that clinical pharmacy practice became a routine feature in hospitals where hospital pharmacists officially collaborated alongside doctors, nurses and other health professional staff regarding medication management and safety issues (Batagol, 2020). Today, hospital pharmacists are actively involved in clinical activities including medication management and patient counselling on hospital wards (Moles & Stehlik, 2015).

Meanwhile, in community pharmacy, medication dispensing is still the central role. However, under the pressure of rising healthcare demand and following the successful role expansion of hospital pharmacists, there are ongoing discussions regarding the contribution of community pharmacists (CPs) to public health (Duckett & Swerissen, 2017; Duckett, 2005; King et al., 2016; Sarah et al., 2020; Wells, 2018). These discussions are based on a substantial body of Australian and international evidence indicating that CPs can provide quality health services in community pharmacies that are clinically effective (Armour et al., 2007; Krass et al., 2007; Morgado et al., 2011; Saini et al., 2011), cost-effective (Fish et al., 2002; Gordois et al., 2007; Malet-Larrea et al., 2016; Perraudin et al., 2016), which improve health and therapeutic outcomes (Hatah et al., 2014; Jokanovic et al., 2017) (Mossialos et al., 2013; Perraudin et al., 2016; Tan et al., 2014a), improve patient satisfaction (Houle et al., 2014) and quality of life (Isetts et al., 2006), and reduce hospital re-admission (Freeman et al., 2021) and health costs (Jokanovic et al., 2017).

Australian CPs are increasingly engaging in more clinical activities. These clinical services are classified into medicine- and non-medicine-related services by a recent study commissioned by the Australian Department of Health (Deloitte Access Economics, 2016). The medicine-related services include medicine review and chronic disease management, while non-medicine related services comprise education and counselling, diagnostic and screening services, wound care and vaccination. Typically, these services are funded as an out-of-pocket expense for consumers, except for medication review services for eligible individuals. The range of these patient-centred services is inconsistently offered in different pharmacies depending on the local needs and pharmacy owner preferences. A proportion of community pharmacists are providing medication management and other medication-related cognitive services through community pharmacies. There are also examples of employing (or "embedding") pharmacists in general practice to work more closely with doctors, providing services both directly to patients and within the practice itself (for example, providing ongoing education to doctors and nurses) (Jackson et al., 2021). The equality of access of this approach is yet to be tested as the model is still evolving, and consumer preferences are not yet understood.

Unlike other health professionals remunerated nationally on a fee-for-service basis through the Medicare Benefits Schedule (MBS), the remuneration of community pharmacy services is negotiated in a rolling five-year Community Pharmacy Agreement (CPA). The 1st-6th CPA agreements were between the Commonwealth Government and the PGA, however, this was expanded to include PSA in the 7th CPA) (Australian Government, 2021). This agreement includes remuneration for pharmaceutical supply (dispensing) through the Pharmaceutical Benefits Scheme (PBS) as well as some level of medication review. The remainder of the expanded services offered by pharmacists is not remunerated by the CPA, including vaccination or smoking cessation. Note that the remuneration funded through the CPA is tied to community pharmacies, rather than independent pharmacists. That can mean employee community pharmacists are paid on a salary basis from pharmacy owners, not directly remunerated for the services they provide. In addition, any services provided outside the scope of community pharmacies, such as pharmacists working in general practices, are not funded through the CPA.

Development of the expanded role of community pharmacists is also shaped by the political context within which it occurs and a number of key stakeholders in Australia have particular influence. The Pharmacy Guild of Australia (PGA) is the national peak body of community pharmacy owners. Its core mission is to support community pharmacies' business and professional interests. The Pharmaceutical Society of Australia (PSA) is the peak professional body representing Australian pharmacists, focusing on continuing professional development and practice support for its members. These organisations can have overlapping, but sometimes conflicting goals. Powerful medical association organisations, including the Royal Australian College of General Practice (RACGP) and the Australian Medical Association (AMA) can also be influential and are typically opposed to an expanded scope of pharmacist practice (RACGP, 2015, 2017, 2019), (AMA (NSW), 2019).

Around the world, CPs' roles are becoming more diverse, ranging from being solely dispensers of pharmaceuticals to performing advanced and specialised roles. Indeed, the increase in healthcare demand has necessitated an expansion of CPs' role beyond the current norm of dispensing medications in many countries (Nagaria et al., 2020; Smith et al., 2014; WTO, 2011). The role of community pharmacists in some high-income countries is more advanced than their Australian counterparts. In Canada, legislation and regulations were changed to support the expanded roles of community pharmacists, overcoming some typical concerns including time pressure, limited remuneration models or mismatched public expectations (Canadian Pharmacists Association, 2020). Indeed, although pharmacists' roles vary considerably across provinces in Canada, a number of expanded pharmacy services are provided in some provinces, namely medication management, vaccination services, dosage management and prescribing. In the United Kingdom (UK), the government explicitly supported the expanded role of community pharmacists by developing a framework within the vision of health reform. CPs in the UK are able to provide a wider range of advanced services than Australian pharmacists such as anticoagulation monitoring, appliance use review or discharge medicines review (Richardson & Pollock, 2010). With substantial evidence on the pharmacist-led interventions, there has been increasing interest over previous decades to make better use of the clinical skills of pharmacists to improve population health in Australia (Duckett & Swerissen, 2017; Duckett, 2005; King et al., 2016; Sarah et al., 2020; Wells, 2018).

1.1.4. Gaps in the literature

Given the dynamic challenges of the healthcare demand and its potential implications on the current and future pharmacy workforce, this thesis focuses on the pharmacy workforce in an attempt to help policymakers when designing policy reforms to increase the contribution of pharmacists in the era of rising health care demand and to improve the quality use of medicine and medicine safety. Population health needs should link directly to workforce planning and focus not only on the absolute workforce numbers but also the geographic distribution of pharmacists, productivity and quality of care services provided (Scott, Sivey, et al., 2011).

To ensure the recruitment and retention of high quality, experienced pharmacists, it is critical to understand the key factors driving the employment decisions of pharmacy degree holders

(PDHs), whether staying or leaving the profession, or working as a clinician or non-clinician pharmacist. To reduce the distributional disparities of pharmacists across the country, the preferences and willingness-to-accept/pay of PDHs in terms of working in rural and remote areas need to be better understood. It is also useful for workforce planning to understand pharmacist preferences in terms of work-life balance and career opportunities. There is also a crucial need to understand the current level of job satisfaction of the current pharmacy workforce. This information is useful when designing policies to improve the engagement and productivity of the current pharmacy workforce and to ensure high-quality care services are provided.

There is scarce literature, in Australia and internationally, examining pharmacist labour preferences and job satisfaction, and analysing if these factors are related to the available clinical workforce. Although community pharmacists in other countries such as Canada and the United Kingdom make a broader contribution to the primary healthcare systems, the integration of Australian pharmacists has not occurred to a similar extent. It is unknown, for example, if the preferences of pharmacy graduates for particular roles or employment opportunities might influence job satisfaction and subsequent employment choices. As health policy makers explore options to make better use of the existing health workforces to meet population needs, a lack of understanding of the motivations and drivers of employment decisions may result in unanticipated negative or ineffective results. This represents a research gap and is the focus of this thesis. By investigating these issues of the Australian pharmacy profession, this thesis attempts to inform future health workforce policy strategies and strengthen the healthcare system.

1.2. Thesis objectives

This thesis has four objectives:

1) To investigate why better integration of community pharmacists into primary care has not occurred to date in Australia;
2) To examine the employment preferences of Australian pharmacy graduates and their willingness to fulfil extended practice roles in the future;
3) To assess the robustness of employment preference estimates particularly in relation to discrete choice experiment design; and
4) To explore the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia.

1.3. Thesis outline

To meet each of the objectives outlined above, this thesis is comprised of 7 chapters.

Chapter 2 reports the data collection process which created a dataset used in Chapters 4, 5 and 6. A cross-sectional survey named PAMELA (Pharmacy in Australia: Measuring Employments, Labour decisions and Activity) was designed. Overall, a total of 982 responses were used for the analysis in this thesis.

Chapter 3 focuses on the integration of community pharmacists into the Australian primary healthcare system using qualitative methodology.

A well-integrated primary health care system helps address the health needs of an ageing population with complex multiple health conditions. In Australia, community pharmacists (CPs) provide services to maximise health gains from medication use and minimise risks, although they are not well integrated into primary care. We utilise a unique set of 33 semi-structured interviews with healthcare leaders, and the Multiple Stream Framework (MFS) to provide a systematic and comprehensive analysis of why integrating CPs in primary care has not been addressed at the national level in Australia. The MSF examines the policy process with five elements: *problem, policy,* and *political streams; policy entrepreneur;* and *policy window*. The *problem stream* showed that the primary healthcare network struggles to cope with the increasing healthcare demand and the prevalence of medication-related problems. The *policy stream* suggests that the consumers would benefit from an integration of CPs into primary care to solve these problems; however, a policy proposal cannot survive under current circumstances. The *political stream* revealed the political barriers arising from conflicts among interest groups within the profession and the healthcare sector. Strategies to overcome the barriers include evidence accumulation, role development in light of population needs, and inter-organisational collaboration across members of the healthcare network.

Chapter 4 explores the intrinsic and extrinsic characteristics influencing Australian pharmacy degree holders' job preferences.

Increasing the contribution of pharmacists to public health through an expanded practice role has long been discussed. Expanded practice roles might include greater involvement in chronic disease management, providing vaccination services and pharmacist prescribing. To facilitate evidence-based policy reform, this study examines the employment preferences of Australian pharmacy degree holders (PDHs) using a discrete choice experiment (DCE). Additionally, we use this case study to provide a comparison between forced and unforced choices in the context of a dual response DCE to understand the external validity of the DCE method. A labelled DCE was developed incorporating the six main sectors of employment for PDHs: hospital pharmacy, community pharmacy, primary healthcare settings, pharmaceutical industry, government/academia, and non-pharmacy related sector. Each alternative was described by five attributes in which roles and career opportunities are intrinsic factors while flexible work schedule, geographic location, and annual salary are extrinsic factors. The DCE was embedded in the PAMELA (Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity) survey. Data were analysed using conditional logit and error component mixed logit models. Based on a sample of 824 PDHs, we provide evidence that primary healthcare settings were generally preferred to community pharmacy while the pharmaceutical industry is the least preferred sector.

Intrinsic characteristics have a significant impact on the employment choices of Australian PDHs in which roles and recognition for work in the forms of promotion and/or specialisation opportunities were highly regarded. However, extrinsic characteristics - salary and geographic location - are the most important factors across all alternatives. We found that employment choices are independent of household income but strongly influenced by choice inertia. While the direction of the attributes' influence on the employment choices is consistent across forced and unforced choice sets, welfare measures for some attributes are significantly different.

This is the first study to provide a comprehensive picture of what PDHs value when making choices between employment options in the labour market. We suggest that utilizing role expansion reform to mitigate workforce shortages in rural and remote areas warrants consideration.

Chapter 5 tests the robustness of the methodology used in Chapter 4, in particular, whether choice set size in labelled discrete choice experiments affect results.

In a labelled DCE, presenting more alternatives may increase the cognitive burden on respondents, threatening the validity of preference estimates. One approach to reducing the complexity of large labelled choice tasks is to use a partial choice set design (PCSD) in which a subset of alternatives is shown in each choice task in contrast to a traditional full choice set design (FCSD) where all alternatives are shown. Using data from a nationwide survey which explored employment preferences of Australian pharmacy degree holders, this paper aimed to (1) verify if the PCSD reduces cognitive burden; (2) test the convergent validity of the PCSD and FCSD; (3) explore respondents' preferences between the FCSD and PCSD. Labelled utility functions were rewritten into a single generic utility function using a label dummy variable and indicator functions, which was used to generate a PCSD with 3 alternatives shown in each choice task (out of 6). 790 respondents were randomly presented with a block of three FCSD tasks and a block of four PCSD tasks. The PSCD's impact on choice variances was investigated using a heteroscedastic conditional logit model. WTP estimates were compared to test if the FSCD and PSCD produce statistically indifferent preference estimates resulted from WTP-space conditional logit and WTP-space mixed logit (MIXL) models, respectively.

We found that the PCSD appeared to induce a smaller choice variance than the FCSD, which reflects positively on its purpose of reducing the cognitive burden. The PSCD was preferred by females and when phones were used to answer the survey. Both FCSD and PCSD produce similar preference estimates for attribute levels, however, the FSCD induces larger preference heterogeneity around alternative labels than the PSCD. Our findings indicate that the PCSD can reduce the cognitive burden and we suggest its use for surveys accessible by mobile phone. The PCSD satisfies the convergent validity test as it produces similar preference estimates to those from the FCSD for attribute levels. However, we found the FCSD induced larger preference heterogeneity around alternative labels, perhaps largely because choice task complexity leads to heterogeneity in process strategies. We urge more research on process heterogeneity to gain insights on the comparison of preference estimates for alternative labels in FCSDs and PCSDs.

Chapter 6 examines the association between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia.

The role expansion of hospital and community pharmacists have been implemented or proposed in several countries as a way to increase the capacity of the health workforce. However, pharmacist preferences for such a role and how that might impact their job satisfaction has not been studied in detail. This chapter aims to investigate the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia using Herzberg's Two Factor Principles as a conceptual framework. We also expand this framework by modelling job values and work orientations of pharmacists which have been linked to satisfaction at work. Job satisfaction, job-related factors and individual characteristics are derived from the PAMELA survey. The association between involvement in clinical activities and job satisfaction was modelled using ordinary least squares regression. We find a positive association between involvement in clinical activities in community pharmacy and the level of job satisfaction. In line with Herzberg's Two Factor Principles, we also find strong associations between the level of job satisfaction with intrinsic factors (the recognition for pharmacists' work) and extrinsic factors (having a flexible work schedule, geographic location and salary). We show that the existence of any mismatch between respondents' current job characteristics and their job values and work orientations appears to have a negative association with the level of job satisfaction. Our findings suggest that the policy of community pharmacist role expansion to include more clinical tasks may be aligned with the intrinsic motivating factors of many pharmacists. The paper also underscores the importance of understanding workers' preference and expectations in improving the well-being of workers at work.

Finally, **Chapter 7** summarises the key contributions of the thesis, both in terms of policy and methodology. Policy and methodological implications are also discussed. Finally, this chapter also provides a discussion on the limitations of studies undertaken and outlines future research opportunities.

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Chapter 2 Data collection

2.1. Motivation for primary data collection

Good research requires reliable and sufficient data. However, high-quality data to understand the contemporary pharmacy workforce has not been available in Australia. The current pharmacist registration data which are collected annually at the time pharmacists renew their registration are unlinked cross-sectional and include a limited number of demographic variables such as age, gender, principal place of practice (states/territories) and the type of registration. They provide little information to understand key issues in the current pharmacy workforce such as labour activities, job satisfaction and employment preferences. For example, income/salary as one of the key variables that may have a significant impact on the level of job satisfaction is not collected. Insufficient data makes it hard to examine the dynamics of the Pharmacy Workforce. Compared to the medical workforce, the longitudinal data produced by the *Medicine in Australia: Balancing Employment and Life (MABEL)* survey includes a wide range of rich information which enables an understanding of key issues of the medical labour market dynamics (Joyce et al., 2010). The MABEL survey has also included a discrete choice experiment to understand the employment preferences of different groups of doctors (Li et al., 2014; Scott et al., 2013; Sivey et al., 2012). Inspired by the MABEL data, primary data collection was undertaken to address the objectives of this thesis and to assist the design of more effective pharmacy workforce policies.

2.2. Ethics approval

The study was approved by the Ethical Review Committee of Griffith University (GU Ref No: 2017/881) and Monash University (MU Ref No: 11845).

2.3. Research design

A cross-sectional survey named PAMELA (Pharmacy in Australia: Measuring Employment, Labour decisions and Activity) was designed. All key relevant factors anticipated to have a significant influence on the current and future dynamics of the pharmacy workforce in Australia were collected in this survey. This included information on job history, job choices, income, career plan, professional commitment and job satisfaction, to fill gaps in the previous literature related to the preferences and satisfaction of pharmacy graduates. A key part of the survey is that a discrete choice experiment (DCE) was used to explore the drivers of the employment preferences in terms of employment choices within and outside the pharmacy profession. This section enabled an understanding of the key factors influencing the attrition of pharmacy graduates from the profession or the uptake of pharmacy graduates providing clinical practice.

2.4. PAMELA questionnaire

2.4.1. Questionnaire development

The PAMELA questionnaire was designed to address the research questions of this thesis and was informed by a review of the relevant literature. Other health workforce surveys conducted in Australia such as the *Medicine in Australia: Balancing Employment and Life (MABEL*) survey (Joyce et al., 2011) and the National Pharmacists Workforce Survey (Witry et al., 2021) were used as references. Suggestions from the key stakeholders including the Board of the Pharmaceutical Society of Australia, the heads of pharmacy schools, and PDHs themselves were also incorporated into the survey.

The survey begins with the *"Participants Information and Consent Form"* which provides information about the study, financial incentives and instructions on how to complete the questionnaire (See Appendix 1 for the details). Consent for respondents to participate was obtained before proceeding with the questionnaire.

Figure 2.1 presents the structure of the PAMELA questionnaire, which has eight sections. The first section about respondents' current job situation is for the screening purpose to redirect them to the following appropriate sections. Respondents who currently have a job will be asked the second section about the characteristics of their current primary job. These characteristics match with the attribute levels presented in the third section- *"Employment preferences"*. Respondents who do not work are directed to the third section. The *"Employment preferences"* section includes DCE choice sets exploring the employment preferences and trade-offs for different types of jobs which are described by five characteristics: role, flexible work schedule, career opportunities, geographic location and annual salary. Following the DCE questions, some debriefing questions were also included to better understand how and why choices were made in the DCE. The *"Employment preferences"* sections were tailored to explore the employment preferences of PDHs in Chapter five and provide a comparison between the full choice set design (FCSD) and partial choice set design (PCSD) in Chapter Six.

The next section focuses on respondents' primary employment such as job satisfaction, job history, career plan and professional commitment. This set of questions are used to analyse the association between job satisfaction and the intention to leave the pharmacy profession in Chapter seven. The last two sections collect information on family and individual characteristics.

At the end of the survey, consent for recontact in one year and financial incentives were obtained. If agreed, respondents were redirected to a separate survey to collect their email address for recontact and/or incentive payment. This compartmentalisation of data separates personally identifiable information (i.e. the email addresses) from the main survey. Additionally, respondent internet protocol (IP) addresses were deleted from the incentive database to remove the possibility of data linking by recipients (i.e. researchers) of both data files. Respondent IP addresses were recorded as pseudo-IP addresses in the main survey to prevent respondent IP tracking but still support the data checks. This process ensures the confidentiality of respondents as aligned with Ethics. For the details of the PAMELA questionnaire, please see Appendix A.

Respondents were able to move forward and backward during the survey. They also could save the survey for later use if they cannot complete the survey in one attempt.

2.4.2. Pre-test study

The survey was pre-tested in two stages to ensure a relevant, concise and understandable final survey. The first stage focused on the DCE choice tasks in terms of issues of cognitive burden, and interpretation and wording of alternatives, attributes and levels. The think-aloud technique was used with four pharmacists to obtain more insights about respondents' trade-offs among alternatives and attributes, their understanding and ranking of attributes. Refinements were made before testing with the subsequent respondents. An online debriefing DCE questionnaire was also distributed to a subgroup of five pharmacists in which respondents were asked to complete eight DCE choice scenarios and a debriefing questionnaire about their understanding, perceived complexity, attribute non-attendance, confusion due to labelling of alternatives, attributes and levels, and suggestions for improvement. Suggestions regarding wording were incorporated before undertaking the second stage.

The second stage involved the distribution of the whole online survey questionnaire to a subgroup (n=15) of the study population. Ten respondents provided detailed feedback regarding the survey length, wording and suggestions of additional questions. One convenient in-depth interview was conducted to gain more detailed feedback. The online survey was reviewed by the Pharmaceutical Society of Australia (PSA) and the heads of pharmacy schools to ensure the policy relevance of the survey. Suggestions on wording and content of the general questions were also incorporated.

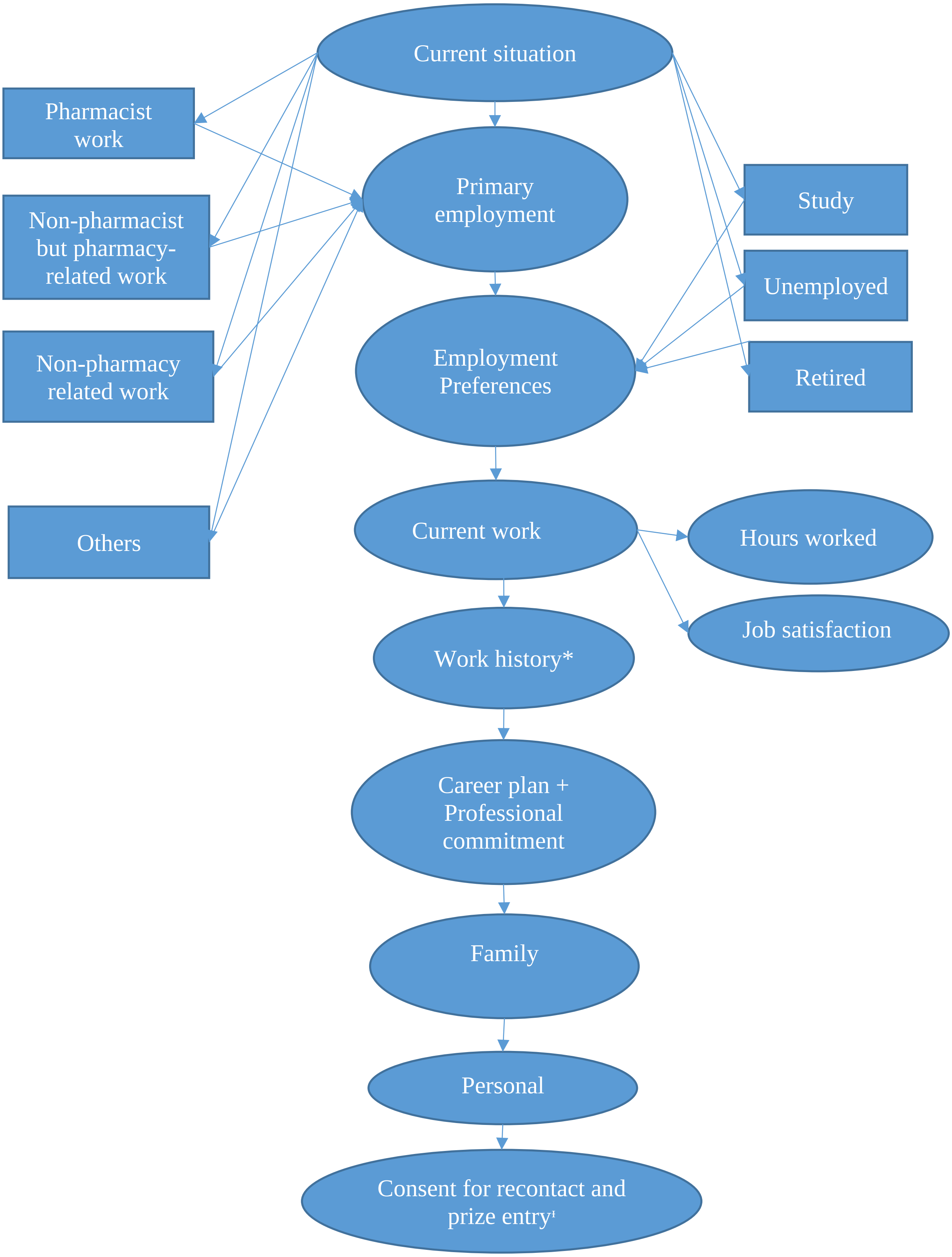

Figure 2.1 Survey structure

*only for respondents not currently practising as a pharmacist; [ꜝ]optional section

2.5. Survey administration

2.5.1. Strategies to increase the response rate

Table 2.1 summarises a number of strategies implemented in the main data collection according to the previous evidence on increasing the response rate for electronic questionnaires (Dillman, 2009; Edwards et al., 2009). Dillman (2009) recommended multiple contacts including a first invitation and then reminders to approach respondents. In addition to adopting this approach, multiple promotions of the survey were optimised on different channels of recruitment such as invitation emails from different institutions and media coverage. Financial incentives (prize draw of 5 vouchers of AUD200) and personalised invitations were also incorporated as recommended by Dillman (2009) and Edwards et al. (2009). As sponsorship of the survey was recommended to increase response rates (Dillman, 2009), endorsements from the Pharmaceutical Society of Australia, the Society of Hospital Pharmacists of Australia and consenting pharmacy schools were obtained (all pharmacy schools in Australia were contacted). These institutions also distributed the survey on our behalf which should serve as a good indicator of the importance of the survey to respondents. Also using multimode (i.e. use both mail and email) may increase the response rate (Yun & Trumbo, 2000). However, given our limited funds, the mail out approach was not available.

Email content was carefully designed including a graphic, having a white background, a personalised salutation and personalised questionnaire, a statement from the PSA president or Heads of Pharmacy School, a deadline to response and an offer of survey results as recommended by (Edwards et al., 2009). A simple email header was used and the word “survey” was avoided (Edwards et al., 2009). Even though Edwards et al. (2009) provided evidence that pre-notification emails could increase the response rate, they could not be done due to the tight schedule from the PSA or due to attrition concerns from Pharmacy schools' alumni database.

Table 2.1 summarises the methods used to increase response rates.

Table 2.1: Methods used to increase the response rates

Recommendation	Source of evidence	Incorporated in the data collection
Multiple contacts including a first invitation and then reminders	(Dillman, 2009)	Yes
Sponsorship of the survey	(Dillman, 2009; Edwards et al., 2009)	Yes
Multimode (i.e. use both mail and email)	(Yun & Trumbo, 2000)	No, due to limited resources
Pre-notification emails	(Edwards et al., 2009)	No, based on advice from recruitment partners
Financial incentives	(Edwards et al., 2009)	Yes
Personalization questionnaire	(Edwards et al., 2009)	Yes
A picture	(Edwards et al., 2009)	Yes
Having white background	(Edwards et al., 2009)	Yes
Including a statement that others had responded	(Edwards et al., 2009)	Yes
A deadline to response	(Edwards et al., 2009)	Yes
An offer of survey results	(Edwards et al., 2009)	Yes
Using a simple header	(Edwards et al., 2009)	Yes
Avoid the word "survey" in the email header	(Edwards et al., 2009)	Yes
Avoid sending the invitation email signed by a male	(Edwards et al., 2009)	No, due to institutions' choice

2.5.2. The invitation emails

The final version of the invitation email included:

- An email header *"Having your say on the Future of the Pharmacy Workforce"*
- A picture having the name of the survey and logos of the PSA and three host universities
- Personalised salutation
- The content promotes motivation for pharmacy graduates to complete the survey
- A quote from the president of the PSA or the Head of Pharmacy School depending on the Schools' choice
- A link to directly access the survey
- A deadline of two weeks was specified.

- Financial incentives (prize draw of 5 vouchers of AUD200) were used to increase the response rate.
- An offer of survey results.

For the details of the email content, please see Appendix 2.

2.5.3. Recruitment channels

Different channels used to recruit respondents includes:

1. The membership database of the Pharmaceutical Society of Australia (PSA)
2. The membership database of the Society of Hospital Pharmacists of Australia (SHPA)
3. The alumni databases of Australian pharmacy schools (Monash, Queensland University of Technology, Griffith University)
4. The social media platforms (Twitter, Facebook, LinkedIn) of PSA, SHPA, pharmacy schools and the accounts of the home institutions and researchers
5. The subscriber database of the Australian Journal of Pharmacy. The survey was linked directly to a banner on AJP e-newsletters sent to subscribers' email addresses every day for 20 days from 6th November to 26th November 2019. In addition, two posts were run online to promote the survey.
6. A media page to provide information about the study was available on the official website of Griffith university (*PAMELA Survey Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity 2019*)
7. Community pharmacies whose emails were listed on the Yellow Pages website (https://www.yellowpages.com.au/)
8. A snowballing approach in which respondents forwarded the invitation emails among their network

Please see Appendix B for the details of the content of invitation emails and advertisements.

For recruitment channels (1), (2), (3), the invitation process was conducted by the person-in-charge of the database in each of the institutions. Invitation to participate was sent to email addresses listed in the membership or alumni databases. We did not have direct access to respondents' contact details from these channels, however, the wording of the invitation emails and media posts was provided to participating institutions.

For recruitment channels (4), (5) and (6), the survey link was incorporated in social media posts and media websites. For recruitment channel (7), we sent the invitation emails to our pharmacy networks and requested the respondents to forward the invitation further. A single anonymous generic web link was provided to each partner to allow us to trace back the source of respondents except only one link was used for channels (2), (4), (6), (7) and (8). These channels except (2)[2] are publicly available and thus, it is not useful to use different links for each of them.

2.5.4. DCE choice tasks presentation

This survey is self-reported; thus the responses depend on respondents' understanding and interpretation of the questions asked. As such, some attempts have been made to increase the consistency in the interpretation of the DCE questions across respondents. Pop-up definitions and examples were provided as much as possible to assist respondents' understanding. Figure 2.2 shows an example of pop-up definitions.

The DCE questions with six alternatives which were presented horizontally were not readable on mobile phones. This was an obstacle to data collection given that many community pharmacies have shared work computers and that the use of mobile phones to read emails and newspapers is common. In the pilot study, pharmacists noted this as a limitation to participation.

[2] A miscommunication occurred, (2) used the generic link instead of a unique link

Recognizing this key obstacle, the DCE question with six alternatives were changed to the vertical presentation[3] as the standard scroll feed. Examples of the DCE questions presented on non-mobile phone devices in Figure 2.3 and presented on mobile phones in Figure 2.5.

[3] There has been no precedent of the vertical presentation of DCE. Although we have data on the mode of delivery and have controlled for this factor in the model, the effect of the survey layout on choice cannot be investigated because the access device (desktop or mobile phones) and the choice task presentation (i.e. horizontal or vertical presentation) are perfectly correlated (i.e. horizontal presentation in desktop and vertical presentation on mobile phone). Additionally, there is evidence that choice behaviour (i.e. taste and scale heterogeneity) were not driven by the access device (desktop or mobile phone) (Vass & Boeri, 2021). However, further research should investigate this issue further.

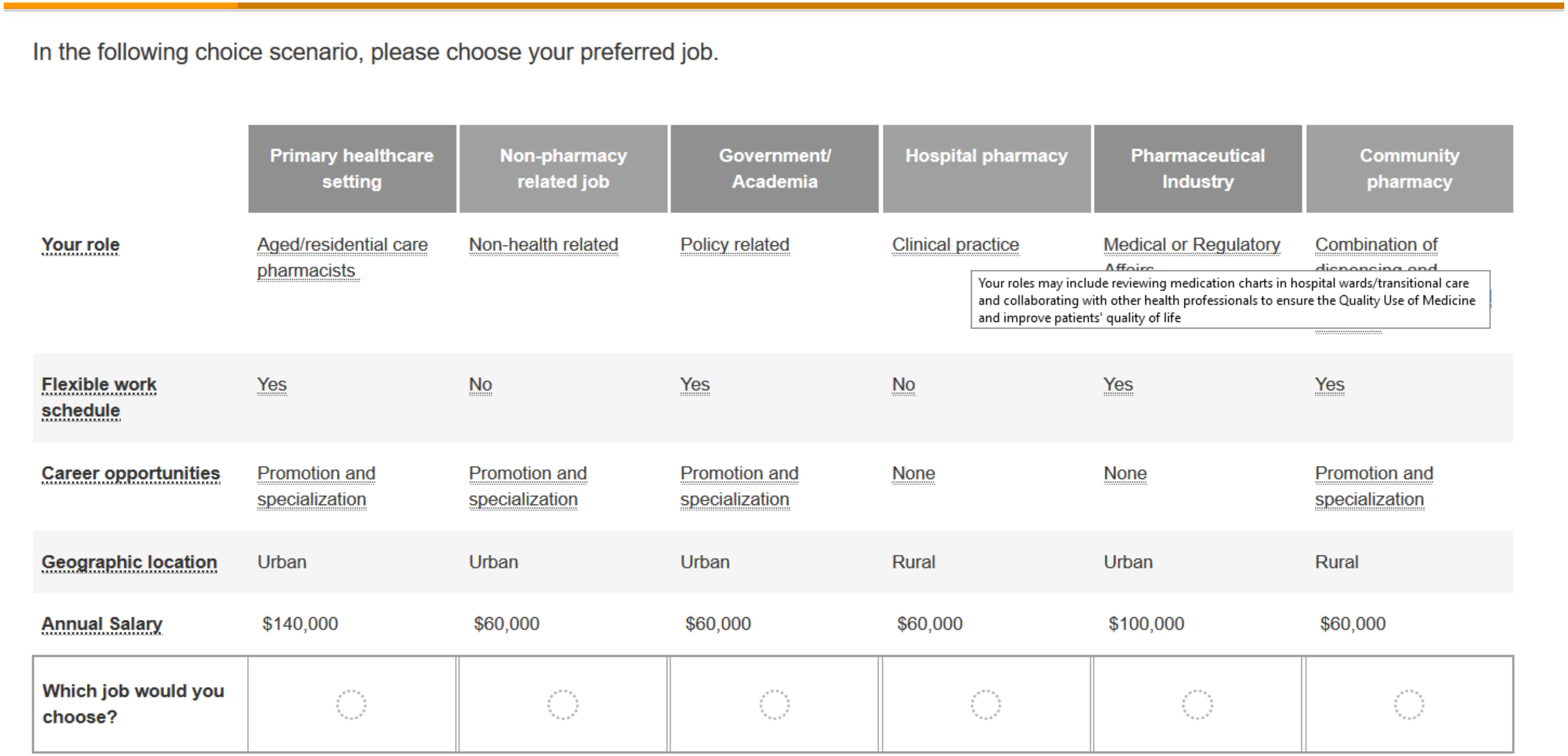

Figure 2.2: Example of pop-up definitions

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Clinical practice	Combination of dispensing and providing professional services	Aged/residential care pharmacists.	Medical or Regulatory Affairs	Policy related	Non-health related
Flexible work schedule	No	Yes	Yes	Yes	Yes	No
Career progression	Limited	Sufficient	Sufficient	Limited	Sufficient	Sufficient
Geographic location	Rural	Rural	Urban	Urban	Urban	Urban
Annual Salary	$60,000	$60,000	$140,000	$100,000	$60,000	$60,000
Which job would you choose?						

Compare your choice with your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**

Figure 2.3: Example of the original presentation of DCE questions on non-mobile devices (desktops, laptops, tablets)

In the following choice scenario, please choose your preferred job.

	Pharmaceutical Industry	Hospital pharmacy	Primary healthcare setting	Non-pharmacy related job	Community pharmacy	Government/ Academia
Your role	Sales or Marketing	Medicine distribution/dispensing	General practice pharmacist	Health-related	Mainly dispensing	Policy related
Flexible work schedule	Yes	No	No	No	No	No
Career opportunities	None	None	Promotion and specialisation	None	None	None
Geographic location	Urban	Rural	Remote	Urban	Remote	Rural
Annual Salary	$220,000	$100,000	$140,000	$60,000	$100,000	$100,000
Which job would you choose?	◌	◌	◌	◌	◌	◌

Figure 2.4: An example of randomising the order of alternatives

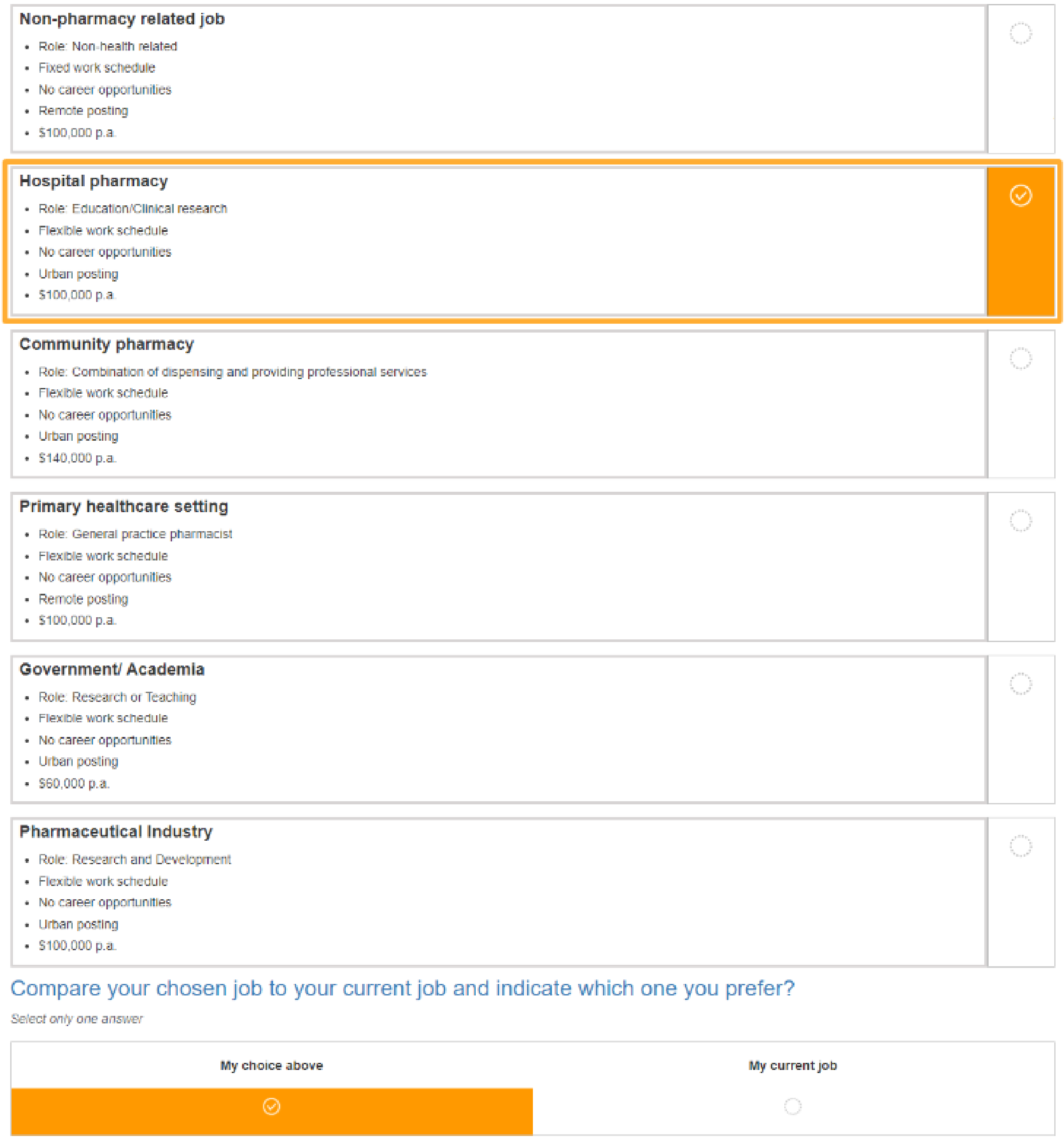

Figure 2.5: Example of the presentation of DCE questions on mobile phones

Another concern in the DCE literature is the potential position bias involving a systematic preference for an alternative based on its position (Campbell & Erdem, 2015; Norman et al., 2016). This potentially introduces a bias for one alternative over another (e.g. preference for extreme left or right or top and bottom). To address this concern, the order of six alternatives of the DCE questions was randomised at the respondent level (i.e. each respondent was allocated one order of alternative across three choice questions). Figure 2.4 shows a different order of alternatives compared to Figure 2.3.

2.6. Data management

The questionnaire was built on the online platform-SurveyEngine (https://surveyengine.com/). Data were collected from respondents who responded to an invitation email to participate or clicked through the survey link on social media or the online advertisement to participate. The online survey platform recorded all responses, both finished and unfinished in an electronic database.

Standard data checks were conducted to ensure data quality. Pseudo-IP addresses were used to identify individuals re-entering the survey multiple times. To err on the side of caution, responses from the same pseudo-IP addresses were excluded.

2.7. Timelines of the data collection process

2.7.1. Pilot test

The pilot started with Griffith School of Pharmacy and Pharmacology on 9th July 2019. The survey link was distributed to 777 alumni by email by the administrators. Inclusion criteria were graduation with a Bachelor of Pharmacy between 2006 and 2017. Approximately three weeks after the initial invitation, a reminder email was sent to those yet to respond.

2.7.2. Main data collection

Different recruitment channels were used at different times due to the different timing of their acceptance to participate or our contact (in the case of AJP and community pharmacies). Table 2.2 summarises the timelines that each recruitment channel was used.

Table 2.2: Timelines of the main data collection

Date	Recruitment channels used	Respondent approach
19/10/2019	PSA	PSA's member emails and social media posts on their LinkedIn account and Facebook group.
28/10/2019	Monash University	Alumni's emails
31/10/2019	QUT	Alumni's emails
6/11/2019	AJP	The first post aired
6/11-26-11/2019	AJP	E-news letters sent to subscribers' email
29/10-19/11/2019	Community pharmacies	Invitation emails
13/11/2019	Mobile version of the survey introduced	Announcement on the social media platform of the PSA and researchers
14/11/2019	SHPA	E-news letter sent to members
19/11/2019	AJP	Second post aired
30/01/2020	UQ	Alumni's emails

Notes:
1. PSA: Pharmaceutical Society of Australia
2. AJP: Australian Journal of Pharmacy
3. QUT: Queensland University of Technology
4. SHPA: Society of Hospital Pharmacists of Australia
5. UQ: University of Queensland

Approximately two weeks after the first invitation, QUT and Monash universities sent a reminder to their alumni. The PSA did not send a reminder to their members due to their tight schedule of communication.

2.8. Sampling frame

Our population of interest were pharmacy graduates from all Australian academic institutions regardless of whether or not they currently work as a pharmacist (in a job that requires an

Australian Health Practitioner Regulation Agency (AHPRA) pharmacist registration). Inclusion criteria are graduating from a school of pharmacy, either with a Bachelor or a Master of Pharmacy, and working in Australia.

The most recent estimate of the total pharmacy workforce obtained from the Pharmacy Board of Australia when pharmacists renew their annual registration (June 2019) was 31,955 registered pharmacists (Pharmacy Board of Australia, 2019). Of them, 29,034 pharmacists held practising registration and 1,116 held non-practising registration. 1,789 intern pharmacy students held provisional registration and 16 people who were taking postgraduate study held limited registration. Even though this registration data does not include people who have left the profession (i.e. forgo their registration), some key characteristics of this data were used for checking the representativeness of the sample conditioning on keeping registration. These characteristics were age, gender, states/territories, type of registration.

2.9. Results

2.9.1. Overview of all responses

The standard data check process was conducted to exclude responses who have not read the *"Participant Information form"*,non-consent, responses from the same IP addresses. This process results in 982 useable responses with at least one question answered. Of these, 657 (66.9%) are complete responses while the rest 352 (33.1%) are incomplete. Of complete responses, 79.2% agreed to do another survey in one year and provided their email address. 80.92% of complete responses agreed to enter the prize draw to have a chance to win one of five vouchers worth AUD200 (Table 2.3). A total of 982 responses were used for the data analysis in this thesis.

Table 2.3: Overview of responses

	N (%)
Complete responses	
Yes	657 (66.90%)
No	325 (33.10%)
Total	982 (100.00%)
Consent for recontact	N
Yes	521 (79.18%)
No	137 (20.82%)
Total	658 (100.00%)
Prize draw enter	
Yes	531 (80.70%)
No	127 (19.30%)
Total	658 (100.00%)

Notes:
1. N: number of observations
2. Useable responses have at least one question answered.

2.9.2. Sources of respondents

The PSA, SHPA and three pharmacy schools from Monash University, Griffith University and Queensland University of Technology consented to the invitation to participate in the PAMELA survey.

Table 2.4 summarises the number and percentages of respondents from each channel of recruitment. The largest source of respondents came from the combined social media post/ snowballing, invitation emails from SHPA and the second campaign on AJP. The second-largest source was invitation emails to members of the Pharmaceutical Society of Australia.

Table 2.4: Numbers and percentages of respondents from each recruitment channel

Source	Completed (N (%))	Incomplete (N (%))	Total (N (%))	Total invitations sent out	Response rates
Pilot test (Griffith)	22 (2.24%)	5 (0.51%)	27 (2.75%)	777	3.47
QUT	12 (1.22%)	4 (0.41%)	16 (1.63%)	350	4.57
AJP- first campaign	11 (1.12%)	11 (1.12%)	22 (2.24%)	NA	NA
Community pharmacies	11 (1.12%)	3 (0.31%)	14 (1.43%)	1015	1.4
Monash	48 (4.89%)	12 (1.22%)	60 (6.11%)	NA	NA
UQ	39 (3.97%)	19 (1.93%)	58 (5.91%)	NA	NA
PSA	188 (19.14%)	66 (6.72%)	254 (25.87%)	10,000	2.54
Other sources	326 (33.20%)	205 (20.88%)	531 (54.07%)	NA	NA
Total	657 (66.90%)	325 (33.10%)	982 (100.%)	NA	NA

Notes: QUT: Queensland University of Technology; AJP: Australian Journal of Pharmacy; PSA: Pharmaceutical Society of Australia; N: number of observations; Other sources: responses from Social media, snowballing, AJP-second campaign and the Society of Hospital Pharmacists of Australia

2.9.3. Response rate

Multiple channels were used to recruit respondents, thus, some respondents may have seen the invitation to participate several times. For example, one may be a member of the Pharmaceutical Society of Australia, the Society of Hospital Pharmacists of Australia and have a subscription to the Australian Journal of Pharmacy and their University alumni. The multiple approaches make the denominator of the sampling frame unknown, thus, the response rate cannot be calculated accurately and reported in this study.

However, responses rates were calculated for each source of respondents conditioned on the information available to estimate the denominators (Table 2.4).

2.9.4. Response bias

In survey research, a potential bias can arise from the differences between respondents and non-respondents. This bias may distort the estimated results and affect the generalizability and the external validity of the study. As such, the representativeness of the sample was assessed based on some key variables including age, gender, principal place of work, employment setting conditioning on having APHRA registration.

The most recent estimate of the total pharmacy workforce in Australia suggests that there were 31,955 pharmacists in June 2019. This data is from the registration data from the Pharmacy Board of Australia which collects information from pharmacy graduates at the time of their annual registration renewal. Thus, these data do not capture information about pharmacy graduates who have left the profession (i.e. do not keep registration). The latest report based on the most recent registration data only includes information about age groups, gender, number of registrations per states/territories and number of pharmacy graduates by types of registration. As a result, this information was used to assess the representativeness of the sample. As our sample also collects information on individuals who do not have a current pharmacy registration, the comparison was undertaken based on the sample of 634 individuals having a registration (i.e. exclude those having no registration and missing values).

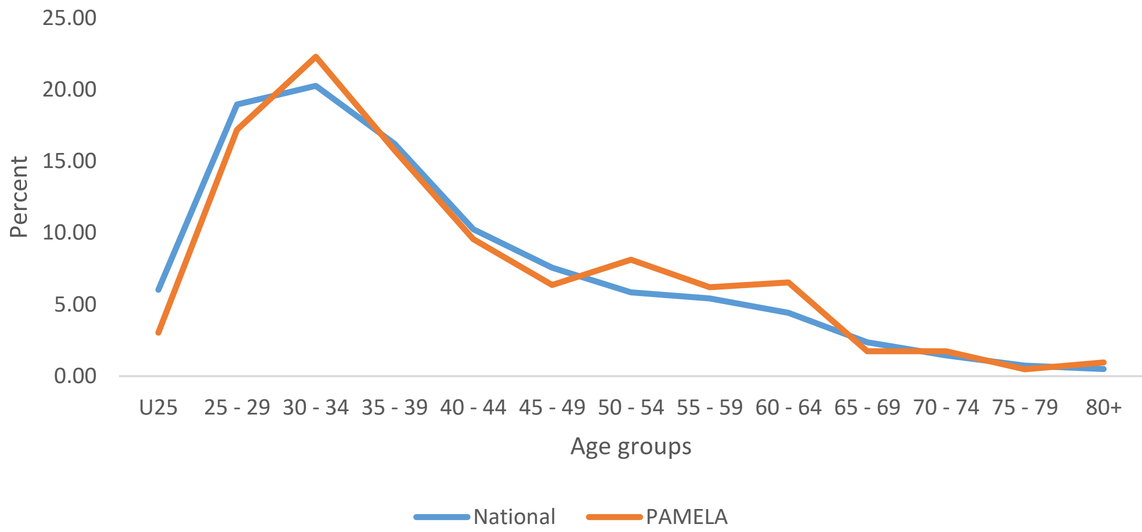

Figure 2.6: Distribution of respondents and the population by age

Figure 2.6 shows that our sample was generally representative in terms of age, however, it is slightly under-representative of the younger groups of pharmacy graduates with a significant difference for those aged under 25 years. The biggest and most significant under-representation is seen in the 40-44 age group. Our sample is slightly over-representative of older age groups with the difference for age group 55-59 being statistically significant (See Table 2.35 for details).

Table 2.5: Comparisons of respondents with the 2019 population in terms of gender, types of registration, age groups and principal place of working

	National (N=31,955)		**PAMELA respondents (N=634)**		
	Number	**%**	**Number**	**%**	**Difference in proportions**
Gender					
Male	11,883	37.19	225	36.47	-0.72
Female	20,072	62.81	392	63.53	0.72
Missing + Prefer not to say			17		
Type of registration with APHRA					
Practicing Registration	29,034	90.86	592	93.38	2.52 **
Provisional Registration	1,789	5.60	28	4.42	-1.18
Limited Registration	16	0.05	0	0.00	-0.05 ***
Non-practicing Registration	1,116	3.49	14	2.21	-1.28 **
I don't currently have an AHPRA registration	NA	NA	36	NAᶦ	
States/Territories					
ACT	625	1.96	17	2.68	0.72
NSW	9637	30.16	121	19.09	-11.07 ***
NT	267	0.84	11	1.74	0.90 *
QLD	6349	19.87	209	32.97	13.10 ***
SA	2235	6.99	35	5.52	-1.47
TAS	784	2.45	20	3.15	0.70
VIC	8116	25.40	161	25.39	-0.01
WA	3346	10.47	52	8.2	-2.27 **
No PPP	596	1.87	8	1.26	-0.61
Age groups					
U25	1,926	6.03	19	3.03	-3.00 ***
25 - 29	6,058	18.96	108	17.2	-1.76
30 - 34	6,474	20.26	140	22.29	2.03
35 - 39	5,182	16.22	99	15.76	-0.46
40 - 44	3,276	10.25	60	9.55	-0.70
45 - 49	2,421	7.58	40	6.37	-1.21
50 - 54	1,867	5.84	51	8.12	2.28 **
55 - 59	1,733	5.42	39	6.21	0.79
60 - 64	1,409	4.41	41	6.53	2.12 **
65 - 69	756	2.37	11	1.75	-0.62
70 - 74	461	1.44	11	1.75	0.31
75 - 79	233	0.73	3	0.48	-0.25
80+	159	0.50	6	0.96	0.46

Notes:
1. *p<0.1; **p<0.05;***p<0.0001. two-proportion z-test
2. NA: Not applicable
3. No PPP: Principal Place of Practice
4. ᶦexcluded from the comparison

Females are slightly over-represented by 0.17% in our sample but the difference is not statistically significant. As our sampling frame includes pharmacy degree holders who have left the profession, we have 36 respondents who do not hold AHPRA registration. Excluding these respondents, respondents with practising registration are significantly over-represented while ones with other types of registrations are significantly under-represented except ones with provisional registration (Table 2.5).

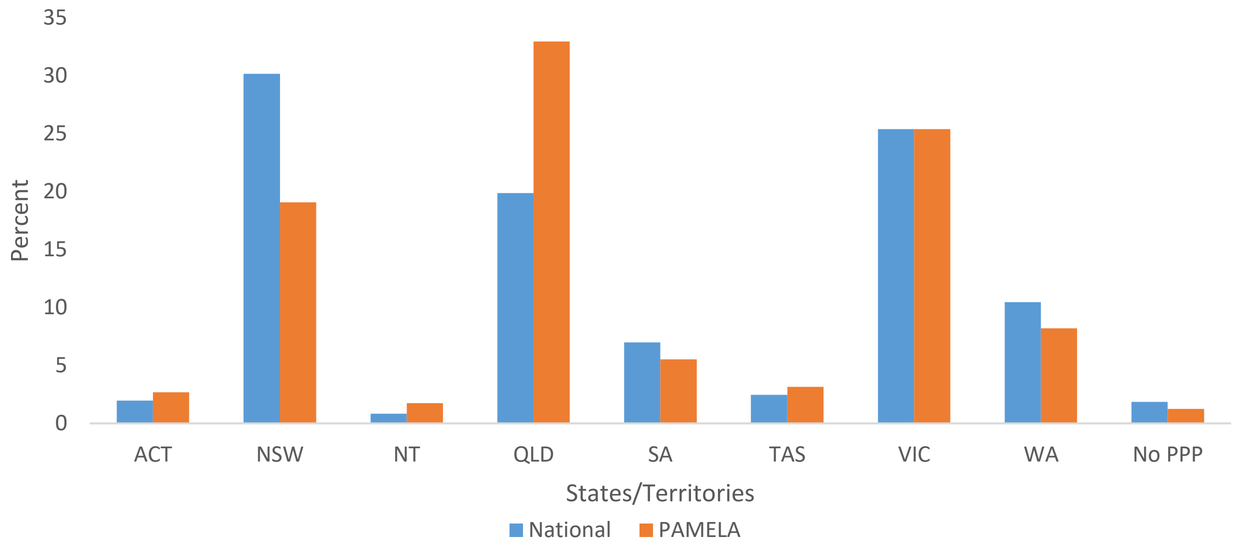

Figure 2.7: Distribution of respondents and the population by States/Territories

Figure 2.7 shows that our sample was over-representative of pharmacy graduates from five out of eight states and territories, including two regional states-Northern Territory and Tasmania. The over-representation of pharmacy graduates being significant in Queensland was anticipated as two universities located in these two states supported the data collection. The biggest under-representation of pharmacy graduates is in New South Wales with the difference of 8.9%.

A further representativeness assessment was also based on the registration data of pharmacists with general/limited registration who are employed (24,609 in 2017) (Australian Goverment, 2017). Age, hours worked, primary work setting and initial qualification were used to assess the sample conditioning on having a registration and being employed.

Table 2.6: Comparisons of respondent characteristics with the 2017 population of pharmacy graduates having general/limited registration and being employed.

	National (N=24,609)		PAMELA respondents (N=569)		
	Number	%	Number	%	Difference in proportions
Primary Work Setting					
Hospital pharmacy	5,266	21.4	148	26.01	-4.61 **
Community pharmacy	15,922	64.7	284	49.91	14.79 ***
Primary healthcare settings	**NA**	NA	25	4.39	
Pharmaceutical industry	**NA**	NA	26	4.57	
Government or Academia	**NA**	NA	51	8.96	
Non-pharmacy related	**NA**	NA	13	2.28	
Employment					
Principal role as a clinician (patient care)	21,656	88	457	80	7.68 ***
Second job	3,052	12.4	177	31.11	-18.71 ***
Age	39.3		41.11		
44 years and under		70.5		66.96	3.54 *
Hours worked	35.7		35.83		
Female	33.6		34.47		
Male	39.1		38.33		
Initial Qualification					
Australia	20,893	84.9	531	93.32	-8.42 ***
Overseas	2,978	12.1	38	6.68	5.42 ***
Gender					
Male	9,548	38.8	202	36.4	2.40
Female	15,061	61.2	353	63.6	-2.40

Notes:
1. *p<0.1; **p<0.05;***p<0.0001. two-proportion z-test
2. NA: Not applicable
3. No PPP: Principal Place of Practice
4. 'excluded from the comparison

Compared to data from 2017 on the number of registered pharmacists having general/limited registration and being employed, our sample is significantly under-representative of community pharmacists, by 12.34%. This is anticipated because the timing of data collection is inconvenient for them given the busy dispensing end-of-year period. The number of people who have a principal role as a clinician is significantly under-represented by 12.44% while the number of people having a second job is significantly over-represented by 20.11%. The number of pharmacy graduates having Australian initial qualification is over-represented by 7.91%. Females are over-representative when compared to the 2017 employed population (1.56%), but this is artistically insignificant. Our sample is slightly older than the 2017 population with the average age being 41 and about 66% people aged under 44. The number of hours worked is similar being 35.97 and 35.7 hours per week for our sample and the 2017 population, respectively. In our sample, females work longer hours than in the population.

2.10. Discussion

Given minimal resources in terms of time, funding and labour, a sample of 982 PDHs can be considered as a promising starting point to examine some key issues of the Australian Pharmacy Workforce. A noticeable achievement of this data collection is that 80% of respondents agreed to participate in further research after completing the PAMELA survey. Approximately 521 email addresses were collected for further research. This shows that the PAMELA survey was well-received by respondents and that the content of the PAMELA questionnaire is of good quality and of interest to respondents. Furthermore, of the 20% who do not agree to participate in further research, some are retired or working in a non-pharmacy profession, thus, further research on the pharmacy workforce will not be as relevant to them.

Multiple approaches to respondents were used in this study combined with the use of advertising and social media. As several recruitment channels were used, , one particular respondent in our study may have received the invitation email from several sources. Thus, the use of a verifiable key to access the survey could not be used. However, a set of collected variables such as IP address, response patterns, browser types, survey version, language setting, and time sequences could be used as a stand-in proxy for a single person. As such, the quality of responses in this study can be controlled to a certain degree.

Selection bias is one main limitation of this study. PDHs who chose to complete the survey may be more motivated than those who did not. As such, this cohort of PDHs is more likely to be the key drivers and advocates for any reform in the profession. The information collected from this group may not be representative of the whole population, but it likely indicates the views of the most influential group of respondents on the future of the Australian Pharmacy workforce.

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Chapter 3 The Integration of Community Pharmacists into the Australian Primary Healthcare System: A Qualitative Study

Abstract

A well-integrated primary health care system helps address the health needs of an ageing population with complex multiple health conditions. In Australia, community pharmacists (CPs) provide services to maximise health gains from medication use and minimise risks, although they are not well integrated into primary care. We combined a unique set of 33 semi-structured interviews with healthcare leaders, using the Multiple Stream Framework (MFS) to provide a systematic and comprehensive analysis of why integrating CPs in primary care has not been addressed at the national level in Australia. The MSF examines the policy process with five elements: *problem, policy,* and *political streams; policy entrepreneur;* and *policy window*. The *problem stream* showed that the primary healthcare network struggles to cope with the increasing healthcare demand and the prevalence of medication-related problems. The *policy stream* suggests that the consumers would benefit from an integration of CPs into primary care to solve these problems; however, a policy proposal cannot survive under current circumstances. The *political stream* revealed the political barriers arising from conflicts among interest groups within the profession and the healthcare sector. Strategies to overcome the barriers include evidence accumulation, role development in light of population needs, and inter-organisational collaboration across members of the healthcare network.

Keywords: Integration of Care, Community Pharmacists, Primary Healthcare, Australia, Health Policy

3.1. Introduction

Regular medication use is the cornerstone of treatment for many chronic diseases. Increased use of medications results in an increased need for services focused on the appropriate use of medication (Jokanovic et al., 2017). Evidence suggests that increasing the involvement of pharmacists in primary healthcare improves patients' health (Jokanovic et al., 2017; Milosavljevic et al., 2018; Twigg et al., 2016; Hesso et al., 2016; Milosavljevic et al., 2018; van der Molen et al., 2017). For example, pharmacist-led medication reviews in the United Kingdom (UK) have reduced medication-related problems in community pharmacies, general practices, and care home settings (Avery et al., 2012; Desborough & Twigg, 2014; Tan et al., 2014a). Pharmacists positively contribute via improved medication adherence and better management of chronic conditions including blood pressure control and cholesterol management (Jokanovic et al., 2017; Milosavljevic et al., 2018; Tsuyuki et al., 2016; Twigg et al., 2016); chronic obstructive pulmonary disease (Hesso et al., 2016; Milosavljevic et al., 2018; van der Molen et al., 2017); supporting smoking cessation, lipid management, emergency contraception, vaccination (Anderson & Blenkinsopp, 2003); and controlling diabetes (Jokanovic et al., 2017). Healthcare costs have been reduced as a result of pharmacists' expanded services (Jokanovic et al., 2017). In the UK, minor ailments services provided by pharmacists are estimated to reduce healthcare costs by £6739 per month (Baqir et al., 2011). In Canada, the nation-wide implementation of smoking cessation, advanced medication review for heart disease, and pharmacists' provision of pneumococcal vaccination is estimated to reduce healthcare costs between $2.5 billion and $25.7 billion over 20 years (Gagnon-Arpin et al., 2017).

Community pharmacists (CPs) have, to varying degrees, adopted expanded roles and have been integrated into the primary care system internationally to meet population health needs (Hertig et al., 2013; Jorgenson et al., 2013; Scott, Hitch, et al., 2011; Tan et al., 2014b). For example, in 2005, the UK statutory regulations were changed to allow pharmacists to perform not only the prevention of medication-related problems (e.g. medication review) but health promotion services (e.g. stroke prevention campaigns, community health talks, vaccination, etc.), health screening or monitoring (blood pressure, blood glucose, cholesterol, etc.), and mental health services. These services, once the monopoly of general practitioners (GPs), are now nationally funded (Richardson & Pollock, 2010). Similarly, legislative changes have enabled the integration of CPs in Canada, although states or territories have had different approaches such as pharmacists can prescribe and monitor lab test in Alberta (Canadian Pharmacists Association, 2020).

Despite international evidence suggesting pharmacist integration improves health outcomes, CPs have not been comprehensively integrated into the primary healthcare network in Australia. The recent national Review of Pharmacy Remuneration and Regulation (known as the King Review) (King et al., 2017) involved extensive consultation about the current use of CPs in the primary healthcare network. Although the King Review consulted widely with the policy community, the Australian government did not follow the King Review's suggestion of integrating CPs into primary healthcare (Australian Goverment, 2018). While the King Review opened a policy window, it was unsuccessful in implementing policy change.

The literature to date has not considered the entire policy process, only pieces of the process. Studies reported barriers to integrating CPs, including a lack of regulations and role standards (Bader et al., 2017; Steckowych et al., 2018); a lack of collaboration and communication among the pharmacy profession, the government and other health professions (Butterworth et al., 2017; Donald et al., 2017; Franco-Trigo et al., 2018; Hermansyah et al., 2018; Moullin et al., 2016); and pharmacists' education and training and remuneration models (Hossain et al., 2017). However, previous studies have not considered that health reform results from a continuing policy process. A number of issues are brought to policymakers' awareness on a daily basis, but not all of them can capture their attention and be resolved (Herweg et al., 2017; Kingdon, 2011). Policy formulation depends not only on the policy proposal *per se* but also on the political environment, including key advocates and their strategies, the support of interest groups, the political power of these interest groups, and the openness of policy windows (Herweg et al., 2017). The likelihood of policy change hinges on the continuous interplay of these factors during the policy process (Herweg et al., 2017). We aim to address this gap in the literature by using a policy process framework to gain an understanding of why CPs have not been integrated in Australia. Our findings provide insights to similar policy debates both in Australia and internationally and help policy advocates prepare for the next policy window.

3.2. Methods

3.2.1. Theoretical framework

The Multiple Stream Framework (MSF) (Kingdon, 2011) investigates five essential elements: problem, policy, politics streams, policy window, and policy entrepreneurs (Figure 3.1). The *problem stream* frames conditions as public problems, while the *policy stream* investigates the broad policy community's collection of ideas and possibilities to solve the issues framed under the *problem stream*. Successful ideas that can survive and gain wider support from the policy community have to meet certain criteria: 1) the value of the potential proposal must be widely accepted (value acceptability), 2) the proposal must be technically feasible to implement (technical feasibility), and 3) the resources required to implement the proposal must be available (financial viability). The *politics stream* consists of the national mood (e.g. public opinion) and interest groups (e.g. the partisanship of policymaking institutions), and the *policy* *window* refers to a critical moment of opportunity when the *problem, policy and politics streams* converge to implement policy change. *Policy entrepreneurs* are the key advocate actors who bring the three streams together and advocate for the change once a policy window opens. (Sabatier, 2014).

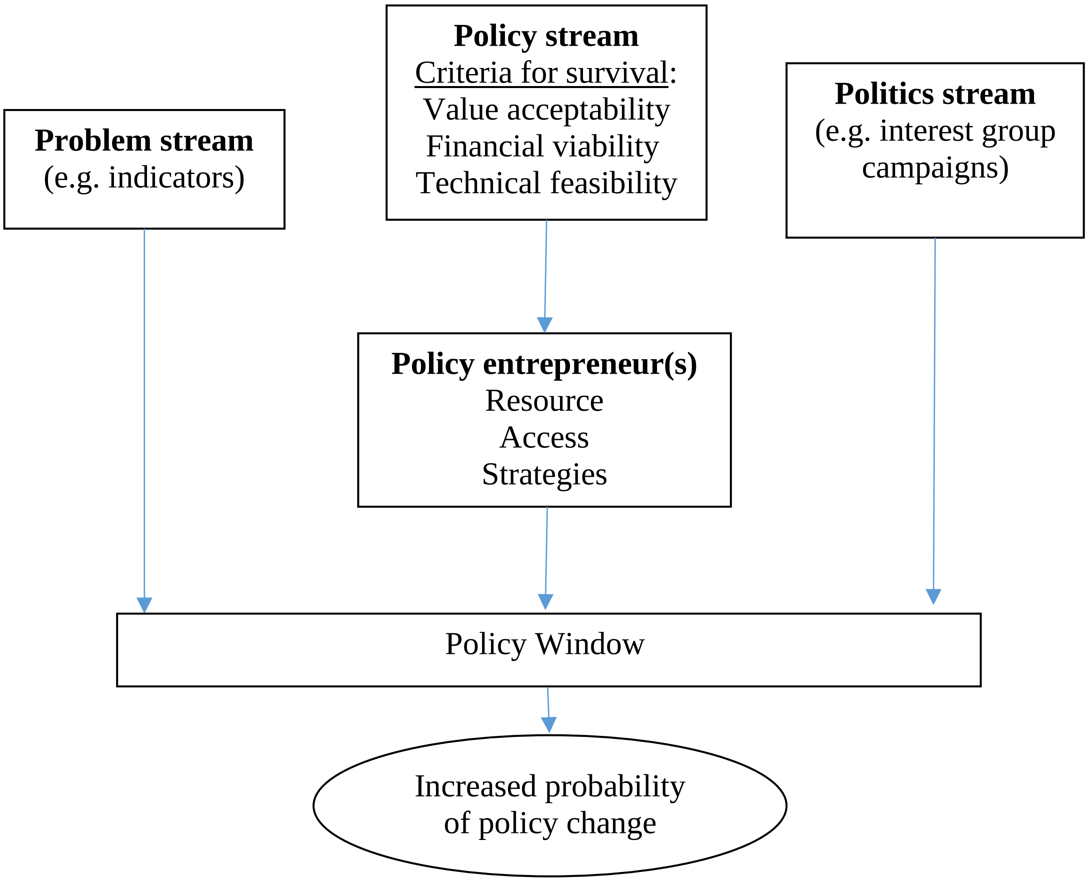

Figure 3.1: The Multiple Stream Framework (MSF) (Herweg et al., 2017)

3.2.2. Data collection and sample

This study is based on a realist paradigm (Grbich, 2013) using qualitative methods to explore the research questions (see Supplementary 1- Interview guide). We used a snowball sampling method (Owen-Smith & Coast, 2017) to recruit Australian participants from nine main groups of stakeholders: government from the Australian Department of Health (GovPs); representatives of four pharmacy associations (PARs); pharmacy academics (PAs); hospital pharmacists (HPs); CPs; health economists (HEs); GPs (general practitioners); representatives of allied health professional associations (AHPs); and consumer advocate representatives (CRs). All respondents were selected based on their professional influence regarding either regulation, education, or policy to gain insights on the policy of the CPs integration.

One-on-one, semi-structured interviews were conducted between January and April 2018 by TT. Of 33 interviews that were 60 minutes long on average, 9 interviews were held face-to-face and 24 via telephone/Skype. Our sample includes 19 leaders of their institutions with high influence on pharmacy regulation, education, or policy (Table 3.1). The interviews were audio-recorded and transcribed by TT and an independent transcription company (Digital Transcripts). We used Nvivo-QSR International (version 12) to assist the data analysis process.

Confidentiality of participant information was maintained in line with ethics approval obtained from the Griffith University Human Research Ethics Committee (GU Ref No: 2017/881) and of Monash University (MU Ref No: 11845). Consent was verbally confirmed at the start of the interview.

Table 3.1: Research participant characteristics

Participant groups	**Gender**		**Level of leadership**		**Total**
	Male	Female	High	Low	
Pharmacy association representatives (PARs)	3	5	4	4	8
Economists and health service analysts (HEs)	4	1	3	2	5
Pharmacy academics (PAs)	4	2	4	2	6
Government officers with pharmacy background (GovPs)	1	3	1	3	4
Hospital pharmacists (HPs)	1	0	1	0	1
Allied health professionals (AHPs)	0	3	1	2	3
General practitioners (GPs)	1	2	3	0	3
Consumers health advocates (CRs)	0	2	1	1	2
Community pharmacists (CPs)	1	0	1	0	1
Total	15	18	19	14	33

Notes: High: Head of associations/ department/ centre/university
Low: Member of associations or staff, not the head of the department/centre/university

3.2.3. Data analysis

We used thematic analysis (Braun & Clarke, 2006). First, TT and JS separately analysed two interviews using the inductive approach to explore the data. We developed code words or phrases that either reflected the content of the interviews or the research questions. The list of codes was then compared and resolved if there were any differences. As the data collection continued, TT also used a constant comparative analysis technique which allowed new codes to emerge. The coded texts were grouped into themes which were then considered in light of the MSF (see Figure 3.2) and constantly discussed among the researchers.

3.3. Results

Six key themes emerged from the data analysis. First, in the *problem stream*, respondents framed problems that arose from both the demand and supply sides of the primary healthcare market. Second, in the *policy stream*, they proposed integrating CPs into the primary healthcare network to solve these problems. Third, regarding the *survival ability criteria*, the current conditions do not support the policy proposal's survival, and fourth, in the *politics stream*, political barriers appear to be the key obstacle to the reform—both of these themes prevent agreement on the policy being implemented. Fifth, under the *policy entrepreneurs* theme, respondents also urged some key advocates to adopt a more active role in advocating their vested proposal. Sixth, under the *strategies* theme, respondents suggested how to enable policy adoption in the future. Figure 3.2 presents these key themes, which are explained in detail in the next section.

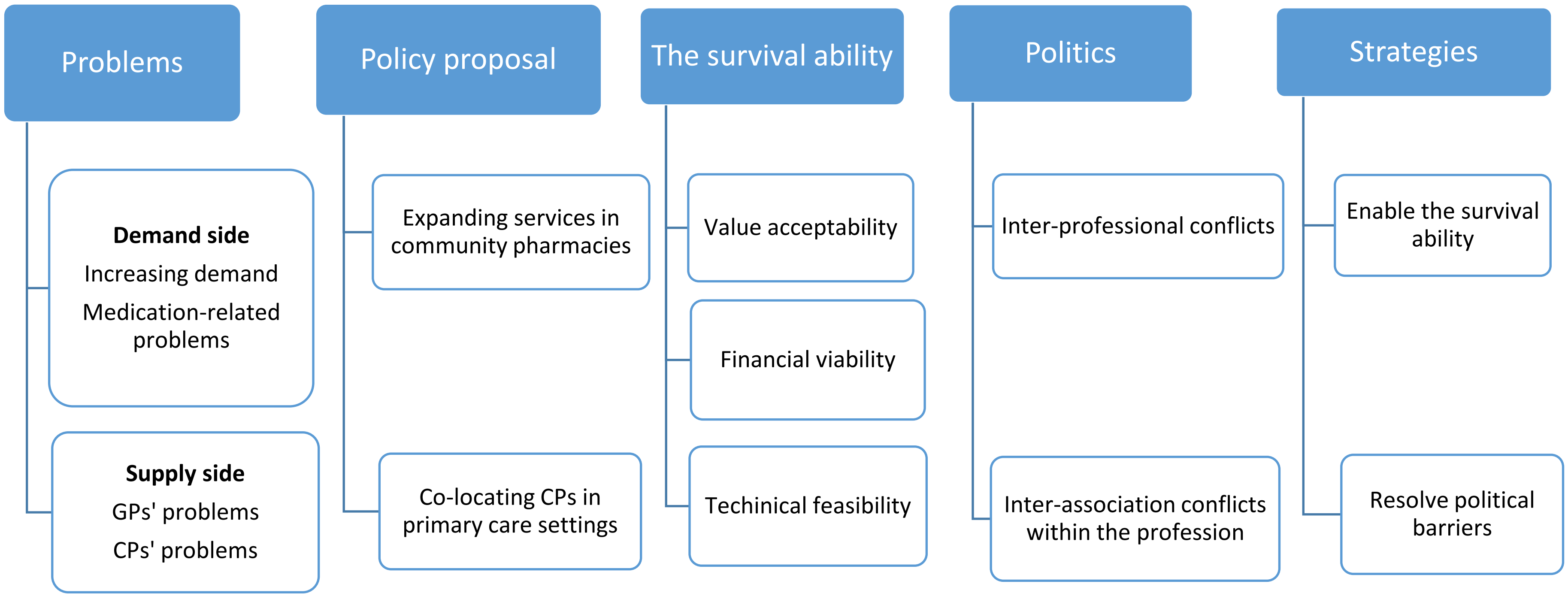

Figure 3.2: Main themes

3.3.1. Problems stream

On the demand side, medication-related problems are increasing because *"people are living with much more complex comorbidities. […] So people are being prescribed more and more drugs, and there's a lot of harm associated with inappropriate medicine use"* **(Gov18)**. These medication-related problems cause *"230,000 hospital admissions each year because of medication misadventure cost $1.2 billion"* **(PAR1)**. The increasing prevalence of chronic conditions and medication-related problems requires frequent monitoring of conditions, managing medication regimes, appropriately using the medication, and providing lifestyle education. However, respondents concerned that *"accessing a general practitioner and paying for it, just to get your blood pressure taken or to get a diabetes blood glucose test, is just a terrible waste of resources for the patient"* **(CR07)**. Furthermore, although medication-related problems may occur throughout the care continuum, GP and CR respondents were especially concerned about the medication-related problems during the transition between secondary and primary care, *"particularly older people with a lot of confusion and poor compliance with the changes"* **(CR22)**. One GP reasoned that *"they [patients] don't have clear instructions about what their new medications are that have been started when they're in hospital. Often doses have changed while they're in hospital, and that's not well communicated to the GP"* **(GP21).**

While the prevalence of medication-related problems is increasing, many respondents commented that the supply side of the healthcare market fails, to some extent, to provide sufficient and efficacious medication management. GP respondents identified problems that prevent them from optimally resolving the medication-related issues. They reported struggles in *"keeping up with the latest kind of medicines and the evidence base support them other than what the drug companies come up with […]getting some independent advice […] I remember finding challenging, especially as a junior doctor"* **(GP30)** while *"there are the time pressures* *on GPs"* **(GP22).** In contrast, CPs with medicine and healthcare training are underused while *"they're [pharmacists are] a trusted profession, they're a trusted setting and an accessible setting. So I think pharmacists are under-utilised as primary care resources"* **(CR22).** A GovP further questioned the current use of pharmacist workforce by saying *"we just have got this very expensive technician [pharmacists] that have just spent five years training [...], and then we just ask them to do something [dispensing] that a technician could do with maybe six to eight months' worth of training"* **(GovP18)**. **Furthermore,** respondents emphasized a lack of contribution of CPs in the primary healthcare network where they are *"not really included in the loop, for example when a patient is discharged from hospital with a multiple medication, it's rare that the pharmacist gets to hear about it"* **(GP26).** Respondents also notes inadequate collaboration between GPs and CPS where **"***it's only when you [GPs] make a glaring error or if you prescribe something that is not available, that the pharmacist might actually pick up the phone and ring you. But I get very little communication back from pharmacists at all, apart from in those circumstances.* **(GP, P21)** (Appendix 3.2, Table A3.1).

The problem stream highlights a need for a better collaboration among members of primary healthcare networks to tackle the increasing healthcare demand and medication-related problems prevalence, especially CPs who have the expertise in medicine but are underused.

3.3.2. Policy stream

Respondents proposed a policy to better integrate CPs into primary healthcare, referring not only to expanding CPs' services in existing community pharmacies under a close collaboration with other health professionals but also to co-locating pharmacists in primary healthcare practices. However, respondents did not reach an agreement on what direction the policy should move.

3.3.2.1 Provision of expanded services

Respondents' views differed on appropriate expanded services in community pharmacies. Most respondents agreed that medicine-related services (e.g. medication review, chronic disease management, and residential aged care services) should be the main aim of the policy because CPs are highly qualified health professionals with expertise in medicine and medication management. This could better utilise the pharmacy workforce and reduce turf wars with other members of the primary healthcare.

In contrast, the provision of non-medicine-related services such as blood pressure monitoring, weight management, and health education etc. did not gain wider support. On one hand, respondents reasoned that community pharmacists are appropriate health providers of these services not only because of their relevant expertise and skills, but also they are commonly perceived as "*the most accessible health professionals*" where *"the average Australian sees a pharmacist 13 times a year and that 80% of the population sees a GP at least once a year"* **(CR22).** The accessibility of CPs could ensure the public convenient and timely access to these screening and preventive services, which *"take pressure off other parts of the health system [...] where that is not always needed to be done by that practitioner"* **(PAR20)**. The provision of non-medicine-related services may help CPs contribute to chronic disease management with a close collaboration closely with GPs and with the help of electronic health records (Supplementary 2, Table S2). On the other hand, some respondents expressed concern about the potential fragmentation of the healthcare system as a GP reasoned *"if you fragment people's care and you encourage them to stay away from GPs, rather than engage with GPs, you lose continuity and when you lose continuity, you lose effectiveness"* **(GP21).**

3.3.2.2Co-locating CPs with other health professionals

Respondents also have different views about whether CPs should co-locate with other health professionals in primary care settings. Supporters highlighted the co-location option can facilitate the improvement of treatment quality where CPs involve *"identifying high-risk patients within the practice and then working with the GP to create a management plan around the medication-related issue. So they really have to be within the practice doing that kind of work, and having some kind of face-to-face or some kind of communication where they can exchange those ideas and management plans"* **(GP21)**. In addition, it may strengthen the relationship between pharmacists and GPs, which will *"help(s) GPs to understand what a pharmacist can do besides dispensing, get them used to work collaboratively, open up that relationship more"* **(GP26)**. However, objections to the co-location option still exist due to the concern of the potential fragmented healthcare. The separation of the medicine supply in community pharmacies and the medicine management support in general practices could be poorly coordinated, resulting in consumers' confusion (Appendix 3.2, Table A3.3).

3.3.3. The survival ability criteria

Based on the MSF, we examined the survival ability of the CP integration policy to understand whether the policy stream is ready to enable a policy change. First, the MSF suggested that widely supported policy ideas have a higher adoption chance. However, there exist disagreements on what types of services should be expanded and whether CPs should be located in other primary care settings. This reflects that the policy has not gained wider acceptability among the policy community and does not satisfy the criterion of value acceptability.

Second, some respondents were concerned that the current pay system does not ensure the financial viability for both directions of the integration policy. They reasoned that *"[the funding] is still largely centred on supply function. While there is remuneration for particular services that are not expanding at the rate at which I think the community needs"* **(PA, P27).** Additionally, the government funds the pharmaceutical supply of CPs (through dispensing fees), which incentivises pharmacists to prioritise and maximise their supply function rather than expanded services. Furthermore, respondents highlighted that there is limited funding for pharmacists integrated into primary care settings as *"the government could require [...] that those people [pharmacists] that work in GP practice have access to government money. The problem with that is that the Guild (Pharmacy Guild of Australia who represent the community pharmacy owners) says it is our money [CPA funding]"* (**PA2**) (Appendix 3.2, Table A3.4).

Thirdly, the policy does not meet the technical feasibility criterion which means resources used for the implementation of the policy need to exist or be ready for existence (Kingdon, 2011). As mentioned previously, respondents articulated that pharmacists who are qualified but underused health professionals are readily available for policy implementation. However, to ensure the quality of non-medicine-related services, some respondents believed that pharmacists still need extra training. Additionally, *"pharmacists work largely in an information vacuum"* **(PAR1),** having no accurate patient information to ensure the quality of their services. A lack of shared health records also may cause the potential duplication of care among healthcare providers and hinder inter-professional collaboration (Appendix 3.2, Table A3.4).

3.3.4. Politics stream

3.3.4.1 Inter-professional tensions

Respondents articulated the fact that the policy introduces the expansion of CPs' services, some of which are currently preserved for doctors and other health professionals. This may threaten their professional boundaries, leading to a turf war among professions. In addition, GP respondents reasoned that the policy proposal was developed as a distinct initiative of the pharmacy profession although it inevitably has broad implications on other health professions. This lack of inter-professional collaboration in the policy proposal development combined with a failure to establish a common ground may account for ongoing conflicts over the policy legitimacy (Appendix 3.2, Table A3.5).

3.3.4.2 Inter-association tensions within the pharmacy profession

Respondents reported conflicts arose from the different missions and strategies to advocate the policy among pharmacy associations. While one association focused on the financial benefits of the expanded roles, the other association supported the integration of CPs to foster the educational and professional development for CPs. As such, their conflicted vision and strategies for the development, implementation, evaluation of the policy prevent the policy to be more widely accepted (i.e. the policy fails to satisfy the value acceptability criterion). The conflicts in the remuneration models for the expanded roles also hinder obtaining funding to ensure the financial viability of the policy. Additionally, respondents expressed their key concern where only one politically powerful association represents the whole pharmacy profession in the funding negotiations with the government. This may distort the direction of the funding allocation especially when the representative association do not support the whole pharmacy workforce but only community pharmacy owners. This may deter the financial viability and the implementation of the integration of CPs into the primary care network (Appendix 3.2, Table A3.6).

3.3.5. Policy entrepreneurs

To promote the integration policy, respondents recommended that the national government, the pharmacy profession, and consumers should play leading roles in policy advocacy (Supplementary 2, Table S7). First, respondents commented that consumers should be the key advocate as population needs is the key driver for any reform to increase supply, increase access/efficiency and reduce costs. Other respondents articulated that the government should be the leader in establishing strategies to solve the issues of increasing population healthcare needs with a broader policy vision about the development of the primary healthcare network and a policy framework to direct the long-term contribution of CPs to the population. However, as this policy directly affects the future viability of the pharmacy profession, there is a general feeling that the profession should be the key advocates for the integration policy. *"[I]t's got to be made by the profession because nobody, no one else in the medical profession and the government itself doesn't owe community pharmacists a future. They have to determine their own future"* **(HE06)**.

3.3.6. Strategies for the next policy window

3.3.6.1 Enabling the survival of the policy proposal

To make the policy proposal widely acceptable, firstly, respondents suggested the pharmacy profession should develop the roles of pharmacists in light of the population's care needs "*to make sure that the services that we're delivering are actually meeting the needs of consumers across the population"* **(PAR24).** Second, respondents stressed the importance of evidence-based practice to make the policy acceptable because *"for a change to take hold it's got to be* *good for pharmacists, it's got to be good for the patients, it's got to be good for the funder […] it's got to be good for the medical neighbourhood"* **(GP26). As rigorous and objective evidence makes it easier to gain acceptability** from a wider policy community, doing this then can make the policy meet the value acceptability criterion.

Respondents suggested remuneration reform to ensure the financial viability of the policy. One option could be a fee-for-service option where *"they [pharmacist] should be funded in the same way as other health professionals which is a certain degree of MBS (medical benefit scheme) funding"* **(PAR3). Another option could be** government funding packages for CP's services in some areas of healthcare needs as one AHP suggested that *"you [government] could give pharmacy a bite of - because I'm pretty sure you [pharmacists] don't have it now - of the few chronic disease numbers that allied health have"* **(AHP14)**. These remuneration reforms options could provide stable financial funding for the integration of CPs.

To make the policy technically feasible, first, respondents highlighted the need to have *"appropriate professional frameworks […] they're [pharmacists] adhered to"* **(PAR01)**, which could enable CPs' accountability and role responsibilities for their services. Second, most respondents stressed the adoption of a shared health record system where *"the electronic record […] would improve the communication between a pharmacist and the general practice"* **(Econ17), hence promoting inter-professional collaboration** (Appendix 3.2, Table A3.8)**.**

3.3.6.2Resolving the political barriers

To overcome the political barriers, respondents recommended establishing a common ground for the problems of population needs and how to best develop the primary healthcare system to meet these needs. This could help to reorient the inter-professional conflicts into better policies for better public health, where *"It is not the boundaries of profession but what needed and who can deliver the services in where"* **(CR07)**. Further, accumulating evidence to show *"what a pharmacist does makes a difference and adds value to a health system*" **(PA27)** could reorient the currently opinion-based debate towards evidence-based practice which, then, could mitigate the inter-professional tensions. Lastly, a continuing inter-organisational collaboration during the development of the policy proposal could allow the policy to evolve through constructive management of differences (Appendix 3.2, Table A3.10)**.**

3.4. Discussion

This study has presented a comprehensive analysis of why the integration of CPs in primary healthcare has not been addressed at the national level in Australia, drawing on interviews with key stakeholders. We found that both the *policy* and *politics streams* are not yet ready for a policy change. First, the *politics stream* shows inter-organisational tensions between pharmacy and other health professions. These interest groups do not share the same vision or policy direction, which have, in turn, prevented the survival conditions of the policy proposal. Specifically, conflicts between pharmacy associations over what direction the policy moves constrain how best to advocate the policy proposal to gain wider support from other interest groups, which then accounts for inter-professional tension. Second, the policy is currently not financially viable, which was often reported in the literature (Hermansyah et al., 2017; Hossain et al., 2018).

To ensure success the next time a window is open, our study suggests several strategies that reform advocates could consider. Most important, it is critical to ensure the policy proposal can survive by accumulating evidence on the health gains of integrating CPs, which can then gain more acceptance from the wider policy community (Herweg et al., 2017). Although evidence of CPs' contribution to the public's health has been collected internationally, evidence from the Australian context will be more meaningful, especially for the government and private insurers. Second, advocates must ensure the policy proposal is financially viable by considering a fee-for-service option or some primary healthcare funding packages. Lessons learned from the UK case study show that successful integration of CPs (which started in 2005) was a result of a change in legislation to allow CPs to receive payments for services which previously were the monopoly of GPs. Further, service evaluation could provide Australian-based clinical and economic evidence that pharmacists could contribute to the primary healthcare network and to public health. This could be a strong argument to help reduce inter-professional tensions, thus gaining wider support among key stakeholders. Last, to ensure the policy proposal's technical feasibility, a shared health record in primary healthcare is an important enabler to provide accurate clinical information to ensure the quality of pharmacists' expanded services and to enhance collaboration among health professionals.

Our unique data collected from key stakeholders in the health sector reveals that political will is a key to successfully integrating the pharmacist policy. To resolve inter-professional conflicts, one option could be to frame the policy proposal with a focus on patient needs and their health benefits. For example, the UK case study argues to support the integration of CPs that policy help increase patient access and healthcare choices (Department of Health, 2000). Similarly, in Australia, a clear articulation of the shared problem, i.e. the need for improvement in the type and number of services designed to meet the population's healthcare needs, could lead to a refocusing of alternative policies acceptable to all stakeholders. Alternative policies could be to deliver healthcare services based on one of the acceptable criteria such as either efficiency, lowest costs, or highest consumer satisfaction. Then, under these policies, the role of pharmacists (and other health professionals) could be revised accordingly. Another option is to adopt a more flexible approach to the training program of health professionals to specifically address the population's needs (Duckett, 2005). This may take the debate away from the boundary of professions into a more task-oriented focus may also help to reorient the debate into a positive light and bring forth new solutions not yet discussed in depth.

This study has some limitations. For example, no themes about "government and legislatures" elements (Herweg et al., 2017), which refer to the support of key policymakers or legislature members, were identified in the interviews. With wider access to more participants, those elements may emerge. Another limitation is a lack of data from members of the Australia Medical Association due to time constraints. Future research may consider these issues.

3.5. Conclusion

Using a unique group of healthcare leaders across relevant disciplines, our study revealed several reasons why the integration of CPs in Australia has not been comprehensively addressed at the national level. We found that both the *policy* and *politics streams* are not yet ready for a policy change. We highlighted potential strategies that reform advocates may adopt to overcome political barriers and to secure adequate support from policymakers. These could include evidence accumulation, role development in light of population needs, and collaboration across members of the healthcare network. Such strategies could help unlock the potential contribution of pharmacists in the primary healthcare network to meet population needs.

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Chapter 4 Intrinsic or extrinsic characteristics? Understanding Australian Pharmacy Degree Holders' Job Preferences

Abstract

Background: Increasing the contribution of pharmacists to public health has been long discussed, particularly the potential deployment of their clinical skills and knowledge to optimise medication safety. As Medicine Safety is a national priority in Australia, intensive policy discussions have focused on the potential role expansion of community pharmacists.

Objectives: To facilitate evidence-based policy reform, this study examines the employment preferences of Australian pharmacy degree holders (PDHs) using a discrete choice experiment (DCE). Additionally, we harness this case study to provide a comparison between forced and unforced choices in the context of a dual response DCE to better understand the external validity of the DCE method.

Methods: A labelled DCE was developed incorporating the six main sectors of employment for PDHs: hospital pharmacy, community pharmacy, primary healthcare settings, pharmaceutical industry, government/academia, and non-pharmacy related sector. Each alternative was described by five attributes in which roles and career opportunities are intrinsic factors while flexible work schedule, geographic location, and annual salary are extrinsic factors. The DCE was embedded in the PAMELA (Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity) survey. Data were analysed using conditional logit and error component mixed logit models.

Results: Based on a sample of 824 PDHs, we provide evidence that primary healthcare settings were generally preferred to community pharmacy while the pharmaceutical industry is the least preferred sector. Intrinsic characteristics have a significant impact on the employment choices of Australian PDHs in which roles and recognition for work in the forms of promotion and/or specialisation opportunities were highly regarded. Our results show that extrinsic characteristics - salary and geographic location are the most important factors across all alternatives. We found that employment choices are independent of household income but strongly influenced by choice inertia. While the direction of the attributes' influence on the employment choices is consistent across forced and unforced choice sets, welfare measures for some attributes are significantly different.

Conclusion: This is the first study to provide a comprehensive picture of what PDHs value when making choices between employment options in the labour market. We suggest that utilising role expansion reform to mitigate workforce shortages in rural and remote areas warrants consideration. From the methodological perspective, we recommend future research adopt the dual format response for opt-out/status quo questions to preserve the level of choice complexity between forced and unforced choice.

Key words: pharmacists, Australia, employment preferences, Discrete Choice Experiments, Pharmacy workforce

4.1. Introduction

There has been increasing interest over previous decades to make better use of the clinical skills of pharmacists to improve population health (Barber et al., 1994). In many countries, including Australia, stakeholder groups (Duckett & Swerissen, 2017; Duckett, 2005; King et al., 2016; Sarah et al., 2020; Wells, 2018) have called for community pharmacists to move away from a dispensing focus to performing more advanced or better-integrated roles as a way of enhancing the quality use of medicines and reducing medication-related harm (Roughead et al., 2013). These proposals are based on evidence that show positive results of pharmacist-led interventions such as a reduction of medication-related problems (Avery et al., 2012; Desborough & Twigg, 2014; Tan et al., 2014a) or better medication adherence and management of chronic conditions (Jokanovic et al., 2017; Milosavljevic et al., 2018; Twigg et al., 2016). An advanced or extended practice role might include medication management (e.g. medication review, chronic condition management etc.), health promotion (e.g. stroke prevention campaigns, community health talks, vaccination, etc.), health screening or monitoring (e.g. blood pressure, blood glucose, cholesterol, etc.), and mental health services. Such services could be provided at conventional community pharmacies in close collaboration with other health professionals or by co-locating community pharmacists within general practices or aged care facilities.

The role of community pharmacists has increasingly become the focus of policy makers following the recent recognition of Medicine Safety as one of the National Health priorities (Australian Government, 2019a). Among the peak pharmacy professional bodies, the Pharmaceutical Society of Australia has outlined a framework including 11 changes needed to further develop the roles of pharmacists (Pharmaceutical Society of Australia, 2019). Whilst, the Pharmacy Guild of Australia outlines strategies to develop community pharmacies as an integral part of the health care system by providing integrated services (Pharmacy Guild of Australia, 2018). However, to ensure the success of any health reforms on the role expansion of community pharmacists and/or the recruitment and retention of capable employees, a better understanding of the determinants of employment choices of pharmacists is crucial (Lagarde & Blaauw, 2009; Mandeville et al., 2014). This includes consideration of whether the current pharmacist workforce is more motivated by intrinsic (e.g. intrinsic interest in the job itself, the opportunities for advancement) or extrinsic characteristics (e.g. salary, work conditions, geographic location) of the proposed expanded roles. Future policy directions would also benefit from the information about how these factors could be compensated or traded and the levels of the responsiveness to these factors across different groups of pharmacists.

From the supply side of the pharmacist labour market, pharmacy degree holders (PDHs)[4] can move between employment sectors with little barrier to entry as long as they still hold their pharmacy registration. Movement between the labour market segments depends on the relative attractiveness of different aspects of the various employment sectors. Any change in the community pharmacy sector inevitably has a broader effect on the recruitment and retention not only of the community pharmacy sector itself but also of other clinical and non-clinical employment sectors available to PDHs.

This chapter aims to provide evidence on the employment preferences of PDHs for various employment options in the labour market using a discrete choice experiment (DCE). To the best of our knowledge, this is the first study globally to provide such critical information in the context of the whole labour market for PDHs. Using our results, we also simulate some policy scenarios to help understand the dynamic consequences of policy reforms of pharmacist role

[4] These could be registered or unregistered pharmacists.

expansion in community pharmacy and primary care settings. Additionally, we harness this case study to provide a comparison between forced and unforced choices in the context of a dual response DCE to better understand the external validity of the DCE method.

Limited evidence of preferences for job choices of pharmacists using revealed or stated preference data sources can be found in the literature. For example, using administrative data sets that detail the actual job decisions of PHDs (revealed preference) in the US, Cline and Mott (2000) found wage increment is influential in the probability of choosing a practice setting and PHDs who have worked in institutional settings (hospital/home care etc.) are more likely to choose the same settings. Although the revealed preference (RP) data are reliable and valid as the choice outcomes represent the trade-off individuals make regarding their actual constraints of resources (Hensher et al., 2015b), estimating PHDs' preferences from RP data poses some challenges. Firstly, the equilibrium allocations of jobs not only reflect the preferences of employees but also the choice of employers and the labour market conditions (Wiswall & Zafar, 2018). These unobserved factors hinder the realisation of the link between job preferences and observed job choices in RP datasets. Although Train (2009) proposed that one way to disengage PHDs' preferences from employer preferences is to recreate the choice sets from which PDHs pick their current job, information on concurrent job alternatives needed to construct the choice sets might be subject to memory bias for recalling characteristics of non-chosen options. Even if the choice sets can be obtained, omitted variable problems would lead to other challenges such as endogeneity (Helveston et al., 2018). Thirdly, RP data can only collect information on the behaviour for the existing job characteristics (Hensher et al., 2015b) whilst policy reform may introduce new job attributes and/or attribute levels.

Other studies have used the preference ranking technique to examine the preferences of pharmacists and pharmacy students for jobs. Young and Mathews (2009) asked pharmacy graduates from a Canadian university to rank a number of job characteristics in order of importance when choosing their current job. They show that the five most important job characteristics are working conditions, job benefits[5], pay, hours of work and geographic location. Similarly, some studies explored the career preferences of pharmacy students by using the rating technique with a Likert scale on a number of influential factors on career choice and selections of the preferred employment sectors upon graduation (Al Ghazzawi et al., 2017; Alhomoud et al., 2019; Besier & Jang, 1992; Hasan et al., 2010; Nakagomi et al., 2016; Rockers et al., 2012; Savage et al., 2009; Ubaka et al., 2013). The main drawback of the ranking/rating method is their inability to allow respondents to trade among job attributes, thus quantifying the relative importance of different characteristics and their willingness-to-pay for some job characteristics (Drummond et al., 2015). The information on the relative importance of job characteristics is undoubtedly useful for policy-makers when undertaking health workforce planning, which may involve disruptive implications, such as the reallocation of pharmacists into new practice roles or geographic areas.

To address the challenges presented in the RP data or the preference ranking method, this paper explores the employment preferences of PDHs using the DCE method, a type of stated preference technique. DCEs have been widely used as a means to evaluate the trade-offs people make to reach their choice outcome among competing options in transportation, marketing and healthcare (Soekhai et al., 2019). First, the experimental design including the variations of job attributes and alternatives exogenously presents the choice tasks to respondents, which, thereby overcomes the endogeneity bias often faced in RP data. Additionally, the DCE disengage the

[5] No definition of "job benefits" provided

employers' preferences and the labour market conditions, enabling a pure elicitation of individual preferences for various job characteristics across the whole labour market. The experimental design ensures job attributes are independently allocated and job choices are chosen independently, providing a preference dataset free from employers' preferences and the labour market conditions. Second, the nature of DCE enables the trade-off among different job profiles, which consists of different attributes; as such, the information on the relative attractiveness of job attributes can be achieved. Lastly, this study examines the preferences of PDHs in an expanded horizon of the current labour market in which some not-yet-popular job choices such as general practice pharmacists or aged care pharmacists are included. This approach, underpinned by the use of the DCE technique, provides an understanding of pharmacists' preferences of all the alternatives relevant to policy, which would otherwise be impossible to be researched due to (a) the lack of contemporary data and (b) the far too time-consuming task of obtaining a sufficiently large sample size of revealed preference data.

We also contribute to the health economic DCE literature in several ways. First, there are several papers focused on community pharmacists' preferences towards expanded roles in primary healthcare (Grindrod et al., 2010; Munger et al., 2017; Scott et al., 2007). However, the preference estimates may be *over*-estimated when they did not take into account the fact that PDHs can move between sectors with little barrier to entry and that a change in the community sector can have broader implications on recruitment and retention in other sectors. This study, on other hand, presented a whole set of job choices available to PDHs to ensure the elicitation of unconditional preferences across all employment sectors. Second, this is the first study that used a labelled experiment DCE to describe a whole set of employment sectors faced by PDHs. Our paper distinguishes itself from the literature by using DCEs to inform health workforce policy that mainly adopted unlabelled experiments (i.e. experiments having generic alternatives e.g. option A, option B) or labelled experiments (i.e. experiments present alternatives whose labels convey a particular meaning) in a limited way of only describing the geographic location of the job (e.g. rural versus urban jobs) (Lagarde & Blaauw, 2009; Mandeville et al., 2014).

Utilising this case study, we also address a methodological gap in the DCE literature. Previous studies suggest that including the opt-out/status quo option would increase task realism where the choice tasks directly mimic the choice process in real-life situations (Carson et al., 1994; Louviere & Lancsar, 2009), thus it is recommended to reduce the hypothetical bias in DCE (Hensher, 2010; Lancsar & Louviere, 2008). However, studies, which examine the effect of including/excluding the opt-out/status quo alternatives produce inconclusive evidence on whether forced and unforced choices generated inconsistent welfare measures. Veldwijk et al. (2014) found significant differences between marginal willingness to pay (MWTP) estimated from forced and unforced choices. Whilst, Carlsson et al. (2007) find that including an opt-out alternative has no significant effect on the MWTP values although it has a significant influence on unobserved heterogeneity by changing the statistical significance of the attribute standard deviations. However, these two studies compared choice tasks with either the opt-out option as an additional alternative, or without the opt-out alternatives, causing a variation in the choice complexity. As such, the effect of including/excluding an opt-out option is confounded with the choice complexity. To disengage the choice complexity effect, Penn et al. (2019) used the dual response format to compare the welfare measures between forced and unforced choices in a case study investigating the valuation of recreational beaches. They found significant variation in MWTP values resulting from forced and unforced choices. Further, a review of the literature on the use of DCEs to inform health workforce policy shows that only 30% of studies include opt-out options (Mandeville et al., 2014). We evaluate the effect of including an opt-out alternative while keeping the choice complexity constant by adopting the dual response format (Brazell et al., 2006).

The structure of this paper is as follows. Section 2 describes the methods used for DCE design and data analyses; followed by the results, reported in Section 3. Section 4 discusses the main findings, limitations and policy implications of this study.

4.2. Methods

Discrete choice experiments, a type of stated preference method, were first developed in marketing and transportation with use across health economics and other areas of applied economics. (Lancsar & Louviere, 2008). DCEs are based on Lancaster's theory of demand which assumes consumers have preferences and derive utility from the characteristics of a good rather than the good *per se* (Lancaster, 1966). DCEs are based on the choice-based approach to consumer theory which assumes consumers "reveal their preferences" through choices observed in DCEs.

DCEs involve the creation of hypothetical market using experimental design which usually consists of a series of choice tasks, each of which consists of a finite number of alternatives which are described by a number of attributes levels. In each choice task, respondents are asked to specify their most preferred alternative. There are two main DCE experiments design-unlabelled and labelled experiments. The first refers to experiments that use generic titles for an alternative which have no real meaning except for ordering (e.g. Job A versus Job B). By contrast, the latter refers to experiments that use specific labels for alternative titles which have some meaning (e.g. hospital pharmacy versus community pharmacy). Only the latter requires the identification of all possible options within the universal set of alternatives e.g. all types of employment sectors that a pharmacy graduate could choose to work (Hensher et al., 2015c).

All preference-revelation responses from DCEs are then pooled to estimate preference and preference-related parameters such as willingness to pay for each of the design attributes (Hensher and Rose, 2007). Choices observed in DCE are analysed using random utility theory which were originally rooted in psychology (Thurstone, 1994) and heavily developed by McFadden (1974). This theory assumes that people are rational decision-makers and attempt to maximize their utility (Amaya-Amaya et al., 2008). When faced with a set of comparative alternatives, respondents choose the alternative that gives them the highest utility value.

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4.2.1. Attribute development

The attribute development was based on the qualitative study conducted in Chapter 3 using a unique sample of 33 key stakeholders, which included policymakers, education influencers, and practising pharmacists. One of the interviews prompts was ‘*What factors are most* *important to you/pharmacists when choosing your/their job?*". Respondents were also asked to rank their suggested attributes in order of importance and give their opinion on the potential policy influence on the suggested attributes. Using a thematic approach for data analysis, results of the qualitative study found a list of twenty-eight important factors which included individual factors (stage of career, age, family constraints, career aspiration, work setting exposure, work experience); training program related factors (the content of training program, placement training); and job-related characteristics. When designing the DCE, only job characteristics were considered, resulting in 18 attributes for consideration. (See Appendix 4.2: Table A4.1 reports the reasons for the inclusion and exclusion of attributes resulted from the qualitative study.)

Based on the qualitative interviews, a labelled, rather than unlabelled experiment was chosen based on the following considerations. Firstly, the qualitative study reported that one of the most important attributes is *"career paths"*. PDHs have various career choices, each of which has distinctive characteristics. For example, the two main traditional career paths - hospital pharmacy and community pharmacy - distinguish themselves in the type and context of patient interactions, level of clinical knowledge required, non-cognitive skills used at work, career progression, and a number of other unobserved factors. While it is possible to describe jobs using a list of attributes in unlabelled experiments, the DCE would become complicated with complex combinations of attribute levels, thus increasing respondents' cognitive burden. Secondly, the labelled design makes choice tasks more realistic and enhance the validity of the DCE results (de Bekker-Grob et al., 2010; Hensher, 2015), where the labels reflect job sectors faced by PDHs in their actual decision-making, e.g. choose between a hospital pharmacy and a community pharmacy job.

As a result, six alternatives were chosen to represent the main employment sectors in the job market for PDHs. Four of these (hospital pharmacy, community pharmacy, the pharmaceutical industry, and government and academia (combined)) represent the most common choices. Government and academia were combined into a single attribute as they account for a very small proportion of jobs (2% each) (Health Workforce Australia, 2014). One of the key policy sectors- the primary healthcare setting (i.e. general practices/aged care facilities) was presented as a stand-alone alternative. The non-pharmacy related (opt-out) job was used to capture all other choices, making the choice set compete (Reed Johnson et al., 2013).

Attribute development was based on the remaining 17 attributes identified in the qualitative study, in conjunction with a consideration of the previous literature and policy relevance. It has been suggested that the criteria for inclusion of attributes should be based on the most relevant, manageable and amenable attributes to policy changes (Coast & Horrocks, 2007).

Considering that the salary attribute is essential for the calculation of willingness-to-pay/accept for changes in other attributes, this attribute was included as *"Annual salary"*. Previous literature commonly uses relative levels for the salary attribute (i.e. 10% increase/decrease around the current salary) based on the theory of reference dependence utility (Holte et al., 2015; Li et al., 2014; Scott, 2001; Scott et al., 2007; Scott et al., 2013). However, one criticism of this approach is that respondents may adopt different referent points other than those specified by the analysts, thus may bias the result estimates (Holte et al., 2016). Therefore, we opted to use absolute levels of salary (e.g. annual salary of AUD100,000) presented as a generic annual salary range of four levels (AUD60,000 – 180,000) for all alternatives except the pharmaceutical industry which has a higher salary range (AUD100,000 – 200,000) in line with the real job market. The levels of salary attributes were derived from the salary structures in different employment sectors (Pharmacy Daily 2019).

We included a geographic location attribute given the maldistribution of pharmacists in rural and remote areas is a long-recognised policy issue (NRHA, 2014). Further, geographic location was one of the commonly mentioned attributes in the qualitative study. In the DCE, this attribute was given three levels: urban, rural and remote areas. Third, given the feminization of the profession with 61% of pharmacists being female (Health Workforce Australia, 2014), the flexibility of the work schedule is considered a relevant factor. The flexible work schedule refers to the workers' ability to dictate their working hours, such as after-hours or weekend work to balance work and non-work commitments. Two generic levels (*"yes"* and *"no"*) were chosen for alternatives based on the qualitative study.

Six other job characteristics were combined into two key attributes. Firstly, our previous qualitative research reveals influencing factors in pharmacists' job choice are *"intellectual satisfaction"* and *"the ability to use their trainings and skills"* and *"the type and level of human interaction"*. The *"role"* attribute was used to reflect the duties that one has to perform in the context of employment sectors, which can capture these distinct factors in different sectors of the pharmacy profession. For example, the role described as *"mainly dispensing"* can be referred to as a low-level use of clinical knowledge while the *"providing professional services"* reflects the opposite. Additionally, *"mainly dispensing"* in the community pharmacy sector can be referred to as a high volume of human interaction while "teaching/research" in the government/academia sector reflect the opposite. The levels of this attribute are alternative-specific and mimic the actual roles in each sector.

Career opportunities, that is, opportunities for career development, can mean both horizontal promotions, where pharmacists can gain specialization certification without management responsibility, and vertical promotions where pharmacists are promoted to higher positions with management responsibility. This attribute was included to examine pharmacists' preferences in terms of the specialization opportunities for clinical practice. Three levels were used to capture career opportunities – *"having no career opportunities"*, *"having specialization opportunities only"*, and *"having both promotion and specialization opportunities"* in three alternatives-hospital pharmacy, community pharmacy and the primary healthcare setting. One constraint was imposed, that *"mainly dispensing"* role level in *"Hospital pharmacy"* and *"Community pharmacy"* do not appear concurrently with the *"having specialization opportunities only"* level, to reflect the fact that dispensing pharmacists cannot become specialised. Only two levels of *"career opportunities"* were used for three alternatives – the pharmaceutical industry, government/academia, and non-pharmacy related jobs: having no career opportunities and having both promotion and specialization opportunities.

Among the remaining eight potential attributes, we excluded *"job availability"* because it is not an easily remedied labour market condition. *"Job satisfaction"* and *"meaning of job"* were also excluded due to their potential dominance in the choice sets (Coast et al., 2012), we also excluded *"public transport availability"*, *"working environment"*, *"working conditions"* and *"work as part of a team"* which were the least mentioned attributes in the qualitative interviews. Further, we also excluded *"job security"* which is considered less important in the current Australian context, as ongoing job contracts are considered normal (except for academia) (See Appendix 4.2: Table A4.2 presents the list of alternatives and their definitions. Table A4.3 presents the list of attributes and their definitions used in the experiment. Table

A4.4 presents the attribute levels and their definitions). Table 4.1 shows the allocations of attributes levels according to alternatives.

Table 4.1: Alternatives and alternative-specific attribute levels

Alternative /Attributes	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government /Academia	Non-pharmacy related sector
Your role	Medicine dispensing/ distribution*	Mainly dispensing*	General practice Pharmacist*	Sales or Marketing*	Policy-related role*	Health related role*
	Clinical practice	Combination of dispensing and providing professional services	Aged care pharmacist	Medical or Regulatory Affairs	Teaching or Research	Non health-related role
	Clinical research/Education	Providing professional services		Research and Development		
Flexible work schedule	No*	No*	No*	No*	No*	No*
	Yes	Yes	Yes	Yes	Yes	Yes
Career opportunities	None*	None*	None*	None*	None*	None*
	Specialization only	Specialization only	Specialization only	Promotion and specialization	Promotion and specialization	Promotion and specialization
	Promotion and specialization	Promotion and specialization	Promotion and specialization			
Geographic location	Urban*	Urban*	Urban*	Urban*	Urban*	Urban*
	Rural	Rural	Rural	Rural	Rural	Rural
		Remote	Remote			Remote
Annual salary	$60,000	$60,000	$60,000	$100,000	$60,000	$60,000
	$100,000	$100,000	$100,000	$140,000	$100,000	$100,000
	$140,000	$140,000	$140,000	$180,000	$140,000	$140,000
	$180,000	$180,000	$180,000	$220,000	$180,000	$180,000

*Base level

4.2.2. Experimental design

Considering an individual respondent is faced with a number of choice tasks, each of which includes a discrete number of alternatives. Let subscript *n, s, j* refers to respondent $n=1,2,\dots,N$, choice task $s=1,2,\dots,S$ and alternative $j=1,2,\dots,J$. Assuming that respondents make a choice to maximise their utility within the random utility framework, a utility function for alternative *j* in choice task *s* for respondent *n* is given by:

$$U_{nsj} = \beta_{j0} + \sum_{k=1}^{K} x_{jk}\beta_{jk} + \varepsilon_{nsj} \quad \text{for all } n= 1,\dots,N;\ s= 1,2,\ \dots,S;\ j = 1,\dots,J \qquad (1)$$

where x_{jk} is a k-vector of attributes levels associated with different attributes, $k = 1,2,..,K$, linked to each alternative *j*. β_{j0} is the alternative-specific constant (ASC) of alternative *j*. β_{jk} are alternative-specific parameters reflecting the desirability of the attribute *k* of alternative *j*. Assuming that the unobserved component of utility ε_{nsj} is independently and identically extreme value type I (Gumbel) distributed, the probability, P_{js} of choosing alternative *j* in choice set *s* of respondent *n* may be shown in the following equation:

$$P_{js}(j/x_{ns}) = \frac{exp(x_{js}\beta_j+\varepsilon_{nsj})}{\sum_{j=1}^{J} exp(x_{js}\beta_j+\varepsilon_{nsj})} \qquad (2)$$

A design including all possible combinations of alternatives and their attributes is called the full factorial design. For example, considering a simple design with 3 labelled alternatives (M=3), each of which has 3 attributes (A=3) and each attribute has 3 levels (L=3), the full factorial design would have $L^{MA} = 3^{3*3}$ =19,683 choices. Although having the perfect statistical property, this design may present a significant cognitive burden on respondents and/or unfeasible required sample size. Thus, the fractional factorial design was designed to reduce the number of choice sets (Hensher et al., 2015c).

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There are two main ways to design a fractional factorial design. One method, the orthogonal design, emphasizes the importance of the independence of parameter estimates i.e., there is no correlation among design attributes (Hensher et al., 2015). Street et al. provides several strategies to locate the optimal design without having to rely on complex algorithms (Street & Burgess, 2004; Street et al., 2005). Another way to design fractional factorial design is using efficient designs in a way that captures the maximum amount of information about the parameters of the attributes to better understand respondents' preferences. They do so by reduce the presence of dominant alternatives (e.g. Job A having better pay and better career opportunities versus Job B having lower pay and no career opportunities, and that responses are unlikely to provide information on the trade-off among attributes and attribute levels of the alternative) which researchers of this stream believe provide little information about individuals' preferences. By minimising the asymptotic standard errors of parameter estimates, this design method aims to enhance the robustness of the estimates (Rose & Bliemer, 2009).
Based on this belief, the literature has seen an increase in the use of efficient design which ensures to provide more information on the trade-offs between different attributes through the allocation of attribute levels. In healthcare, there is an increase from 0% of application during 1990-2000 to 53% during 2013-2017 (Soekhai et al., 2019). Noted that one limitation of this

method is having to rely on complex algorithm and the need to know in advance the precise econometric model that will be estimated once the data has been collected. In our study, we used an efficient design with zero priors which was proved to be equivalent to an orthogonal design (Hensher et al., 2015).

Standard errors can be derived from the roots of the diagonal of the asymptotic variance-covariance matrix (AVC). This matrix depends on the experimental design (i.e. the allocation of attribute levels X), the choice outcome (Y) and parameter estimates (β). As McFadden (1974) and later Rose and Bliemer (2009) show that the AVC matrix can be determined without knowing the choice outcome (Y) using either Monte Carlo simulation or analytically. As parameter estimates are unknown, prior parameter values which can be sourced from literature, expert opinions or the pilot study, are used as "best guesses" for the true parameters. Thus, with a certain allocation of the attribute levels, the AVC matrix can be derived (Hensher et al., 2015).

The efficient design produces as small as possible standard errors to maximise efficiency. Thus, the design can increase the statistical information collected from the choice tasks (or require a reduced sample size). To compare the efficiency of different designs, we rely on some estimates of efficiency which reflect the amount of efficiency error and hence, the smaller the efficiency error is, the better the design is. The most common efficiency error is D-error which is the determinant of the AVC matrix assuming only for a single respondent whilst the A-errors is the summation of the diagonal variances of the AVC matrix. The design having the smallest value of D-error is called D-optimal design, and similarly, the A-optimal design having the smallest value of A-error (Hensher et al., 2015).

Given the model specified in (1), and (2), an efficient experimental design with zero priors was generated for a conditional logit model using Ngene software v.1.1.1 (ChoiceMetrics) (Rose & Bliemer, 2009). Eighteen choice sets were generated and blocked into six versions. Each respondent answered one block of three choice sets. This combination was chosen due to our consideration of the length of the survey and its potential cognitive burden on respondents, exacerbated because the survey also consists of another set of questions from a different DCE and other non-DCE questions. Choice sets and blocks were randomly allocated to respondents.

4.2.3. Choice context

The DCE section starts with information on the choice context, along with descriptions and definitions of alternatives and attributes to assist the consistency of respondents' understanding. The definitions of each attribute and level appearing in the choice tasks could be reviewed using the mouse hover function (not available if done on a mobile phone). An example of the choice question was also presented to familiarise respondents with choice tasks. Respondents completed seven choice tasks, of which, three had six job alternatives (referred to the full choice set experiment which is reported in this paper) and four had a subset of three alternatives (referred to the partial choice set experiment which is discussed in detail in Chapter 5). The order of the two designs was randomly allocated to respondents.

The choice context was set up by asking respondents to imagine they were looking for a job; they were then presented with a series of competing job alternatives. Respondents were asked to choose their preferred job in each choice set (forced choices). For respondents who are currently working, they are then asked to specify their preference between their current job and the preferred option in the choice scenarios (unforced choices). Figure.4.1 presents an example of a choice question.

In the following choice scenario, please choose your preferred job.

	Non-pharmacy related job	Pharmaceutical Industry	Primary healthcare setting	Community pharmacy	Hospital pharmacy	Government/ Academia
Your role	Non-health related	Research and Development	Aged/residential care pharmacist	Combination of dispensing and providing professional services	Clinical practice	Research or Teaching
Flexible work schedule	Yes	Yes	Yes	Yes	No	No
Career opportunities	Promotion and specialisation	Promotion and specialisation	None	Specialisation only	Promotion and specialisation	None
Geographic location	Rural	Urban	Rural	Urban	Rural	Rural
Annual Salary	$180,000	$140,000	$180,000	$140,000	$140,000	$180,000
Which job would you choose?				✓		

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	My current job
	✓

Figure.4.1: Example of the choice question

4.2.4. Pre-test study

The survey was pre-tested in two stages to ensure a relevant, concise and understandable final survey. The first stage focused on the DCE choice tasks in terms of cognitive burden, and interpretation and wording of alternatives, attributes and levels. The think-aloud technique was used with four pharmacists to obtain more insights about respondents' trade-offs among alternatives and attributes, their understanding and ranking of attributes. Refinements were made before testing with the subsequent respondents. An online debriefing DCE questionnaire was also distributed to a subgroup of five pharmacists in which respondents were asked to complete eight DCE choice scenarios and a debriefing questionnaire about their understanding, complexity, non-attribute attendance and confusions of alternatives, attributes and levels, and suggestions for improvement. Suggestions regarding wording were incorporated before undertaking the second stage.

The second stage involved the distribution of the whole online survey questionnaire to a subgroup (n=15) of the study population. Ten respondents provided detailed feedback regarding the survey length, wording and suggestions of additional questions. One convenient in-depth interview was conducted to gain more detailed feedback. The online survey was reviewed by the Pharmacy Society of Australia to ensure the policy relevance of the survey. Suggestions on wording and content of the general questions were also incorporated.

4.2.5. Data collection

The DCEs were embedded in the Pharmacy in Australia: Measuring Employment, Labour preferences and Activities (PAMELA) survey (Wave 1). This survey investigated the employment preferences and work activities of Australian PDHs including information on the current employment of respondents, work experience and their individual characteristics. All

PDHs with a Bachelor or a Master of Pharmacy obtained from one of the Australian academic institutions or internationally trained pharmacists currently registering in Australia were invited to participate in the survey.

A pilot was undertaken in July 2019 using the Griffith School of Pharmacy and Pharmacology alumni database. Whilst, the main data collection was conducted via a number of recruitment channels between October 2019 and January 2020 (Appendix 1). The questionnaire was built on the online platform-SurveyEngine (https://surveyengine.com/). The study was approved by the Ethical Review Committee of Griffith University (GU Ref No: 2017/881) and the Ethical Review Committee of Monash University (MU Ref No: 11845).

4.2.6. Analysis

The conditional logit model was first estimated. Eq (2) defines the conditional logit model where ε_{nsj} are assumed independently and identically distributed for all respondents n and across all choice sets and all alternatives j. In the model, the alternative specific constants (ASCs) which capture the average unobserved factors related to alternatives (Hensher et al., 2015c) were specified for each alternative. The salary attribute was coded as a continuous variable. All of the other attributes were dummy-coded with the first category of each attribute used as the reference category (Table 1). Alternative-specific coefficients were estimated for the *"role"*, *"geographic location"* attributes. Generic coefficients were also estimated for *"salary"* and *"flexibility"* to reflect that the marginal utility of these two attributes is the same across sectors. For the *"career progression"* attribute, alternative specific coefficients were estimated for the level *"having both promotion and specialisation opportunities"* to reflect the differences in the marginal utility of having this level across sectors. A generic coefficient was estimated for the level *"only having specialisation opportunities"* which were available for three alternatives *"hospital pharmacy", "community pharmacy" and "primary care settings"*. These specifications were supported by the equality test on the alternative specific parameters of these attributes (Appendix A). To ensure the necessary normalizations, ASCs and the main effects of socio-demographics for the *"Community pharmacy"* are set to zero.

The conditional logit model can be extended to the mixed logit (MIXL) model, which accounts for unobserved preference heterogeneity among respondents (Hensher & Greene, 2003; McFadden & Train, 2000). In its most general form, the MIXL can have all coefficients of attribute levels specified as random parameters. However, we expected that preference heterogeneity on attributes could be captured by the alternative-specific coefficients. As such, MIXL models reported in this paper have the ASCs specified as random parameters with a normal distribution, which reflects flexibility in the job choice across individual respondents, given there is no prior knowledge about the direction of the effect of unobserved factors on the job choice. Although the random parameters can capture heterogeneity across individuals and alternatives, they cannot account for additional heterogeneity of unobservable effects that may be distributed across all alternatives. Therefore, we specified an error component that allows unobservable effects to be correlated among the utilities for all alternatives. The approach was supported by a comparison of model fit statistics across specifications with different coefficients specified as random parameters (Appendix 4.2). Optimal model selection was based on goodness-of-fit statistics, the Akaike information criterion (AIC) (Akaike, 1974) and the Bayesian information criterion (BIC) (Schwarz, 1978). The relative importance of attributes was based on the ranking of the ratio of the differences in the utility between the highest and lowest levels of a single attribute and the sum of the differences in the utility of all attributes (Malhotra, 2017).

For the comparison between the unforced and forced-choice, the forced-choice sets were directly derived from the DCE choice tasks while the unforced choice sets combine the current employment alternative with six alternatives from the forced-choice sets to make seven-alternative choice sets. See Appendix 6 for the construction of the current employment alternatives of which alternative and attributes are based on data collected from the PAMELA survey. Respondents who were not in employment at the time of the survey (i.e. undertaking higher education; retired; unemployed) did not face unforced choice tasks, so for the comparison of forced and unforced choices, we used the sample exposed to both forced and unforced choice sets.

To compare the forced and unforced choices, the Swait-Louviere test (Louviere et al., 2000b; Swait & Louviere, 1993) was used to test for equal parameters across two data sources. In this test, the LR test statistic $-2(LL_p – (LL_{FC} + LL_{Pc})$ is asymptotically chi-squared distributed with K degrees of freedom where K+1 is the number of attributes constrained to have equal parameters across two data sources. LL_p is the log-likelihood of a pooled CL model including all observations but allowing for different scale between two data sources, LL_{FC} and LL_{PC} (Louviere et al., 2000b; Swait & Louviere, 1993). Additionally, willingness-to-pay (WTP)estimates from two separate CL models on two data sources were directly compared using the t-test of equality for two dependent samples (i.e. both WTPs were estimated from the same sample). Marginal willingness-to-pay (MWTP) or marginal willingness-to-accept (MWTA) was calculated for all non-monetary attributes to reflect the amount of annual salary respondents would be willing to pay or accept for a change in the level of particular job characteristics. MWTP/ MWTA for a particular attribute level is the ratio of the coefficient estimate of that attribute level and the coefficient estimate of the salary attribute.

All analyses were conducted using NLOGIT software, using the same seed for all estimations to make the results comparable and distribution simulations were based on 2000 Halton draws.

4.2.7. Preference heterogeneity using observable characteristics

To explore preference heterogeneity using observable characteristics, individual characteristics were entered in the models as main effects and interaction terms with the job attributes. We further conducted some specific hypothesis tests below.

Hypothesis 1: Employment choices are independent of household income.

Employment decisions of pharmacy graduates may be a household choice in which household income may distort the influence of job salary on the probability of choosing a job. That means if household income increases or decreases, salary may have a different contribution to the utility function (Hensher et al, 2015, page 321). To test this hypothesis, we included a variable indicating the ratio of salary levels and household income as the main effect in the utility functions. The coefficient of this variable, if statistically significant, reflects the concept that the importance of salary in a person's decision-making varies, relative to other issues, when household income varies. The PAMELA survey allowed us to test this hypothesis by providing the household income information via the question *"What is your total gross household income (before tax) per week? (Include your and your partner's earnings, and any income from other business interests, dividends, etc.)"*.

Hypothesis 2: Choice inertia

This hypothesis is informed by both the pharmacy workforce literature and the choice modelling literature in general. The former reported that past experience positively influences the choice of the same employment sectors of both pharmacists (Cline & Mott, 2000) and pharmacy students (Ubaka et al., 2013). Choice inertia has been previously investigated where past experiences may have an effect on the current choice and that people have a tendency to stick with the past choice, which has been referred to as 'inherent preferences' (Cherchi & Manca, 2011). To test this hypothesis in the context of Australian PDHs, we test the statistical significance of coefficients of having experience of a particular sector as main effects in the utility functions of that particular alternative.

Hypothesis 3: Current geographic location positively affects the preference of jobs in the same area.

The PAMELA survey collected information about the geographic location of respondents' current employment. We generated a variable reflecting whether the geographic location of respondents' current job is the same as the level of this attribute in our DCE to test if it influences preferences.

Hypothesis 4: Females and respondents having children less than 5 years old will value flexible work schedule more highly.

Ubaka et al. (2013) find females tend to value flexibility higher than males. To test this hypothesis in the Australian context, we interacted two dummy variables - female and having children less than 5 years, old with the dummy variable of having a flexible work schedule.

4.2.8. Predictive analysis

Our PAMELA survey also captures information about the current employment sector of respondents (i.e. revealed preferences). We use the shares of the current employment sectors as the base case for the predictive analysis. The estimated coefficients were used to simulate potential policy scenarios by changing some variables of interest. The predictive probability of choosing each alternative was calculated for each individual in the base case and in each scenario of potential policy change. The effect of potential policy change was based on the average difference in the probabilities of choosing an alternative between the base case and the alternative policy scenario. As the unobserved factors in the actual market may be different from those in the DCE due to job availability and inconvenience, the ASCs were recalibrated to increase the realism of the policy simulation (Train, 2009, page 33). As recommended by (Train, 2009), an iterative process was used to recalibrate the ASCs until the estimated shares were similar to the actual shares.

Due to the interest in the role expansion of community pharmacists, our simulation focused on changes in attributes in community pharmacy and primary care settings to represent government policy change. Specifically, in the community pharmacy sector, we simulated several scenarios: (1) increase the annual salary of community pharmacy job by AUD 40,000, (2) all community pharmacy jobs were offered as a flexible work schedule, (3) all community pharmacy jobs had promotion and specialisation opportunities, and (4) all jobs had advanced roles exclusively focusing on providing professional services.

In primary care settings, we simulated several scenarios: (1) increase the annual salary of primary care settings job by AUD 40,000, (2) all primary care settings jobs had promotion and specialisation opportunities, and (3) all primary care jobs are an aged care pharmacist role.

4.3. Results

4.3.1. Sample statistics

A total of 824 respondents answered at least one choice question, producing 2434 choice observations. Incomplete responses produced missing values for some individual characteristics. Table 4.2 presents the descriptive statistics of respondents. About 64% of 654 respondents are female and 16% of 681 respondents reported having children less than 5 years old. Approximately 42% of 664 respondents reported having non-pharmacy higher education. Of 739 respondents that reported their experience, most of them (94%) have worked in the community pharmacy sector, 52% have hospital pharmacy experience, 27% have experience in government/academia and 29% have worked in a non-pharmacy related sector. 16% have worked in primary care settings and 10% in the pharmaceutical industry. Among respondents who are currently working, almost half of them were working in community pharmacy and the majority (75%) work in an urban location.

Respondent characteristics were compared to figures of the 2019 population of pharmacists registered by the Pharmacy Board of Australia in terms of age, gender, type of registration, age group, and principal place of working. Employed respondent characteristics were also compared to those of the 2017 population of employed pharmacists registered by the Pharmacy Board of Australia in terms of age, gender, Australian or international qualification, primary work settings, hours worked and whether having a second job. This comparison shows our sample is generally representative of the pharmacist population (Appendix 3).

Table 4.2: Descriptive statistics

	%	N=824*
Female	63.76	654
Having children less than 5ys	16.15	681
Having non-pharmacy higher education	41.57	664
Age		
<40 years old	57.42	667
40-60 years old	29.84	667
>60 years old	12.74	667
Current sector of employment		
Hospital pharmacy	24.1	751
Community pharmacy	51.53	751
Primary care settings	3.86	751
Pharmaceutical industry	4.66	751
Government/Academia	9.19	751
Non-pharmacy related sector	6.66	751
Current work locality		
Urban	75.2	750
Rural	22.13	750
Remote	2.67	750
Previous experience		
Hospital pharmacy	52.23	739
Community pharmacy	94.18	739
Primary care settings	16.24	739
Pharmaceutical industry	10.15	739
Government/Academia	27.74	739
Non-pharmacy related sector	29.91	739

* A total sample of 824 respondents responded to the survey and missing values exist in characteristics.

4.3.2. Forced choice

We first report the results of forced choices, which contains a larger sample (i.e. including those who are and are not in employment at the time surveyed). Table 4.3 reports the conditional logit (CL) and error component MIXL estimates using the forced-choice responses. For both models, we present the estimated coefficient and marginal rates of substitution (WTPs/WTAs) for non-monetary attributes. Both models produce similar results in terms of the number of statistically significant coefficients and the significant estimates all have expected signs. In terms of goodness-of-fit, the error component MIXL model appears to perform better, therefore we focused on its results below. A detailed comparison of goodness-of-fit statistics across different models is provided in Appendix 4.2.

The ASC for the pharmaceutical industry sector is statistically negatively significant, which suggests that it was generally less desirable to work in this sector than in community pharmacy due to unobserved factors. Similarly, the primary care setting sector is more desirable than community pharmacy as indicated by its positively significant ASC. In addition, the coefficient distributions of all ASCs have statistically significant standard deviations, suggesting there is strong preference heterogeneity in the unobserved factors on the job choice across respondents. The standard deviation parameter of the error component for all alternatives is significant, indicating significant heterogeneity of additional unobserved effects associated with each alternative.

In terms of the role attribute, our findings show PDHs have distinctive preferences for roles in each sector. In hospital pharmacy, an education or research role was more desirable than medicine dispensing or distribution roles and PDHs would be willing to forgo an annual salary of AUD 20K to have this role. Interestingly, having clinical practice roles was not significantly influential in job choice (p=0.5). In community pharmacy, providing a combination of medicine dispensing and professional services was more desirable than either only dispensing medicine or only providing professional services and PDHs would be willing to forgo an annual salary of AUD 38K to have the combination role. PDHs also significantly preferred to only provide professional services and would forgo an annual salary of AUD 20K to do so compared to only dispensing medicine. In the primary care setting, PDHs had no significant preference between working in general practice or in an aged care facility (p= 0.73). In the pharmaceutical industry, PDHs preferred research and development roles to sales or marketing roles and would forgo an annual salary of AUD63K to have the former, which is the largest marginal willingness to pay for a role attribute. PDHs also preferred medical or regulatory affairs to sales and marketing roles with the WTP value being AUD 55K. In government/academia, PDHs preferred policy-related roles to research/ teaching and would need to be compensated an annual salary of AUD 28K to undertake a research/teaching role. In the non-health-related sector, PDHs did not have a clear preference between health-related and non-health-related roles (p=0.77).

Our findings indicate that geographic location is the most important non-monetary job characteristics with the largest monetary values for WTA, apart from the pharmaceutical industry. It was least desirable to work in remote areas, except for the non-pharmacy related sector, where working in remote areas was more desirable than in rural areas. However, the MWTAs of rural and remote jobs are different in different sectors. For rural jobs, PDHs would need to be compensated an annual salary of AUD 75K in primary care settings which is the highest WTA among the sectors while the lowest WTA of AUD 17K was needed for compensation in community pharmacy. The amount of compensation increased substantially for community pharmacy and primary care settings jobs in a remote area, with the estimates being AUD 68K and AUD 85K, respectively.

Logically, PDHs significantly preferred a higher annual salary. In addition, having both promotion and specialization opportunities were significantly influential in the job choice and PDHs would be willing to forgo a different amount of annual salary to have this desirable job characteristic. Specifically, the largest WTP estimate for having both promotion and specialization opportunities was AUD 50K in the pharmaceutical industry, followed by AUD 40K in government/academia. PDHs would be willing to forgo an annual salary of AUS 31K and 26K to have this attribute in primary care settings and hospital pharmacy. PDHs were willing to forgo AUD 13K annual salary to have this attribute in community pharmacy but this was not statistically significant, thus it was not an influential factor on job choice (p=0.28). Having specialization opportunities did not significantly influence job choice in hospital, community pharmacy and primary care settings and PDHs would only be willing to forgo an annual salary of AUD 5K to have this attribute (p=0.88). Having a flexible work schedule influenced job choice and PDHs were willing to forgo AUD 15K to have this attribute.

To account for the effect of missing values, we examined the estimation results between the samples with and without missing values for key individual characteristics and found comparable results (see Appendix 4.5).

As the CL and error component MIXL models produce similar results in terms of the direction and magnitude of coefficients and welfare measures (Table 4.3), we used the CL models for our comparison of forced and unforced choice sets for the ease of estimation[6].

[6] The "unlabelled" utility functions were set up for the data analysis of the unforced choice where the current employment alternative is the same as one of the six key alternatives (e.g. current working in hospital pharmacy and a "hospital pharmacy" presented in the forced choice). As the "unlabelled" utility functions do not allow for the estimation of an error component MIXL, we opted for the CL models for the ease of estimation.

Table 4.3: Conditional logit and error component mixed logit model results

Attributes	Alternatives	Conditional logit		MIXL	
		Coeff. (SE)	MWTP ($000)	Coeff. (SE)	MWTP ($000)
ASCs					
Community pharmacy ASC	Community pharmacy	Ref		Ref	
Hospital pharmacy ASC	Hospital pharmacy	0.11		0.06	
		(0.16)		(0.27)	
S.D.	Hospital pharmacy	NA		1.48 ***	
				(0.22)	
Primary Care Setting ASC	Primary Care Setting	0.51 ***		0.78 ***	
		(0.16)		(0.25)	
S.D.	Primary Care Setting	NA		1.04 ***	
				(0.23)	
Pharmaceutical Industry ASC	Pharmaceutical Industry	-1.01 ***		-1.16 ***	
		(0.19)		(0.29)	
S.D.	Pharmaceutical Industry	NA		1.36 ***	
				(0.21)	
Government/Academia ASC	Government/Academia	0.03		0.35	
		(0.16)		(0.27)	
S.D.	Government/Academia	NA		0.75 ***	
				(0.29)	
Non-pharmacy related sector ASC	Non-pharmacy related sector	-0.16		-0.24	
		(0.17)		(0.30)	
S.D.	Non-pharmacy related sector	NA		1.37 ***	
				(0.25)	
Roles					
Dispensing/distribution role	Hospital pharmacy	Ref		Ref	
Clinical practice role	Hospital pharmacy	0.07	6	0.10	7
		(0.16)		(0.22)	
Education/Research role	Hospital pharmacy	0.23 *	19	0.30 *	20
		(0.13)		(0.18)	
Dispensing role	Community pharmacy	Ref		Ref	

Combination of dispensing and professional services role	Community pharmacy	0.39 ** (0.17)	32	0.57 *** (0.21)	38
Professional services role	Community pharmacy	0.26 * (0.15)	21	0.36 * (0.19)	24
General practice role	Primary Care Setting	Ref		Ref	
Aged care facility role	Primary Care Setting	0.02 (0.12)	1	0.05 (0.16)	3
Sales or marketing role	Pharmaceutical Industry	Ref		Ref	
Medical or Regulatory Affairs role	Pharmaceutical Industry	0.64 *** (0.15)	52	0.82 *** (0.19)	55
Research and development role	Pharmaceutical Industry	0.79 *** (0.16)	64	0.93 *** (0.19)	63
Policy related role	Government/Academia	Ref		Ref	
Research or teaching role	Government/Academia	-0.33 ** (0.13)	-27	-0.41 *** (0.15)	-28
Health-related role	Non-pharmacy related sector	Ref	Ref	Ref	Ref
Non health-related role	Non-pharmacy related sector	-0.08 (0.14)	-7	-0.06 (0.17)	-4
Flexible work schedule					
No	All sectors	Ref		Ref	
Yes	All sectors	0.18 *** (0.06)	15	0.22 *** (0.07)	15
Career Opportunities					
No opportunities	All sectors	Ref		Ref	
Both promotion and specialization opportunities	Hospital pharmacy	0.27 ** (0.13)	22	0.38 ** (0.17)	26
Both promotion and specialization opportunities	Community pharmacy	0.20 (0.14)	16	0.19 (0.17)	13
Both promotion and specialization opportunities	Primary Care Setting	0.33 ** (0.13)	27	0.46 *** (0.18)	31
Both promotion and specialization opportunities	Pharmaceutical Industry	0.61 *** (0.12)	50	0.76 *** (0.16)	51
Both promotion and specialization opportunities	Government/Academia	0.52 *** (0.12)	42	0.61 *** (0.15)	41

Both promotion and specialization opportunities	Non-pharmacy related sector	0.36 *** (0.14)	29	0.45 ** (0.18)	30
Only specialization opportunities	Hospital pharmacy/Community pharmacy/Primary care settings	0.05 (0.09)	4	0.07 (0.12)	5
Geographic location					
Urban location	All sectors	Ref		Ref	
Rural location	Hospital pharmacy	-0.41 *** (0.12)	-34	-0.54 *** (0.16)	-36
Rural location	Community pharmacy	-0.22 * (0.13)	-18	-0.25 (0.17)	-17
Rural location	Primary Care Setting	-0.95 *** (0.14)	-77	-1.12 *** (0.18)	-75
Rural location	Pharmaceutical Industry	-0.65 *** (0.12)	-52	-0.88 *** (0.16)	-59
Rural location	Government/Academia	-0.58 *** (0.12)	-47	-0.65 *** (0.14)	-44
Rural location	Non-pharmacy related sector	-0.59 *** (0.16)	-48	-0.73 *** (0.21)	-49
Remote location	Community pharmacy	-0.82 *** (0.16)	-67	-1.00 *** (0.19)	-68
Remote location	Primary Care Setting	-1.03 *** (0.14)	-84	-1.26 *** (0.18)	-85
Remote location	Non-pharmacy related sector	-0.47 *** (0.16)	-38	-0.57 *** (0.20)	-39
Annual salary ($0,000)	All sectors	0.01 *** (0.00)		0.01 *** (0.00)	
Error component for alternatives					
Standard Deviation	All sectors			1.34 *** (0.20)	
logL		-4002		-3937	
AIC		8068		7951	
BIC		8253		8171	
Observations		2434		2434	

Notes:
1. *p<0.1; **p<0.05;***p<0.0001

2. The mixed logit model (MIXL) assumes the normal distribution for all alternative specific constants.
3. Marginal willingness to pay (MWTP) values in both models are the ratio of coefficient estimates for each attribute level and the coefficient estimate of annual salary
4. Maximum simulated likelihood was undertaken with 2000 Halton draws[7] for the mixed logit model with error components.

[7] There is evidence that Halton draws which is a type of intelligent draw method requires "fewer numerous intelligent draws appear to give empirically similar results to numerically larger numbers of random draws" (Hensher, Rose, Greene, 2015, Applied Choice Analysis, page 605). Even for random draws, Train (2009) only recommends several hundred draws while Bhat (2001) recommends 1000 draws. Estimations with different numbers of Halton draws were also tested and the results were quite stable when the number of draws is at least 500. Addiitionally, a recent systematic review (Soekhai et al. 2019) shows that the average number of draws used in previous literature is only 1354 (median 1000 draws). As such, 2000 Halton draws were believed to be sufficient in our study.

4.3.3. Preference heterogeneity using observable characteristics

In terms of preference heterogeneity using observable characteristics (Appendix 4.6), we used the results from the error component MIXL model including socio-demographic characteristics from forced choices because the sample is more representative of the PDHs population (i.e. including employed, unemployed PDHs). In general, community pharmacy and the pharmaceutical industry were significantly less desirable for females than hospital pharmacy. PDHs who have obtained non-pharmacy higher education significantly preferred the government/academia sector. PDHs aged 50 years or more significantly value community pharmacy and primary setting more than hospital pharmacy. There was no statistically significant difference in preferences across employment sectors among respondents who have children less than 5 years old and among mid-career aged PDHs.

Table 4.4 summarises the results of the hypothesis tests.

Hypothesis 1: Employment choices are independent of household income.

The coefficient of the variable indicating the ratio of salary levels and household income is not statistically significant, suggesting that employment choices are independent of household income.

Hypothesis 2: Choice inertia

Table 4.4 shows that the coefficients of having past experience in a role are statistically significant in all alternatives except community pharmacy, suggesting choice inertia significantly affects the job choice of these sectors.

Hypothesis 3: Current location positively affect the preference of jobs in the same location

All alternative specific coefficients reflecting whether the geographic location of respondents' current job is the same as the level of this attribute in our DCE are significant, suggesting that PDHs tend to choose jobs in the same geographic location of their current employment.

Hypothesis 4: Female and respondents having children less than 5 years old will value flexible work schedule more highly.

The coefficients indicating the interaction between a female and having a flexible work schedule are not statistically significant, which means Australian female PDHs do not value flexible work schedule more highly than their male counterparts. The coefficients indicating the interaction between having children less than 5 years old and having a flexible work schedule are not statistically significant except for primary care settings. This could be because PDHs having children less than 5 years old value flexible work schedule more highly than those who do not only in primary care settings or allPDHs in other sectors value flexible work schedules, regardless of gender or personal situation.

Table 4.4: Hypothesis results

	Hypothesis	Alternatives	Test statistics (β/p value)	Accept/ Reject the null
H1	**Employment choices are independent of household income.**			
	Ratio of annual salary and annual household income	All sectors	-0.09 (0.15)	Accept
H2	**Choice inertia: Past experience positively influence the choice of the same sector**			
	Previous experience in Hospital pharmacy	Hospital pharmacy	0.62 *** (0.19)	Reject
	Previous experience in community pharmacy	Community pharmacy	0.23 (0.36)	Accept
	Previous experience in primary care setting	Primary Care Setting	0.37 * (0.22)	Reject
	Previous experience in pharmaceutical	Pharmaceutical Industry	1.28 *** (0.27)	Reject
	Previous experience in government/academia	Government/Academia	0.59 *** (0.19)	Reject
	Previous experience in non-pharmacy related sectors	Non-pharmacy related job	0.59 ** (0.26)	Reject
H3	**Current location positively affects the preference of jobs in the same location.**			
	Job alternative has same locations as current employment	Hospital pharmacy	0.45 ** (0.21)	Reject
	Job alternative has same locations as current employment	Community pharmacy	0.64 *** (0.21)	Reject
	Job alternative has same locations as current employment	Primary Care Setting	0.78 *** (0.19)	Reject
	Job alternative has same locations as current employment	Pharmaceutical Industry	0.60 *** (0.19)	Reject
	Job alternative has same locations as current employment	Government/Academia	0.52 *** (0.18)	Reject
	Job alternative has same locations as current employment	Non-pharmacy related job	0.67 ** (0.27)	Reject
H4	**Females value a flexible work schedule more highly than males.**			
	Int: Female & Flexibility	Hospital pharmacy	0.03 (0.27)	Accept
	Int: Female & Flexibility	Community pharmacy	0.19 (0.27)	Accept
	Int: Female & Flexibility	Primary Care Setting	0.21 (0.26)	Accept
	Int: Female & Flexibility	Pharmaceutical Industry	0.46 * (0.27)	Reject
	Int: Female & Flexibility	Government/Academia	0.03 (0.26)	Accept
	Int: Female & Flexibility	Non-pharmacy related job	0.00 (0.31)	Accept
H5	**Respondents who have kids less than 5 years old value a flexible work schedule more highly than those who do not.**			
	Int: Having kids less than 5 ys and Flexibility	Hospital pharmacy	0.33 (0.48)	Accept
	Int: Having kids less than 5 ys and Flexibility	Community pharmacy	0.03 (0.47)	Accept
	Int: Having kids less than 5 ys and Flexibility	Primary Care Setting	1.04 ** (0.50)	Reject
	Int: Having kids less than 5 ys and Flexibility	Pharmaceutical Industry	0.08 (0.47)	Accept
	Int: Having kids less than 5 ys and Flexibility	Government/Academia	0.37 (0.46)	Accept
	Int: Having kids less than 5 ys and Flexibility			

Not
es:
1. *p<0.1; **p<0.05;***p<0.0001
2. Test statistics was done using the mixed logit model results which assumes the normal distribution for all ASCs.

4.3.4. Comparison between forced and unforced choices

Using the CL model to analyse forced and unforced choices produce similar results in terms of the direction of the influence of statistically significant attribute levels on the employment choices (Table 4.5). However, the WTP values resulting from the CL models are quite different between the forced and unforced choice (using the t-test of equality for pairwise comparison in Table 4.5). Among statistically significant attribute levels from both the forced and unforced choice models, MWTP suggests differences in the level *"Education/research role"* in Hospital pharmacy and *"Medical or Regulatory Affairs role"* in Pharmaceutical Industry; flexible work schedule, *"Having both promotion and specialization opportunities"* in all sectors except Community pharmacy and Primary Care Settings; and all geographic location levels in all sectors except for Community pharmacy. Differences in the MWTP estimates were seen mainly in *"career opportunities"* and *"geographic location"* levels for all sectors except *"community pharmacy"*. In general, the MWTP values based on the unforced choice model are significantly larger in magnitude than their counterparts from the forced-choice model.

Table 4.6 presents the results of the Swait-Louviere parameter equality tests. The chi-square statistic for the test equals approximately 162. The critical chi-squared value of 63.87, based on 33 degrees of freedom and the significance level $\alpha = 0.01$, rejects the hypothesis of preference homogeneity across all variables. This result confirms the preference estimates from the two data sources are not equivalent.

Figure 4.2 indicates the relative importance of attributes in each sector using the results of the unforced and forced choices from the same sample. While salary plays the most important role in the forced choice among all sectors, the unforced choice shows the lesser impact of this attribute. Specifically, roles and career opportunities are considered more important than salary in hospital pharmacy. Geographic location is the most important attribute in community pharmacy and primary healthcare settings while career opportunities are more important than salary in the pharmaceutical industry. While the forced choice suggests career opportunities are more important than geographic location in government/academia and non-pharmacy related sectors, the unforced choice suggests the opposite.

Table 4.5: Forced and unforced choice WTPs results from CL models

Attributes	Alternatives	Forced choice		Unforced choice		
		Coeff. (SE)	MWTP ($000)	Coeff. (SE)	MWTP ($000)	Difference in MWTP†
ASCs						
Hospital pharmacy ASC	Hospital pharmacy	Ref		Ref		
Community pharmacy ASC	Community pharmacy	-0.04		-0.14		
		(0.18)		(0.17)		
Primary Care Setting ASC	Primary Care Setting	0.53 ***		0.33 *		
		(0.18)		(0.18)		
Pharmaceutical Industry ASC	Pharmaceutical Industry	-1.17 ***		-0.80 ***		
		(0.21)		(0.19)		
Government/Academia ASC	Government/Academia	0.05		-0.17		
		(0.19)		(0.17)		
Non-pharmacy related sector ASC	Non-pharmacy related sector	-0.19		-0.09		
		(0.20)		(0.18)		
Roles						
Dispensing/distribution role	Hospital pharmacy	Ref		Ref		
Clinical practice role	Hospital pharmacy	0.15	11	1.23 ***	156	145 ***
		(0.18)	(-15,37)	(0.14)	(115,198)	
Education/Research role	Hospital pharmacy	0.37 **	27	-0.14	-18	-45 *
		(0.15)	(6,49)	(0.16)	(-57,22)	
Dispensing role	Community pharmacy	Ref		Ref		
Combination of dispensing and professional services role	Community pharmacy	0.26	19	0.67 ***	85	66 **
		(0.19)	(-10,47)	(0.14)	(47,124)	
Professional services role	Community pharmacy	0.21	15	0.25	31	16
		(0.17)	(-10,41)	(0.17)	(-12,74)	
General practice role	Primary Care Setting	Ref		Ref		
Aged care facility role	Primary Care Setting	-0.10	-7	0.10	13	20
		(0.14)	(-27,12)	(0.15)	(-24,51)	
Sales or marketing role	Pharmaceutical Industry	Ref		Ref		
Medical or Regulatory Affairs role	Pharmaceutical Industry	0.73 ***	53	0.76 ***	97	44 *
		(0.16)	(29,78)	(0.16)	(56,139)	

Research and development role	Pharmaceutical Industry	0.91 *** (0.17)	67 (43,92)	0.40 ** (0.18)	51 (8,94)	-17
Policy related role	Government/Academia	Ref		Ref		Ref
Research or teaching role	Government/Academia	-0.33 ** (0.14)	-24 (-44,-4)	0.17 (0.14)	21 (-13,55)	45 **
Health-related role	Non-pharmacy related sector	Ref		Ref		
Non-health-related role	Non-pharmacy related sector	-0.08 (0.15)	-6 (-28,16)	-0.18 (0.16)	-22 (-62,17)	-16
Flexible work schedule						
No	All sectors	Ref		Ref		Ref
Yes	All sectors	0.23 *** (0.06)	17 (8,26)	0.35 *** (0.06)	44 (29,60)	27 **
Career Opportunities						
No opportunities	All sectors	Ref		Ref		Ref
Both promotion and specialization opportunities	Hospital pharmacy	0.26 * (0.15)	19 (-2,40)	1.28 *** (0.12)	162 (121,204)	143 ***
Both promotion and specialization opportunities	Community pharmacy	0.16 (0.16)	11 (-11,34)	0.02 (0.14)	3 (-32,37)	-9
Both promotion and specialization opportunities	Primary Care Setting	0.29 ** (0.14)	21 (,43)	0.34 ** (0.16)	44 (2,86)	23
Both promotion and specialization opportunities	Pharmaceutical Industry	0.65 *** (0.14)	48 (28,67)	0.96 *** (0.15)	122 (82,162)	74 **
Both promotion and specialization opportunities	Government/Academia	0.46 *** (0.14)	34 (13,54)	0.71 *** (0.14)	90 (53,128)	56 **
Both promotion and specialization opportunities	Non-pharmacy related sector	0.33 ** (0.15)	24 (2,47)	0.90 *** (0.16)	115 (72,158)	90 ***
Only specialization opportunities	Hospital pharmacy/Community pharmacy/Primary care settings	0.07 (0.10)	5 (-10,20)	0.10 (0.09)	13 (-11,37)	8
Geographic location						
Urban location	All sectors	Ref		Ref		Ref
Rural location	Hospital pharmacy	-0.35 *** (0.13)	-26 (-46,-6)	-0.86 *** (0.12)	-109 (-144,-74)	-83 ***
Rural location	Community pharmacy	-0.33 ** (0.15)	-24 (-45,-3)	-0.15 (0.12)	-19 (-48,10)	05

Rural location	Primary Care Setting	-0.86 ***	-63	-0.92 ***	-117	-54 *
		(0.15)	(-98,-43)	(0.18)	(-220,-108)	
Rural location	Pharmaceutical Industry	-0.70 ***	-51	-0.90 ***	-114	-63 **
		(0.14)	(-88,-38)	(0.14)	(-168,-66)	
Rural location	Government/Academia	-0.63 ***	-47	-0.64 ***	-81	-34
		(0.14)	(-96,-45)	(0.14)	(-252,-128)	
Rural location	Non-pharmacy related sector	-0.55 ***	-41	-0.57 ***	-73	-32
		(0.17)	(-72,-30)	(0.18)	(-155,-73)	
Remote location	Community pharmacy	-0.96 ***	-70	-1.29 ***	-164	-94 ***
		(0.18)	(-67,-26)	(0.21)	(-117,-45)	
Remote location	Primary Care Setting	-0.96 ***	-71	-1.49 ***	-190	-119 ***
		(0.15)	(-66,-16)	(0.20)	(-119,-27)	
Remote location	Non-pharmacy related sector	-0.40 **	-29	-1.33 ***	-169	-140 ***
		(0.18)	(-55,-3)	(0.21)	(-229,-110)	
Annual salary ($0,000)	All sectors	0.01 ***		0.01 ***		
		(0.00)		(0.00)		
logL		-3257		-3407		
AIC		6578		6878		
BIC		6757		7057		
Observations		1992		1992		

Notes:

1. *p<0.1; **p<0.05;***p<0.0001
2. †: z test = $\frac{(\beta1-\ \beta2)}{\sqrt{\sqrt{SE_1^2+SE_1^2}}}$
3. Marginal willingness to pay (MWTP) values in both models are the ratio of coefficient estimates for each attribute levels and the coefficient estimate of annual salary. Confidence intervals are in the brackets.

Table 4.6: Swait-Louviere testing of parameter equality

Models	Log likelihood	K	Chi-square value	Degree of freedom (β +1)	Critical value (95%)	Result
Forced choice	-3257	32				
Unforced choice	-3407	32				
Joint forced and unforced	-6745	32	162	33	63.87	Reject

Notes:
1. Hypothesis: β= βf= βu
2. Likelihood ratio test: -2[Lμ - (L1 + L2)]
3. K: number of parameters

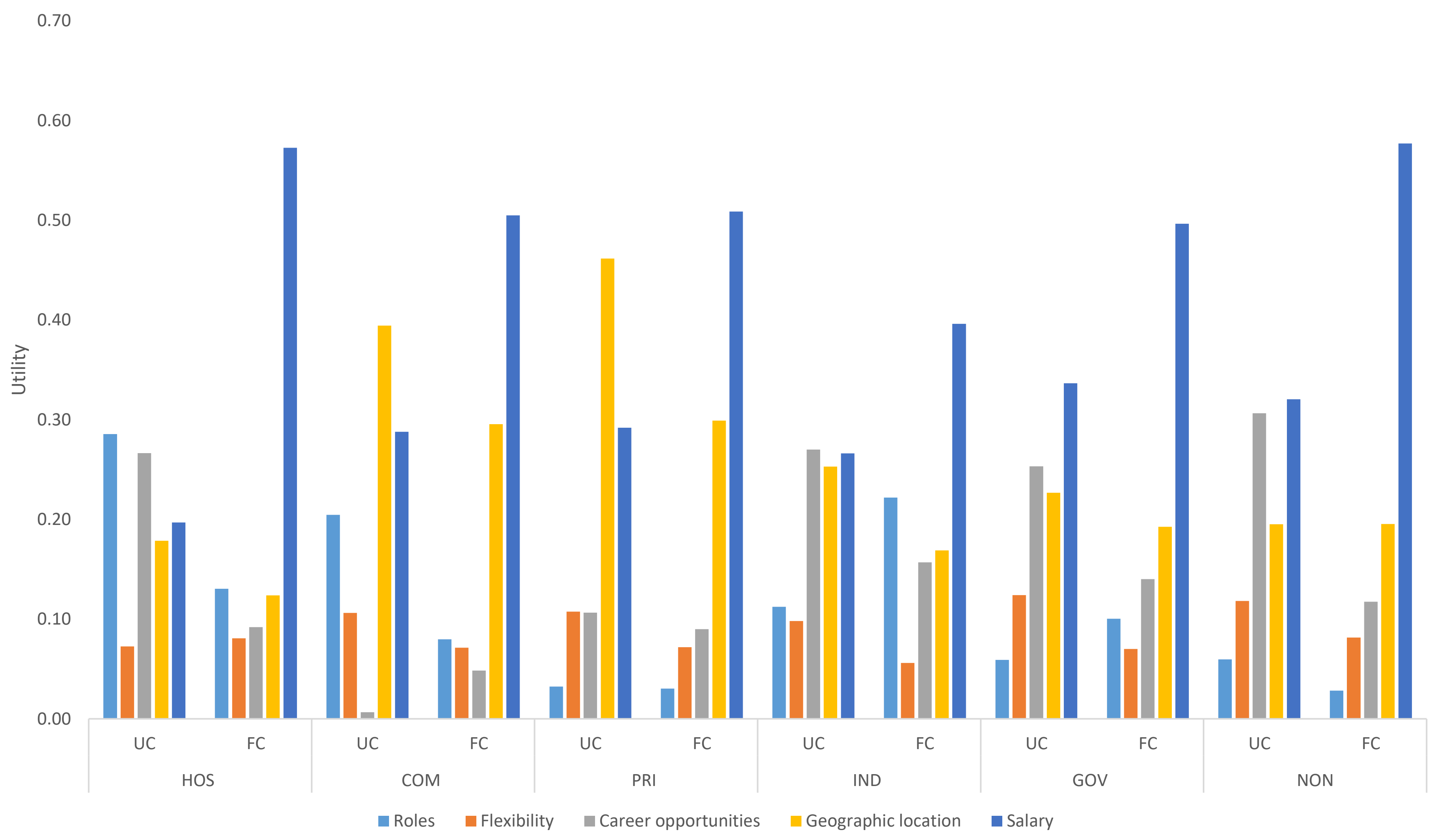

Figure 4.2: Relative importance of attributes in each sectors using the unforced and forced choice (Note: UC: Unforced choice; FC: Forced choice)

4.3.5. Predictive analysis

We used coefficient estimates from the MIXL model using both unforced and forced choices for the policy simulation. The base case was based on the revealed preference data from the PAMELA survey on the corresponding variables (Table 4.7). In terms of annual salary, PDHs earn on average $97,000 in hospital pharmacy, $74,000 in community pharmacy, $76,000 pharmacists working primary care settings, $125,000 in pharmaceutical industry, $96,000 in government/industry and $107,000 in non-pharmacy related sector. For the simulation, we rounded these numbers to $100,000 for hospital pharmacy and government/academia, $75,000 for both community pharmacy and primary care settings, $125,000 for industry, and $105,000 for non-pharmacy-related sector. In the base case, other attribute levels were based on the most common values in each alternative. We specified the role level as clinical practice in a hospital, a combination of dispensing and professional services in community pharmacy, general practice role in primary care settings, medical or regulatory affairs role in the industry, research/teaching role in government/academia and a health-related role in non-pharmacy-related sector. In terms of work schedule, hospital and community pharmacies do not offer flexibility while the rest do. In terms of career development, community pharmacy has no opportunities for promotion, primary care setting has specialisation opportunities while the rest have both specialisation and promotion opportunities. All jobs are in urban areas.

Figure 4.3 shows the predicted percentage of uptake of community pharmacy jobs due to changes in some attributes of this sector. The forced choice results predict that increasing the annual salary by $40,000 the community pharmacy has the largest influence on choice probabilities while offering the chance to have a flexible work schedule is expected to increase the uptake of community pharmacy the most, based on the unforced choice results. If all community pharmacy jobs offer promotion and specialisation opportunities or roles focused on professional service, the forced choice results also predict higher uptake of community pharmacy roles compared to the unforced choice.

Figure 4.4 presents the predicted proportion of PDHs choosing primary care settings based on changes in attributes in this sector. Similar to Figure 4, the forced choice results predict that increasing annual salary by $40,000 will be most influential on choice probabilities while unforced choice results indicate the chance to have a flexible work schedule is most important. In contrast to the results in Figure 4, the forced choice predicts lower uptakes of primary healthcare jobs if offering promotion and specialisation opportunities or all having aged care pharmacists roles.

Table 4.7: Mean values of PAMELA variables used for the base case in policy simulations

	Hospital pharmacy	Community pharmacy	Primary Care Setting	Pharmaceutical Industry	Government/Academia	Non-pharmacy related job
Clinical practice role	**75.27**					
Combination of dispensing and professional services role		**73.44**				
General practice role			**68.75**			
Medical or Regulatory Affairs role				**56.76**		
Research or teaching role					**66.67**	
Health-related role						**69.35**
No flexible work schedule	**84.5**	**59.91**				
Having flexible work schedule			**73.53**	**83.33**	**72.97**	**68.97**
No opportunities		**69.7**				
Specialization opportunities only			**52.94**			
Promotion and specialization opportunities	**55**			**72.22**	**50**	**50**
Urban location	**85.28**	**66.28**	**75.76**	**94.44**	**87.84**	**86.21**
Rural location	11.17	31.4	21.21	2.78	10.81	12.07
Remote location	3.55	2.33	3.03	2.78	1.35	1.72
Annual salary ($0,000)	97	74	76	125	96	107

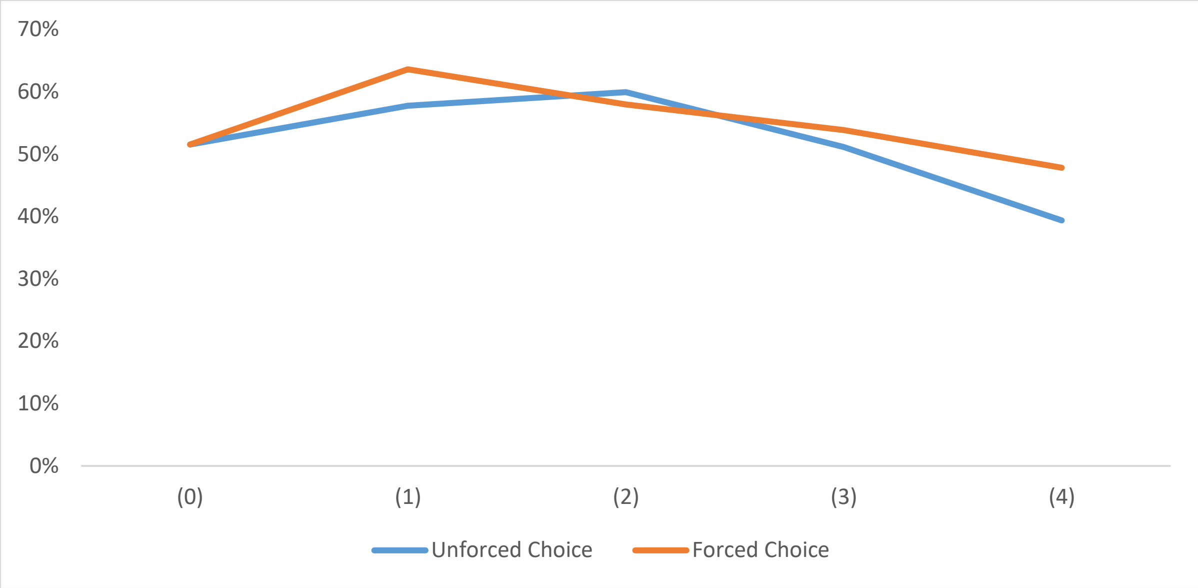

Figure 4.3: Predictive analysis using the results of unforced and forced choice in Community pharmacy.
Notes: (0) Calibrated base case, (1) Increased salary by $40K, (2) Flexible work schedule, (3) Having promotion and specialisation opportunities, (4) Advanced role

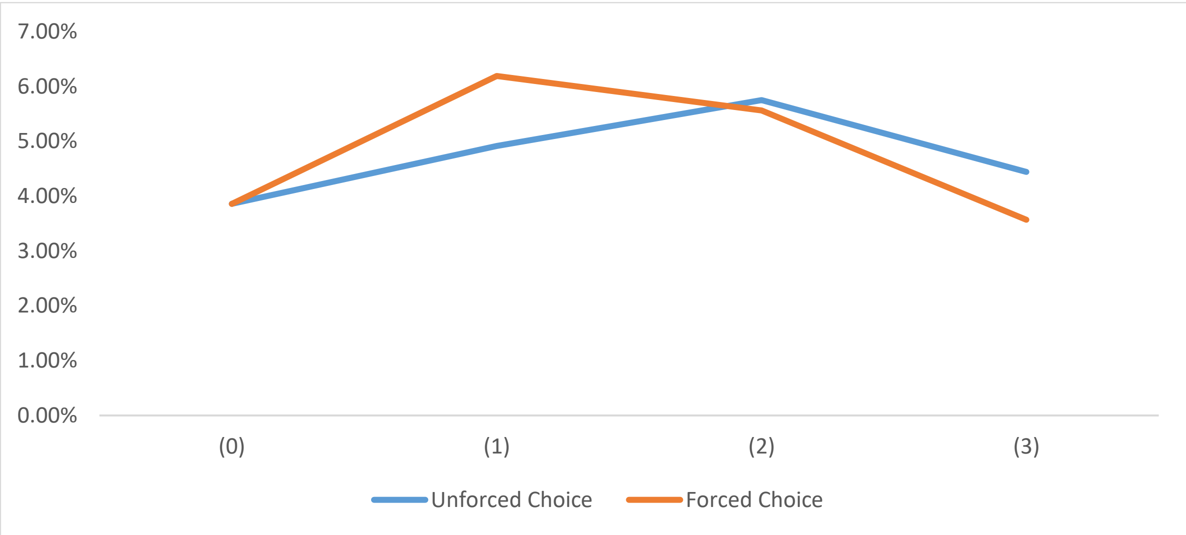

Figure 4.4: Predictive analysis using the results of unforced and forced choice in Primary care settings.
Notes: (0) Calibrated base case, (1) Increased salary by $40K, (2) More career development, (3) Aged care role

4.4. Discussion

This is the first study to provide a comprehensive picture of what PDHs value when making choices between various employment options in the whole labour market. We addressed our research aims by developing a carefully crafted discrete choice experiment that results in high quality, relevant choice data. One important finding was that intrinsic characteristics have a significant impact on the employment choices of Australian PDHs. Specifically, PDHs prefer roles that are involved with professional services in community pharmacy sectors. This shows general support for policy reforms regarding the role expansion of community pharmacists. Recognition for work in the forms of promotion and/or specialisation opportunities are highly regarded across sectors. In terms of extrinsic characteristics, our results also show that annual salary appeared to be one of the most important factors across all alternatives. Another important finding is that our econometric modelling identified preference heterogeneity in unobserved factors associated with all job alternatives. This suggests that policy reform on one or many job attributes in one sector would lead to different substitution patterns between sectors, which confirmed that our whole-of-system approach was appropriate.

In terms of employment sector preferences, we found Australian PDHs have clear preferences among six key employment alternatives. Specifically, our findings show that working in the pharmaceutical industry was the least preferred option. This finding aligns with the job preferences of pharmacy students in Saudi Arabia (Alhomoud et al., 2019) but contrasts with previous studies which found a preference for pharmaceutical industry roles among Japanese pharmacy students (Nakagomi et al., 2016), or non-pharmacy-related careers among pharmacy students in Malaysia (Hasan et al., 2010). We also found that community pharmacy was one of the least preferred sectors. While this finding aligns with findings from Japan (Nakagomi et al., 2016) and Saudi Arabia (Alhomoud et al., 2019), it contrasts with previous studies. For example, community pharmacy was reported as one of the most preferred job options for pharmacy students in Nigeria (Ubaka et al., 2013), in the US (Savage et al., 2009), and in Malaysia (Hasan et al., 2010). Given these studies focused on student samples who are more likely to have no working experience, the stability and validity of the employment preferences results may not hold once the study sample enters the job market. Conversely, our population of interest are PDHs who have faced a real-life job choice decision at least once after graduation. Thus, their preferences may be different from those of pharmacy students. Furthermore, the differences in employment preferences across countries could be attributable to the systematic differences in the health care system and the contribution of pharmacists in each country. In fact, Australian pharmacists are considered to undertake more advanced roles than their counterparts in Japan, Malaysia, South Africa but more restricted roles compared to US pharmacists.

Most importantly, our findings provide evidence to support the role expansion of community pharmacists from the supply-side perspective. Specifically, PDHs preferred to have advanced roles rather than medicine dispensing roles and would be willing to forgo at least 36% or 25% of their current annual salary (mean annual salary of AUD 85,227) to be able to do a combination of medicine dispensing and professional services or exclusively provide professional services, respectively. This shows the current PDH population value opportunities for intellectual fulfilment highly and there was a willingness for expanded roles for community pharmacists. In terms of the role expansion of pharmacists beyond community pharmacy, there is strong evidence of the preference of PDHs for primary care settings compared to community pharmacy (i.e. the reference alternative), indicating a general willingness for role expansion beyond traditional community pharmacies. The indifference of preferences between general practice and aged care facilities in primary healthcare settings indicates the potential for role substitution between the two.

In terms of opportunities for advancement, we found that intrinsic characteristics have a varied influence on choice probabilities for different alternatives. Interestingly, either having a promotion and/or specialisation opportunities were not desirable to attract PDHs to community pharmacy with both levels of this attribute producing the least utility among the five attributes (and being statistically insignificant). By contrast, there were strong preferences for having both promotion and specialisation opportunities in hospital and primary care settings, suggesting that this incentive could be used to attract more PDHs to these two sectors. Furthermore, career development opportunities were significantly desirable in the pharmaceutical industry, government/academia and non-pharmacy related sector with the highest WTPs values (AUD49,585, $41,996 and AUD29,489 respectively). This may suggest one of the reasons why PDHs choose to work in non-clinical sectors.

Another important non-monetary factor that has a strong influence on employment preferences is geographic location. A consistent pattern was found across sectors where urban areas were preferable to rural ones, which in turn were preferable to remote ones. An exception was observed in non-pharmacy-related sector where PDHs preferred remote areas to rural ones. Our findings are generally in line with the literature of other health professions in Australia (Scott et al., 2013) and internationally (Lagarde et al., 2013).

One important policy implication is that our results suggest several ways to address the long-standing issue of the mal-distribution of pharmacists in rural and remote areas. In the community pharmacy sector, we show that PDHs would be willing to forgo an annual salary of AUD 25,080 and AUD 40,923 to have some degree of role expansion while would only need to be compensated an annual salary of AUD 16,556 to work in rural areas. While the amount of compensation is higher in remote areas (WTA=$67,275), offering advanced roles for PDHs may reduce the amount of financial reward needed to attract pharmacists to remote areas. As a number of pharmacists-led interventions provide evidence of benefits to public health (Milosavljevic et al., 2018; Newman et al., 2020; Saba et al., 2014; Steed et al., 2019), the role expansion of pharmacists could contribute to better public health as well as potentially help address the shortage of pharmacists in rural and remote areas. In contrast, PDHs would require at least 90% of their mean annual salary ($74,771/$85,000) for compensation to work in rural and remote primary care settings. Compared to the WTP values of AUD 23,748 (2011 value) for GPs to work in remote areas (an inland town with a population < 5,000) (Scott et al., 2013), our substantial amounts of WTAs suggests that the government would need large financial rewards to encourage PDHs to take up primary care setting jobs in these areas.

Our hypothesis testing revealed more detail about the employment preferences of Australian PDHs. First, we found that employment choices are independent of household income while the current geographic location positively influenced the job choice in the same location. These findings suggest that employment choices are a joint household choice in terms of geographic location rather than monetary factors. This means other factors such as employment opportunities for their partners, social networks etc. in their current geographic location may have an influence on their employment choices. Secondly, choice inertia testing shows that state-dependence does exist congruent with the literature where a similar population of interest was examined (Cline, 2000). This suggests that past choices influence preferences and may reduce the extent to which established pharmacists are willing to consider positions in other industries. As such, early exposure to various sectors such as internship programs etc. may help increase the uptakes of jobs, especially in primary care settings where the number of jobs is still small. Thirdly, in contrast to international literature (Ubaka et al., 2013), Australian female PDHs do not value a flexible work schedule more highly than males. This could represent a distinctive preference of Australian PDHs or could be due to the different population of interest or different health system structures. Furthermore, the DCE results have shown that not only the preferences of pharmacists for different aspects of work, but also the impact of individual characteristics vary significantly across sectors, which supports our choice to use a labelled experiment.

Another contribution of our study is the analysis of unforced choice sets where we incorporated the current employment alternative and its attributes. We found that the two forced and unforced choice datasets produce different preference estimates and welfare measures. However, the direction of attributes' influence on the employment choices are consistent and as expected. We also found that the relative importance of attributes across alternatives and predictive uptakes differs between the forced and unforced sets. Our results align with the literature, which also reports the difference in preference estimates between forced and unforced choices (Dhar & Simonson, 2003; Kallas & Gil José, 2012; Veldwijk et al., 2014). However, previous studies in which the unforced choice sets consist of all alternatives of the forced choice sets and an additional opt-out alternative have made the complexity of the forced and unforced choices sets incomparable. As an increase in choice complexity is expected to increase the choice of opt-out alternatives (Boxall et al., 2009), the differences between the forced and unforced choice set in these studies may be confounded with the effect of choice complexity. We, on the other hand, utilised the dual-response format (Brazell et al., 2006) to disengage the effect of choice complexity with the effect of including an opt-out option. Another study (Penn et al., 2019) has used the dual response format to compare forced and unforced choice sets. However, their opt-out alternative (*"would you really go to the beach you chose above")* leads to a comparison between two different samples who chose the opt-out option or not. By contrast, one advantage of our study is that we can retrieve attribute levels of the opt-out alternative, hence making our forced and unforced choice sets more comparable among the same respondents. We also utilise a homogenous sample of highly educated respondents and a familiar choice situation (i.e. job choices) to reduce fatigue effects. We add to the existing literature which underscores the importance of presenting unforced choices in DCEs to better represent the real market situation and reduce the hypothetical bias (Boxall et al., 2009; Ryan & Skåtun, 2004), confirming that the forced and unforced choice sets produce different preference estimates even when controlling for choice complexity. We recommend future research adopt the dual format response for opt-out/status quo questions to preserve the level of choice complexity between forced and unforced choices.

Our study has a number of strengths. The rich information of the relative strength of PDHs' preferences for different aspects of job opportunities also provides the opportunity to predict the effect of implementing potential policy scenarios. The DCE design was undertaken using best practice guidelines, with alternatives and attributes carefully developed using appropriate qualitative methods. Methods included semi-structured interviews to build the attribute lists and forming alternative labels, and think-aloud techniques and a debriefing questionnaire to test the comprehensibility of the DCE. We also adopted a labelled experiment to mimic employment options available on the real job market, hence increasing the realism of the choice tasks and disengaging the effects of key job attributes from the sector labels (Mandeville et al., 2014).

This study also has some limitations. Firstly, even though the use of a labelled experiment in this study is appropriate, it does not eliminate the possibility that respondents may use the labels to refer to omitted variables and these inferences are in turn related to the random errors, presenting an endogeneity issue. This omitted variable bias may manifest alternative specific attributes effects on some alternatives and/or violate the Independence of Irrelevant

Alternatives property of the MNL model (Louviere et al., 2000b). However, given the market of pharmacists is well established and any policy change in the near future are hardly expected to fundamentally change how pharmacists perceive each sector in the near future, unobserved sources of utility related to alternative labels are unlikely to change. That means any omitted variables can be captured by alternative specific constant and consequently, parameters estimates have validity in the prediction of the job market. In addition, our econometric modelling has further accounted for these factors by using the error component mixed logit model, allowing flexible substitution patterns between alternatives. Secondly, this study had limited recruitment channels. Due to the difficulties in respondent recruitment, we used various sources of respondents including the alumni databases, the membership databases and media sources. Although we utilised different avenues of recruitment (social media, pharmacy schools etc.), selection bias may be an additional issue in this study.

4.5. Conclusion

Using DCE methods, we have provided new insights regarding the employment decisions of PDHs. We have provided evidence of the willingness of the current PDHs population to work in a co-location primary care setting, as well as in an expanded role within the community pharmacy setting. We suggest that implementing the role expansion of community pharmacists in rural and remote areas may mitigate the shortage of pharmacists in these areas, and should be further considered as a policy option. Doing so would potentially save government funding if financial rewards are used to support a better geographic distribution of pharmacists. We have also provided some insights about what attracts PDHs to clinical and non-clinical roles, which could be crucial in health workforce planning. Lastly, from a methodological perspective, we recommend future research adopt the dual format response for opt-out/status quo questions to preserve the level of choice complexity between forced and unforced choice.

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Chapter 5 A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment

Abstract

Background: In a labelled discrete choice experiment, presenting many alternatives may increase the cognitive burden on respondents, undermining the validity of preference estimates. One approach to reducing the complexity of large labelled choice tasks is to use a partial choice set design (PCSD) in which a subset of alternatives is shown in each choice task in contrast to a traditional full choice set design (FCSD) where all alternatives are shown.

Objectives: Using data from a nationwide survey exploring employment preferences of Australian pharmacy degree holders, this paper aimed to: (1) explore if the PCSD reduces cognitive burden; (2) test the convergent validity of the PCSD and FCSD; and (3) explore respondents' preferences between the FCSD and PCSD.

Methods: Labelled utility functions were rewritten into a single generic utility function using label dummy variables to generate a PCSD with 3 alternatives shown in each choice task (out of 6). 790 respondents completed both PCSD and FCSD in the experiment and were randomly presented with a block of three FCSD tasks and a block of four PCSD tasks. The PSCD's impact on choice variances was investigated using a heteroscedastic conditional logit (HCL) model. To formally test the equality of willingness-to-pay (WTP) estimates from FCSD and PCSD data sources, 95% confidence interval (CI) for the difference of WTP means obtained from WTP-space mixed logit (MIXL) models were computed and compared. An MNL model was used in conjunction with respondents' qualitative responses to understand factors influencing respondents' preferences for design types.

Results: We found that the PCSD appeared to produce more consistent choices than the FCSD, which support the hypothesis that it reduced the cognitive burden. Based on testing the overlapping 95% CI of WTP distributions, both FCSD and PCSD produce similar preference estimates for attribute levels, however, the FSCD induces larger preference heterogeneity around alternative labels than the PSCD. The PSCD was preferred by females and when phones were used to answer the survey.

Conclusion: Our findings suggest that the PCSD can reduce the cognitive burden and also satisfies the convergent validity test as it produces similar preference estimates to those from the FCSD for attribute levels. However, we found the FCSD induce larger preference heterogeneity around alternative labels, perhaps largely because choice task complexity leads to heterogeneity in process strategies. We suggest the use of PCSDs for surveys accessible by mobile phone as this approach was explicitly preferred by respondents and easy to read on the screen of a mobile phone. We urge more research on process heterogeneity to gain insights into the comparison of preference estimates for alternative labels in FCSDs and PCSDs.

Key words: Partial choice set designs, Availability designs, choice task complexity, discrete choice experiments, Stated Preference, Labelled experiments

5.1. Introduction

Discrete choice experiments (DCEs) have been widely used as a means to evaluate the trade-offs agents (i.e., individuals or group representatives) make among competing options. Continuity, one of the axioms about individuals' preferences implies that one uses compensatory decision-making processes and that one evaluates all alternatives/attributes in a choice task (Lancsar & Louviere, 2006). Violations of this assumption may threaten the validity of preference estimates and the accuracy of the statistical inferences. Hess et al. (2010) provides a detailed discussion about the effects of some behaviour traits violating the assumption of evaluating all alternatives/attributes in a choice task — such as non-trading, lexicographic and inconsistent behaviours — on the results and interpretation of choice models. One of the factors that may increase the incidence of these behaviour traits is choice task complexity, such that respondents may struggle to absorb all information and adopt decision-making heuristics to simplify the choice tasks, producing potentially unreliable results (Swait & Adamowicz, 2001a, 2001b). As such, strategies to make choice tasks manageable for respondents are an area of active research.

An experimental design usually consists of a series of choice tasks, each of which consists of a finite number of alternatives, which are described by a number of attribute levels. In each choice task, respondents are asked to specify their most preferred alternative. All responses are then pooled to estimate preference and welfare estimates such as willingness to pay for each of the design attributes (Hensher & Rose, 2007). While unlabelled experiments involve the presentation of generic alternatives (e.g. option A, option B, etc.), labelled experiments typically present all possible alternatives whose labels convey a particular meaning (e.g. bus, train, and car).

In labelled experiments, to satisfy the utility maximizing decision rules, all relevant alternatives must be presented to respondents (Hensher, 2015). As a result, some experiments may involve a large set of alternatives, for example, from six alternative modes of transportation (Hensher & Rose, 2007) up to 19 viewing entertainment alternatives (McKenzie et al., 2019). However, it is reported that large sets of alternatives are more likely to increase the cognitive burden, which may introduce more choice errors. Indeed, using entropy- a measure to simultaneously capture design dimensions, Swait and Adamowicz (2001a) provide evidence that an increase in the amount of information (e.g. the number of alternatives/attributes) significantly increase choice variances. DeShazo and Fermo (2002) reported that increasing the number of alternatives between two and seven in an unlabelled DCE context induces a higher amount of choice variance. They also observed a U-shaped relationship between the number of alternatives and the variance of the error term. This indicates that choice variance reduces as alternatives increase until a particular number of alternatives after which the choice variance significantly increases. In their application, they found the optimal number of alternatives is around three. By systematically changing the design dimensions of an unlabelled DCE in terms of the number of alternatives and attributes, Caussade et al. (2005) also confirmed the U-shaped relationship between the number of alternatives and choice variance and suggest four alternatives being the optimal number of alternatives. As these studies on the impact of choice complexity on the choice variance only focus on unlabelled experiments with generic attributes, the impact of the increase in the number of labelled alternatives with alternative specific attributes and attribute levels remains unknown.

There are two possible solutions to reduce choice task complexity associated with a large set of alternatives in labelled experiments. One typical strategy involves a subjective refinement to include a manageable set of alternatives. However, the removal of relevant information would cause serious consequences on the preference estimates, thus Hensher (2014) argued that the inclusion of relevant alternatives/attributes is more important than choice task complexity (Hensher, 2014). Another strategy is to keep all alternatives but to show a subset of alternatives in each choice task, which is referred to by Bliemer et al. (2018) as a partial choice set design (PCSD), also called an availability design (Rose et al., 2013). In contrast, designs that present all alternatives in each choice task can be referred to as full choice set designs (FCSDs).

Although there have been some applications of the PSCDs in the recent labelled DCE literature (Franceschinis et al., 2016; Franceschinis et al., 2017; McKenzie et al., 2019), the impact of the PCSD with fewer alternatives on preference estimates and respondents' cognitive burden in comparison with a conventional FCSD remains an empirical question. To ensure the appropriate use of the PCSD and the reliability of its results for policy implications, it is crucial to examine the validity of this preference elicitation design including how accurately the PCSDs measure the preference outcomes and how generalizable the PCSDs' results are to other settings (Janssen et al., 2017). Among a number of validity tests proposed to use in DCEs (Janssen et al., 2017), within the scope of our application, we focus on convergent validity which is the most commonly used validity assessment procedure in the literature (Janssen et al., 2017), especially when revealed preference data are not available. The PCSDs satisfy the convergent validity test if the results of the PCSDs are consistent with other experimental designs that measure the same construct from the same population (Bishop & Boyle, 2019; Janssen et al., 2017). Furthermore, the use of PCSDs is mainly motivated by the objective of reducing respondents' cognitive burden, making their choice tasks more consistent. By pooling PSCD and FCSD data we are able to directly explore whether PSCD had a higher choice consistency, represented by smaller choice variances, as compared to the FCSD; the design with a better consistency will reduce the standard errors of preference and welfare estimates, thus increasing the precision of parameter estimates (DeShazo & Fermo, 2002). Lastly, while the use of any preference elicitation design directly affects respondents' answers, the choice of design type is usually an ex ante decision of researchers without respondents' input. However, understanding respondents' preferences for design types inevitably sheds light on how to better use a particular design in appropriate contexts to increase the validity of the preference estimates.

The objectives of this paper are threefold. Firstly, within the scope of our application, we aim to investigate the convergent validity of the PSCD and the FCSD. As such, we test whether the PCSD and the conventional FCSD provide statistically insignificantly different preference estimates (adjusted for possible scale effects). We do so by manipulating a within-respondent comparison where the two designs are simultaneously embedded in a nationwide survey to elicit job preferences from the population of Australian pharmacy degree holders. Secondly, we aim to test if the PSCD can achieve its purpose of reducing the cognitive burden by comparing the choice variances of unobserved factors resulted from the PCSD choices with those from the FCSD ones. Lastly, we explore respondents' preferences between these two design types.

This study fills a gap in the literature on the influence of choice set size by pioneering the comparison of designs with a different number of alternatives in the context of labelled DCEs. We do so by exploiting a carefully crafted within-respondent comparison of the PCSD and FCSD designs to ensure control of unobserved factors. Between-respondents comparisons, which were largely adopted in previous studies of design comparisons (Krucien et al., 2019; Louviere, Islam, et al., 2008; Viney et al., 2005), may potentially influence the results to some extent due to differences in unobserved characteristics or variations in the quality of data collection among different groups of respondents. By contrast, our unique within-comparison setting eliminates factors such as respondents' constraints and expectations, past or current job experience; and also generate a consistent data collection process across two designs. Furthermore, we implemented a series of randomisation in terms of the order of choice tasks, alternatives and design types to minimise any unobserved effects that potentially arise. We also utilise a highly educated sample to reduce the chance of any difference being attributed to cognitive ability. Lastly, we utilise a rich dataset that contains information on respondents' preferences for the design types and their underlying reasons for their preference which provide great insights into our design comparison qualitatively.

The remainder of the chapter is structured as follows. In Section 2, we provide a brief literature review of the PCSDs. Section 3 introduces the experimental design, choice task assignment, data collection, and our modelling approach while section 4 reports the results. We discuss the implications of our findings and make suggestions for future research in Section 5 and conclude in Section 6.

5.2. A brief review of PCSDs

Although the idea of presenting a smaller number of alternatives in a choices task dates back to the early 1980s (Anderson & Wiley, 1992; Batsell & Polking, 1985; Raghovarao & Wiley, 1986), the literature on PCSD is limited in its development and application. Some early studies used the PCSD presenting labels as choice alternatives without attributes (e.g. only labels *"Coke"* or *"Pepsi"* were presented) to estimate the availability effects due to the presence or absence of alternatives. For example, Batsell and Polking (1985) proposed models to account for availability effects based on a subset of two alternatives from a total of five snack brands.

Anderson and Wiley (1992) proposed a theory and procedure to generate designs to account for availability effects in which choice sets include alternative labels only, reasoning that the cross effect of the availability of alternatives may have two directions. In the case of substitute alternatives, the presence of an alternative may reduce the utility of the other, resulting a negative availability effect. If two alternatives are complimentary, the presence of an alternative may increase the utility of the other, resulting in a positive availability effect. The presence of these availability effects shows that the independence of irrelevant alternatives (IIA) assumption may be violated.

Later studies began to test choice sets with the presence or absence of alternative labels and their attributes (e.g. Coke or Pepsi with their price attribute). Lazari and Anderson (1994) used a catalogue of PCSDs from twelve alternatives in which attribute levels varied (e.g. price attributes had two to eight levels) to estimate the availability and attribute cross effects. Louviere et al. (2000a) provided a detailed discussion on the generation of PCSDs from an orthogonal master design to ensure that the appearance of each alternative is independent and balanced in the master and sub-set designs.

Except for the limited literature discussed above, methodological research on PCSDs was overlooked for the last decades until recently, when Rose et al. (2013) extended the PCSD generation method of Louviere et al. (2000a). They focused on two directions of the PCSD being either (i) fixed choice set size (i.e. having the same number of alternatives per choice tasks but alternatives are varying) or (ii) variable choice set sizes (i.e. the number of alternatives are varying per choice task). Their strategy for generating a PCSD is sequential. Firstly, a master design that indicates which subset of alternatives is shown in each choice task is generated. Secondly, a sub-design indicates which attribute levels appear in each of the included alternatives (derived from the master design). Several approaches such as a Balanced Incomplete Block Design (BIBD) or an efficient design can be used to generate the master design. BIBD master designs only exist for very specific combinations of the number of alternatives and number of choices tasks, limiting their practical applicability. Efficient master designs can be generated for any combination of alternatives and the number of choice tasks, although generating such designs in practice is hampered by the lack of readily available algorithms (Bliemer et al., 2018).

There are a few previous applications of the methods proposed by Rose et al. (2013) to generate an efficient PCSD. In the area of environmental economics (Franceschinis et al., 2016; Franceschinis et al., 2017), the authors generated a fixed choice set of three alternatives derived from a FCSD of six alternatives. Interestingly, they applied three approaches to generate the PCSD, namely (i) orthogonal designs, (ii) D-efficient designs, and (iii) serial designs. In the latter, they updated the design for each subsequent respondent using priors based on data from previous respondents as proposed by (Bliemer & Rose, 2010). They adopted a mixed logit model for analysis to account for preference heterogeneity. Unfortunately, they did not provide any comparison of these three design types on the performance of preference estimates. In the area of the media industry, McKenzie et al. (2019) generated an orthogonal master design including ten alternatives from which an efficient PCSD having five alternatives per choice task was derived. They reported the cross attribute marginal effects resulting from a mixed logit model for analysis.

Recently, Bliemer et al. (2018) expanded previous work by proposing two new methods that can utilize existing algorithms in current DCE design software such as Ngene software (Rose JM & MCJ.). One of their proposed methods, the external candidate set method, is advantageous in that it can be used for any combination of the number of alternatives; choice set size and number of choice tasks. However, a key disadvantage of this method is the requirement of extensive input into this algorithm, namely a large candidate set with feasible choice tasks. Another method, referred to as the labelled-to-unlabelled experiment reformulation method, is to rewrite utility functions for labelled alternatives into a single generic utility function using a dummy variable for the label and indicator functions to link attributes to labelled alternatives (Bliemer et al., 2018). While this method leads to a fairly complex generic utility function (in conjunction with attribute level constraints), it does not require any further input such that PCSDs can be conveniently produced using existing DCE design soft wares.

Furthermore, in contrast to other PCSD generation methods in which each labelled alternative can appear at most once, within each choice task, this method relaxes this constraint to allow a labelled alternative to appear more than once in a choice task We adopted the latter method to produce a PCSD and investigate the validity of this PCSD form in our application. A unique feature of the PCSD used in this study is that each alternative label can appear more than once in a choice task (e.g., among three alternatives, two jobs were about *"Community Pharmacy"* and one was about *"Hospital pharmacy"*). This is especially useful in cases where some alternatives dominate others. Our previous qualitative study and the literature indicate that employment sectors (i.e. alternative labels) have a strong influence on the employment preferences of pharmacy degree holders. This may increase the possibility that the traditional use of labelled experiments could result in biased estimates as the effect of the labels may distort respondents' choice outcome where they pick their preferred choice solely based on the labels and do not trade between attributes (de Bekker-Grob et al., 2010). The presentation of the same alternatives in choice tasks with different attribute levels in our application could avoid this behaviour and increase the validity of preference results. In addition, the unique setting of our PCSD allows alternative labels to vary in different choice tasks also helps avoid inertia in the choice-making behaviour of respondents (e.g. reducing the behaviour of always choosing *"hospital pharmacy"* because in some choice tasks *"hospital pharmacy"* does not appear).

5.3. Methods

5.3.1. Experimental Design

The study was undertaken in the context of a larger study, which explored the employment preferences of Pharmacy Degree Holders in Australia. The experiment included six alternatives, each of which were described by five attributes. Each attribute has two to four levels. Table 5.1 presents all alternatives and attributes used in the experiment.

Table 5.1: Alternative, attributes and alternative-specific attribute levels

Alternative/Attributes	Hospital pharmacy (HOS)	Community pharmacy (COM)	Primary healthcare setting (PRI)	Pharmaceutical Industry (IND)	Government /Academia (GOV)	Non-pharmacy related sector (NON)
Your role (RL)	Medicine dispensing/ distribution*	Mainly dispensing*	General practice Pharmacist*	Sales or Marketing*	Policy-related role*	Health-related role*
	Clinical practice (RL_H1)	Providing professional services (RL_C1)	Aged care pharmacist (RL_P1)	Medical or Regulatory Affairs (RL_I1)	Teaching or Research (RL_G1)	Non-health-related role (RL_N1)
	Clinical research/Education (RL_H2)	Combination of dispensing and providing professional services (RLC2)		Research and Development (RL_I2)		
Flexible work schedule (FL)	No*	No*	No*	No*	No*	No*
	Yes (FL)	Yes (FL)	Yes (FL)	Yes (FL)	Yes (FL)	Yes (FL)
Career opportunities (CR)	None*	None*	None*	None*	None*	None*
	Promotion and specialization (CR_1)	Promotion and specialization (CR_1)	Promotion and specialization (CR_1)	Promotion and specialization (CR_1)	Promotion and specialization (CR_1)	Promotion and specialization (CR_1)
	Specialization only (CR_2)	Specialization only (CR_2)	Specialization only (CR_2)			
Geographic location (LO)	Urban*	Urban*	Urban*	Urban*	Urban*	Urban*
	Rural (LO_1)	Rural (LO_1)	Rural (LO_1)	Rural (LO_1)	Rural (LO_1)	Rural (LO_1)
		Remote (LO_2)	Remote (LO_2)			Remote (LO_2)
Annual salary (SA)	$60,000 (SA)	$60,000 (SA_C)	$60,000 (SA)	$100,000 (SA)	$60,000 (SA)	$60,000 (SA)
	$100,000	$100,000	$100,000	$140,000	$100,000	$100,000
	$140,000	$140,000	$140,000	$180,000	$140,000	$140,000
	$180,000	$180,000	$180,000	$220,000	$180,000	$180,000

Notes: 1. *Base level
2. All categorical variables are dummy-coded

Both FCSD and PCSD are based on the random utility framework in which U_{nsj} is the marginal utility associated with alternative j in choice set s for respondent n, which consists of an observed component of utility, V_{nsj} and an unobserved component ε_{nsj}. The observed component of utility V_{nsj} consists of a vector of attributes levels $\mathbf{x}_{js} = [x_{jsk}]$ associated with different attributes, $k = 1, 2, \ldots, K$, represents each alternative j. β_{j0} is the alternative-specific constant (ASC) of alternative j, normalized to zero for the first alternative and β_{jk} are alternative-specific parameters of alternative j.

$$U_{nsj} = V_{nsj} + \varepsilon_{nsj} = \beta_{j0} + \sum_{k=1}^{K} x_{jsk}\beta_{jk} \quad \text{for all } n = 1, \ldots, N;\ s = 1, 2, 3;\ j = 1, \ldots, 6 \quad (1)$$

Labelled utility functions were rewritten into a single generic utility function using a label dummy variable and indicator functions to generate the PCSD, see Bliemer et al. (2018). Let $\delta_{js}^{(i)}$ be an indicator variable that equals 1 if alternative j in choice task s is of label i (where 1 = *HOS*, 2 = *COM*, 3 = *PRI*, 4 = *IND*, 5 = *GOV*, and 6 = *NON*), and *0* otherwise. The utility function in Eqn. (1) can be rewritten as:

$$V_{nsj} = \sum_{i=2}^{6} \beta_{j0}\delta_{sj}^{(i)} + \sum_{i=1}^{6}\sum_{k=1}^{K} \beta_{ik}x_{isk}\delta_{sj}^{(i)}, \quad \text{for all } n = 1, \ldots, N;\ s = 4, 5, 6, 7;\ j = 1, \ldots, J, \qquad (3)$$

where $2 \leq J \leq 6$ is the number of alternatives to be shown in the PCSD. In this study, we choose $J = 3$, i.e., we show only 3 out of 6 alternatives in choice tasks. The first term in Eqn. (1) is equivalent to a dummy coded variable for job type where label 1 (*HOS*) is the base, in other words, a new qualitative attribute *JOBTYPE* is added to the utility function. All alternative specific attributes enter the generic utility function as interaction terms with the indicator variable, which keeps or drops the attribute depending on the job type of the alternative.

To derive the PCSD, the values of the job type (indicator) variable were translated back to the alternative labels. For example, if $\delta_{js}^{(1)} = 1$, which means that *JOBTYPE* is *HOS*, then labelled alternative hospital pharmacy is shown and only attributes levels for hospital pharmacy are displayed; if $\delta_{js}^{(2)} = 1$, which means that *JOBTYPE* is *COM*, then labelled alternative community pharmacy is shown together with its relevant attribute levels.

The mathematic reformulation of the utility functions allows the two designs to have the same attribute levels, which were coded in the same way (i.e. continuous or dummy coded attributes). The efficient design method with zero priors was used to generate a FCSD and a PCSD using Ngene software (ChoiceMetrics Ltd.) (For details of Ngene coding, see Appendix 2).

5.3.2. Choice task assignment

Based on the number of attributes, attribute levels and the number of alternatives, each design needs to satisfy the minimum required a number of choice tasks to ensure sufficient degrees of freedom for model estimation. This means the FCSD (having 44 parameters and 6 alternatives) and PCSD (having 44 parameters and 3 alternatives) require 9 and 22 choice tasks, respectively (Hensher et al., 2015c). As such, we chose 18 and 24 choice tasks for FCSD and PCSD, respectively, resulting in six blocks per design. To set up a within-respondent comparison, each respondent completed one block of three FCSD choice tasks and one block of four PCSD choice tasks, successively.

To minimise the response order effects, we randomised the order of design types (whether FCSD or PCSD appears first). Choice tasks within each block and block within designs were randomised across the respondents. This process results in 72 versions (6 FCSD blocks x 6

PCSD blocks x 2) of the choice questionnaire. These 72 versions were randomly allocated to respondents in a way that each version was ensured to appear an equal number of times in each round of allocation. That is, if a respondent fails to complete a choice question version, that particular version of the choice question is allocated to the next respondent. Another round of allocation does not occur until all versions have been assigned.

To account for the alternative-order effect in the FCSD, we randomised the alternative order in the second half of the sample (416/790) while the first 314 respondents have the same alternative order (i.e. HOS, COM, PRI, IND, GOV, NON). The design nature of PCSDs allows the alternative order to vary depending on the appearance of labels.

5.3.3. Data collection and Ethics

The DCEs were embedded in the Pharmacy in Australia: Measuring Employment, Labour Preferences and Activities (PAMELA) survey. The questionnaire was built in the SurveyEngine online platform (https://surveyengine.com/). The data collection was conducted via a number of recruitment channels between October 2019 and January 2020 (Appendix 1). All pharmacy degree holders with a Bachelor or a Master of Pharmacy degree obtained from an Australian academic institution or internationally trained pharmacists currently working in Australia were invited to participate in the survey.

The choice context was set up by asking respondents to imagine they were looking for a job, and were then presented with a series of competing job alternatives. Respondents were asked to choose their preferred job in each choice set. Figure 5.1 and Figure 5.2 present examples of a FCSD and a PCSD choice question.

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Clinical practice	Mainly providing professional services	Aged/residential care pharmacists	Sales or Marketing	Policy related	Non-health related
Flexible work schedule	Yes	Yes	No	No	No	No
Career opportunities	Specialization only	Promotion and specialization	None	Promotion and specialization	None	Promotion and specialization
Geographic location	Rural	Remote	Rural	Rural	Urban	Urban
Annual Salary	$180,000	$180,000	$180,000	$180,000	$100,000	$180,000
Which job would you choose?	✓					

Compare your chosen job to your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**
✓	

Activat

Figure 5.1: An example of the FCSD choice tasks

	Community pharmacy	Community pharmacy	Pharmaceutical industry
Your role	Combination of dispensing and professional services	Mainly professional services	Sales or Marketing
Flexible work schedule	Yes	No	Yes
Career opportunities	Promotion and specialisation	Specialisation only	Promotion and specialisation
Geographic location	Remote	Urban	Urban
Annual salary	$180,000	$60,000	$100,000
Which job would you prefer?			

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	My current job

Figure 5.2: An example of the PCSD choice tasks

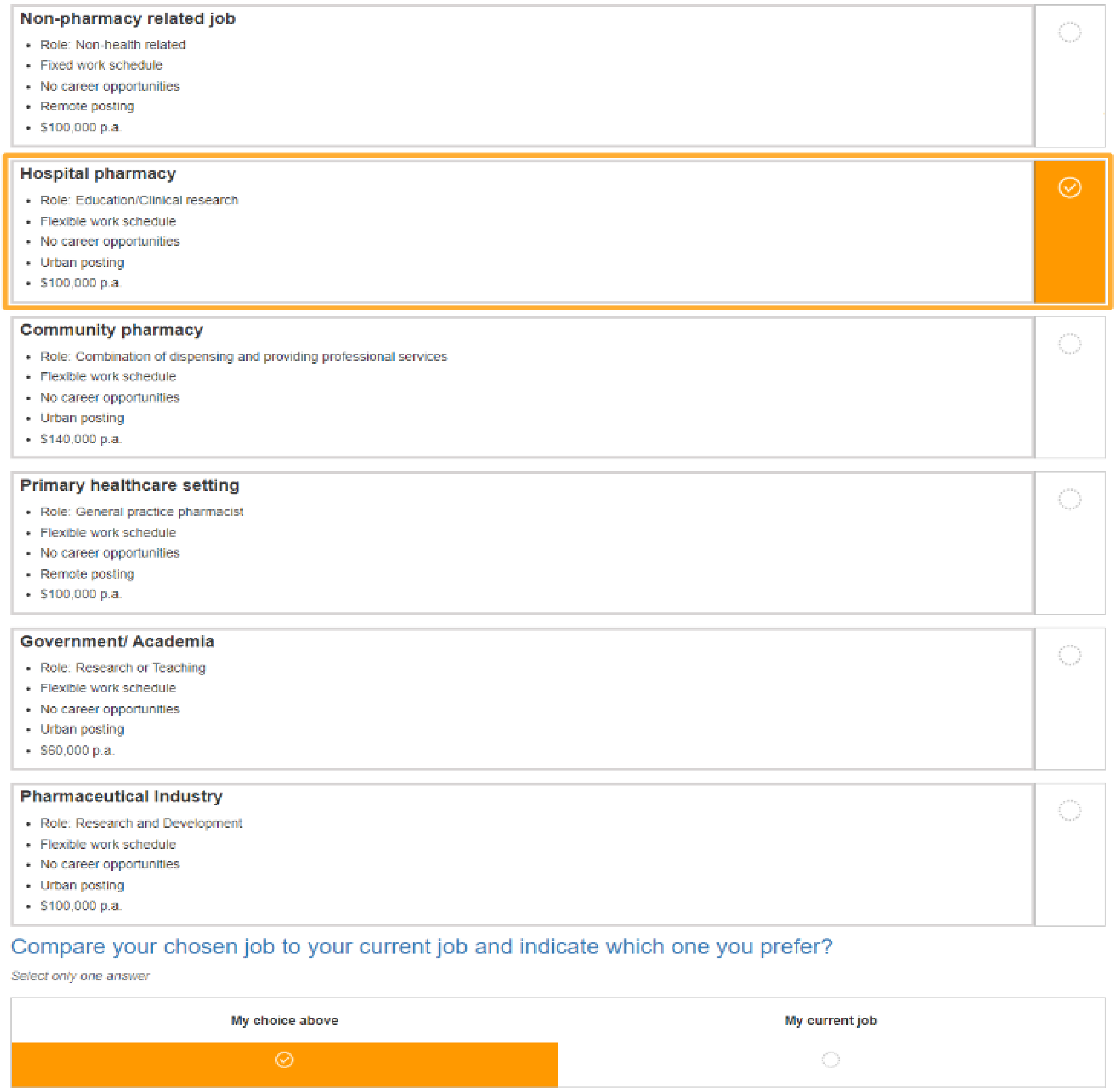

Figure 5.3: An example of the FCSD choice tasks presented on mobile phones

5.3.4. Research question and analysis

Stata software was used for descriptive statistics. The data analysis was conducted using NLOGIT software. The distribution simulations were based on 1000 Halton draws.

5.3.4.1. Question 1: Does the PCSD produce smaller error variances than the FCSD?

We aimed to investigate the performance of the PCSD on reducing the cognitive burden by comparing the choice variances produced from choice tasks of the PCSD and FCSD. Swait and

Adamowicz (Swait & Adamowicz, 2001b) suggested choice variances could be influenced by the choice complexity, the effort applied by respondents and the ability of respondents to make complex decisions. We adopted the heteroscedastic conditional logit (HCL) (Bech et al., 2011; DeShazo & Fermo, 2002; Swait & Adamowicz, 2001b) in which the scale is a function of observed factors influencing the choice variances. The HCL model is described below:

$$U_{nsj} = \lambda V_{nsj} + \varepsilon_{nsj} = \lambda\beta_{j0} + \sum_{k=1}^{K} x_{jsk}\lambda\beta_{jk} + \varepsilon_{nsj} \text{ for all } n = 1,\ldots,N;\ s = 1,2,3;\ j = 0,\ldots,5 \qquad (1)$$

$$\varepsilon_{nsj} \sim iid\ EV1 \quad (2)$$

$$\lambda_{nsj} = \frac{\pi}{\sigma_\varepsilon\sqrt{6}} \qquad (3)$$

$$V_{nsj} = \sum_{j=1}^{J} \gamma_{j0} JOBTYPE_{js} + \gamma_{nj1}RL_{njs} + \gamma_{n2}FL_{njs} + \gamma_{n3}CR_{njs} + \gamma_{n4}LOC_{njs} + \beta_{n5}SA_{njs} + \varepsilon_{nsj} \quad (4)$$ [8]

$$\lambda_{nsj} = \exp(\alpha_1 *Design + \alpha_2 *Choice\ order + \alpha_3 *Choice\ order\ squared + \alpha_4 *Design\ order + \alpha_5 *response\ time + \alpha_6 *phone + \alpha_7 *A4060 + \alpha_8 *AMT60 + \alpha_9 *Female) \quad (5)$$

For the analysis, the *"SA"* attribute was coded as a continuous variable. All other attributes were dummy-coded with the first level of each attribute (in Table 1) used as the reference category. Label-specific coefficients were estimated for the *"RL"* attribute while generic coefficients were estimated for the rest of the attributes and attribute levels (*"LO"*, *"SA"*, *"FL"*, *"CR"*).

Facing an increased choice complexity, respondents may have higher error rates, inconsistent answers which are equivalent to higher choice variance or lower scale (Bech et al., 2011). The HCL model accounts for the differences in the choice variances across individuals, hence

[8] The traditional data analysis of labelled DCEs often use labelled utility functions (i.e. one utility function is specified a distinctive alternative in a choice task). This approach would not be applicable for the data analysis of the PCSD of which choice tasks have two duplicate alternatives (e.g. two HOS alternatives). As a result, for data analysis, we specified utility functions in the fashion of unlabelled experiments for both FSCD and PCSD as similarly described in Section 2.2. Doing so enables the pooling of two data sources and the comparison of the two designs. (For details of model setup, see Appendix 2)

reflecting the observed choice variability or the choice consistency across individuals. The factors influencing cognitive burden included the choice complexity (i.e. number of alternatives), the effort applied by respondents, measured by time spent on the choice questions, and the ability of respondents to make complex choices, proxied by age are parameterised through the scale function. Besides, we also control for gender. These parameters in the scale function indicate the direction and statistical significance of the influence of these characteristics on the scale factor. A comparison of the coefficients' magnitude also reveals the relative impact of these characteristics on the scale.

Firstly, we used a dummy variable that indicates the type of design presented to respondents (the FCSD being the reference level) to understand the effect of the FSCD and PCSD on choice consistency. Increasing the number of alternatives may induce two opposite effects on choice variances, which in turn represent choice consistency (DeShazo & Fermo, 2002). One effect, which is referred to as choice complexity, may increase the choice variances. This occurs either when intensive information choice tasks increase choice errors due to an increase of cognitive burden or respondents may adopt simplifying information process strategies (heuristics) to avoid making complex choices. Another effect, which is referred to as matching, may reduce choice variances. This means a broader range of options may match respondents' preferences more accurately. Respondents can make more consistent choices if offered a wider range of choices than a limited one. Thus, a wider range of alternatives may potentially increase the choice consistency and lower the choice variances. The significance and sign of λ_1 can provide evidence of the PCSD's effect on choice variances. If $\lambda_1 > 0$, this suggests the PCSD increases the scale (i.e. reduce the choice variances), thus it reduces the cognitive burden due to the reduction in choice complexity. If $\lambda_1 < 0$, this suggests the FCSD decreases the choice variances as the matching effect outweighs the choice complexity.

To ensure the precise capture of the design effects, in the second model specification, we also controlled for other factors that potentially influence the choice variances. One such factor is the sequence of the choices respondents are faced during the DCE task. In our model, the choice task sequence (i.e. from first to seventh in order) was included as both a linear effect and a squared effect to take into account the possibility of a U-shaped effect. This can capture the learning effect at the beginning and fatigue effects at the end of the questionnaire (Swait & Adamowicz, 2001b). That means respondents may apply a higher level of effort and learn as they answer the first choice tasks up to a certain point after which the cognitive demand is overwhelming or fatigue sets in, leading to higher error rates. As such, we expected that $\lambda_2 \leq 0$ and $\lambda_3 \geq 0$.

As we randomly assigned whether the FSCD or PCSD appear first to respondents, we controlled for the order of the design type in the scale function by using a dummy variable with FSCD appearing first as the reference level. We hypothesised that if the PSCD appears first, the increasing fatigue combined with the change of a higher number of alternatives in the FSCD appearing latter could make respondents rely on simplifying information process strategies, hence making choices that are more random. In contrast, if the FSCD appears first, the effort respondents put in at the beginning of the choice tasks help reduce the choice variances. The PSCD appears with less information, which could offset the increase in fatigue, thus respondents may make a more consistent choice than in the FSCD. As such, we expect the choice variances to be higher when PSCD appears first and that $\lambda_4 \leq 0$.

The time spent on the first choice question is controlled as a proxy for the effort respondents make in the choice task (Bech et al., 2011). We hypothesized that the more time respondents spent on the first question, the lower variance they would have throughout all choice tasks due to a learning effect. As such, we expect $\lambda_5 \geq 0$. We also controlled for the types of device respondents use to answer the questionnaire (using non-mobile phone being the reference level). The DCE tasks were presented differently for mobile phone and non-mobile phone devices, which may affect the choice variances differently. However, mobile phones usually have smaller screens that respondents have to scroll down/zoom in to view the complete choice tasks, we hypothesised that using mobile phones may increase the choice variances, thus $\lambda 6 \leq 0$. We controlled for age as a proxy for the ability to make a complex decision.

5.3.4.2. Question 2: Whether the PCSD and FCSD produce statistically indistinguishable preference estimates

As preference estimates and scale factor are confounded in preference space models, we opted to use models in willingness-to-pay (WTP) space to compare WTP values between the two models. The conditional logit model (CL) in WTP space was first estimated. However, the CL assumes the independence of irrelevant alternatives (IIA) and implies constant share elasticities, which may be restrictive in our PCSD with the presence or absence of particular alternatives. We then applied the mixed logit model (MIXL) model with all ASCs being random parameters which can account for unobserved preference heterogeneity around the alternative labels and the panel nature of the data (Train & Weeks, 2005). The Akaike information criterion (AIC) (Akaike, 1974) and Bayesian information criterion (BIC) (Schwarz, 1978) are reported.

The utility function in WTP space is shown in Eq.5 where γ_{njk} are WTPs associated with each attribute and β_{n5} is the parameter estimates of SA attribute in preference space.

$$U_{nsj} = \beta_{n5}\left(\sum_{j=1}^{J} \gamma_{j0} JOBTYPE_{js} + \gamma_{nj1} RL_{njs} + \gamma_{n2} FL_{njs} + \gamma_{n3} CR_{njs} + \gamma_{n4} LO_{njs} + SA_{njs} \right) + \varepsilon_{nsj} \quad (6)$$

To formally test the equality of WTP estimates from FCSD and PCSD data sources, 95% confidence interval for the difference of WTP means obtained from two designs were computed. For ASCs which have random parameters in the MIXL, we used the Delta method (Bliemer & Rose, 2013) to compute the standard error of the WTP distributions, which were then used in the computation of the 95% confidence interval for the difference of WTP means. The confidence interval for difference including zero means the two datasets produce similar welfare *(WTP)* estimates for a particular attribute level. We also compare the relative importance order of attributes which was based on the ranking of the ratio of the differences in the utility between the highest and lowest levels of a single attribute and the sum of the differences in the utility of all attributes (Malhotra, 2017).

5.3.4.3. Question 3: What factors affect respondents' preferences between two design types?

After completing the DCEs, respondents were asked *"Which type of scenarios did you prefer?"* They indicated their preferences by choosing either *"six choice question"* (i.e. FCSD), *"three choice question"* (i.e. PCSD), or *"no preference"*. A multinomial logit model (MNL) was used to explore the factors associated with the preference, in which the *"no preference"* was used as the base level.

We explored in the MNL a number of design-related factors, including the order of design, device types used to answer the survey, the perceived difficulty of choice questions of each design type; and individual factors. The perceived difficulty of each design type was derived from the question *"How difficult was it to make a choice in the first three (four) presented scenarios that contained six (three) different jobs?"* after each a block of both FCSD and PCSD types. Answers on five Likert scales from *"very difficult"* to *"very easy"* were reported.

Dummy variables were created with two levels: *"easy"* if respondents indicate the choice tasks are *"easy"*, or *"very easy"*; *"not easy"* (reference level) otherwise.

We further explored the factors affecting the perceived difficulty of each design type. Using the variables indicating whether respondents found it easy to answer FSCD (or PSCD) choice as binary dependent variables, we run a logit model on individual factors, the type of device used to answer the survey, and the total time used to answer the whole choice tasks.

The PAMELA survey also collected detailed information from respondents on the reasons for their design preference by the question *"Why did you prefer questions that presented 6 jobs? / 3 jobs?"* We categorised and summarised the reasons respondents stated for their preferences for a particular design type.

5.4. Results

5.4.1. Sample statistics

We have 824 and 823 respondents answering at least one choice question of the FCSD and PCSD, respectively. To enable the within-respondent comparison of the two designs, we included 790 respondents who completed all three and four choice sets for the FCSD and PCSD respectively. These result in 2,370 and 3,160 choice observations for the full and partial choice set design, providing 5,530 observations. Characteristics of respondents are presented in Table 5.2. The majority of the respondent is female, ages less than 40 years, working and earning an average income of $85K. Most respondents used a desktop to complete the survey and the mean duration time spent on seven choice questions was 5 minutes.

Table 5.2: Characteristics of respondents, n=790[9]

	%/Mean	n =790
Female	63.76	654
Age (years)		667
<40	57.42	383
40-60	29.84	199
>60	12.74	85
Annual income (Australian dollar)	$85,474	664
Device used		761
Mobile phone	21.55	164
Tablet	4.33	33
Desktop	74.11	564
Total time (DCE section only) (minutes)	4.59	783
Employment status		790
Working	91	715
Not working	7	53
Retired	3	22

5.4.2. Question 1: Does the PCSD produce smaller error variances than the FCSD?

Table 5.3 reports the results of the CL and HCL model described above. The HCL models which account for scale heterogeneity produce similar results to the CL model in terms of the signs and statistical significance of parameters estimates of attribute levels. Both HCL models show that the scale factor is significant, suggesting that scale variation is a significant source of heterogeneity.

The HCL1 model which only accounts for scale differences between data sources produces similar results of the estimated scale factor parameter corresponding to the data-specific scale differences to the HCL2 which account for some individual and design-related effects on scale heterogeneity. On average, the estimated parameter of PCSD-specific scale heterogeneity is 0.16 with a t-statistic of 5.09 indicates that the PCSD had significantly lower variance than the FCSD. The observed greater variance in unobserved heterogeneity in the FCSD data compared to the PCSD data may represent the possibility of greater uncertainty in respondents' responses

[9] A comparison between the included and whole sample was included in Appendix 5.3, Table A5.4

due to the FCSD choice complexity. Thus, this finding suggests that the cognitive burden associated with the choice complexity outweighs the matching effect.

Further investigating the effects of individual and design-related factors on scale heterogeneity reveals some interesting findings. The choice task order was significantly negatively related to the scale (λ_2 = -0.06, t= -3.34). The quadratic term was appropriate in the parameterisation of the scale factor, with a coefficient of 0.01– and t-statistic of 4.52. The quadratic relationship between the choice task number and the variance suggests that the choice variance first decreases, then increases with the number of choice tasks. This finding shows that learning effects and fatigue effects may have an influential role in the scale factor, consistent with previous literature (Train, 2009). In addition, the estimated scale factor associated with the order of design type is -0.06 with a t-statistic of -4.57. This suggests that when the PCSD was presented before the FCSD, the scale was significantly reduced (i.e. variances were increased).

The more time respondents spent on the first choice task, the lower variance they would have throughout all choice tasks (λ_4 = 0.01, t= 5.89). Interestingly, using mobile phones reduced the choice variance (λ_5 = 0.36, t= 28.65). In terms of individual factors, the older respondents are, the more uncertain their choices are (λ_7 = -0.36 t=-20.72 and λ_8 = -0.95, t=-18.96). Female made more uncertain choices than male (λ_9 = -0.1, t= -8.23).

Table 5.3: Results of heteroscedastic conditional logit models

		CL		HCL	
Attributes	*Alternatives*	β	S.E	β	S.E
ASC (COM)	Community pharmacy	Ref		Ref	
ASC (HOS)	Hospital pharmacy	0.20 *	0.11	0.54 **	0.18
ASC (PRI)	Primary Care Setting	0.51 ***	0.10	0.86 ***	0.15
ASC (IND)	Pharmaceutical Industry	-0.66 ***	0.12	-0.52 **	0.18
ASC (GOV)	Government/Academia	0.19 *	0.10	0.54 **	0.17
ASC (NON)	Non-pharmacy related sector	0.14	0.11	0.35 **	0.17
Dispensing/distribution role (RL_H0)	Hospital pharmacy	Ref		Ref	
Clinical practice role (RL_H1)	Hospital pharmacy	0.04	0.11	0.03	0.15
Education/Research role (RL_H2)	Hospital pharmacy	0.23 **	0.09	0.28 **	0.14
Dispensing role (RL_C0)	Community pharmacy	Ref		Ref	
Combination of dispensing and professional services role (RL_C1)	Community pharmacy	0.28 **	0.12	0.48 **	0.18
Professional services role (RL_C2)	Community pharmacy	0.27 **	0.12	0.39 *	0.21
General practice role (RL_P0)	Primary Care Setting	Ref		Ref	
Aged care facility role (RL_P1)	Primary Care Setting	-0.28 ***	0.08	-0.34 **	0.11
Sales or marketing role (RL_I0)	Pharmaceutical Industry	Ref		Ref	
Medical or Regulatory Affairs role (RL_I1)	Pharmaceutical Industry	0.52 ***	0.11	0.79 ***	0.14
Research and development role (RL_I2)	Pharmaceutical Industry	0.58 ***	0.10	0.89 ***	0.13
Policy related role (RL_G0)	Government/Academia	Ref		Ref	
Research or teaching role (RL_G1)	Government/Academia	-0.20 **	0.08	-0.24 **	0.11
Health-related role (RL_N0)	Non-pharmacy related sector	Ref		Ref	
Non health related role (RL_N1)	Non-pharmacy related sector	-0.35 ***	0.09	-0.33 **	0.13
No flexible work schedule (NO-FL)	All sectors	Ref		Ref	
Having flexible work schedule (FL)	All sectors	0.21 ***	0.04	0.28 ***	0.05
No opportunities (CR0)	All sectors	Ref		Ref	
Promotion and specialization opportunities (CR1)	All sectors	0.38 ***	0.04	0.53 ***	0.06
Specialization opportunities only (CR2)	Hospital pharmacy/Community pharmacy/Primary care settings	0.17 **	0.06	0.29 **	0.09
Urban location (LO0)	All sectors	Ref		Ref	
Rural location (LO1)	All sectors	-0.68 ***	0.04	-0.96 ***	0.07
Remote location (LO2)	All sectors	-0.92 ***	0.06	-1.36 ***	0.10
Annual salary ($0,000) (SA)	All sectors	0.01 ***	0.00	0.02 ***	0.00
Scale				0.64 ***	
Scale function					
Female				-0.10 ***	0.01
40-60 years				-0.37 ***	0.02
>69 years				-0.95 ***	0.05
PSCD (FSCD: referent)				0.16 ***	0.03
Response time of first choice				0.01 ***	0.00
Using mobile phone				0.35 ***	0.01

Order of design (Reference: FCSD appears first)		-0.06 ***	0.01
Choice task number		-0.05 **	0.02
Choice task number squared		0.01 ***	0.00
Respondents†	790	647	
Observations	5530	4487	
Log likelihood	-6777	-5404	
Notes: 1. Number of observations in HCL is smaller than in CL due to missing values 2. *p<0.1; **p<0.05;***p<0.0001			

5.4.3. Question 2: Whether the PCSD and FCSD produce statistically indistinguishable preference estimates?

Both WTP-space CL and WTP-space MIXL models produce similar results in terms of the number of statistically significant coefficients and all the significant estimates have expected signs. In terms of goodness-of-fit, the WTP-space MIXL model has lower AIC and BIC, therefore the following discussion is based on MIXL estimates (Table 5.4) whilst the CL estimates and the formal test using CL results can be found in Appendix 5.6.)[10].

All statically significant attribute levels have the same sign in both designs except for ASCs in which the FCSD produced negative WTPs values for *"Hospital pharmacy"* (HOS) and *"Non-pharmacy related sector"* (NON) while the PCSD produced the opposite. However, the 95% CI of WTP distributions which take into account both the means and standard deviations of random ASCs are overlapping, indicating WTPs for alternative labels are statically similar. Furthermore, the PCSD also produced more (at 5%) statistically significant ASCs (5 out of 5 ASCs) than the FCSD (3 out of 5 ASCs). The standard deviations of ASCs in the FCSD are larger and more statistically significant than those in PCSD, suggesting preference heterogeneity is more significant in the FCSD. It is possible that preference heterogeneity observed in the FCSD may be due to heterogeneity in the processing strategies and not just reflecting the preference heterogeneity. Respondents could be overwhelmed with more

[10] An investigation on the alternative orders in the second half of the sample does not show a significant alternative order effect. Results were reported in Appendix 5.7.

complex choice tasks in the FCSDs and had adopted alternative non-attendance and focused on their more preferred alternative labels. On the other hand, the lower level of choice task complexity in the PCSD may be cognitively affordable for respondents, thus they are less likely to simplify choice tasks.

Indeed, visualising WTP parameter estimates on a radar chart shows that both FCSD and PCSD produced similar preference estimates for all attribute levels except for ASCs (Figure 5.4). Interestingly, the *"flexible work schedule"* (FL), *"career opportunities"* (CR) and *"geographic location"* (LO) attributes appear to have strikingly similar patterns of WTP values. Furthermore, the relative importance of attributes and alternatives is remarkably similar across the designs, in which the order of preference appears to be (from most preferred to least preferred): salary, job type, role, location, career progression and flexible work schedule (Figure 5.5).

Using the confidence interval for the difference between two confidence intervals, we show that the FCSD and PCSD produced different WTP values for only three out of 20 variables (i.e. the confidence intervals do not include "0"). Of them, "rural" (LO1) is statistically significant in both designs while "Aged care pharmacist" (RL_P1) and "Non-health related role" (RL_N1) are only statistically significant in the PCSD. The interesting finding that 17 of 20 variables (85%) have statistically similar WTP values from both designs indicates that both designs generally produce similar preference estimates.

Table 5.4: WTP space MIXL results with ASCs being random parameters from FCSD and PCSD

Attributes	Alternatives	FCSD		PCSD		95% CI for the difference of means
		MWTP (SE)	95% CI	MWTP (SE)	95% CI	
ASC (COM)	Community pharmacy	Ref	Ref	Ref	Ref	Ref
ASC (HOS) ‡	Hospital pharmacy	-31.86 ** (12.26)	(-230.42,168.15)	46.36 ** (14.29)	(-62.23,152.11)	(-150,302)
ASC (PRI) ‡	Primary Care Setting	4.29 (9.66)	(-144.42,150.19)	55.93 *** (12.26)	(-447.70,561.93)	(-472,580)
ASC (IND) ‡	Pharmaceutical Industry	-102.81 *** (12.36)	(-288.31,77.61)	-34.46 ** (14.99)	(-279.41,200.55)	(-236,368)
ASC (GOV) ‡	Government/Academia	-17.97 (10.96)	(-184.21,143.40)	27.47 ** (13.02)	(-104.75,164.11)	(-162,262)
ASC (NON) ‡	Non-pharmacy related sector	-41.78 ** (12.76)	(-233.46,143.26)	29.06 ** (12.88)	(-49.98,114.79)	(-128,283)
Dispensing/distribution role (RL_H0)	Hospital pharmacy	Ref	Ref	Ref	Ref	Ref
Clinical practice role (RL_H1)	Hospital pharmacy	7.50 (13.75)	(-19.45,34.45)	11.43 (14.12)	(-16.25,39.11)	(-35,43)
Education/Research role (RL_H2)	Hospital pharmacy	22.38 ** (11.20)	(0.43,44.33)	10.40 (11.42)	(-11.97,32.77)	(-43,19)
Dispensing role (RL_C0)	Community pharmacy	Ref	Ref	Ref	Ref	Ref
Combination of dispensing and professional services role (RL_C1)	Community pharmacy	24.69 ** (12.05)	(1.08,48.30)	20.53 (14.27)	(-7.44,48.50)	(-41,32)
Professional services role (RL_C2)	Community pharmacy	20.53 * (10.97)	(-0.97,42.02)	28.86 * (17.34)	(-5.13,62.86)	(-32,49)
General practice role (RL_P0)	Primary Care Setting	Ref	Ref	Ref	Ref	Ref
Aged care facility role (RL_P1)	Primary Care Setting	0.17 (10.63)	(-20.66 ; 21.00)	-40.34 *** (9.57)	(-59.09 ; -21.59)	(-69,-12)

Table 5.4 (continued): WTP space MIXL results with ASCs being random parameters from FCSD and PCSD

Attributes	Alternatives	FCSD		PCSD		95% CI for the difference of means
		MWTP (SE)	95% CI	MWTP (SE)	95% CI	
Sales or marketing role (RL_I0)	Pharmaceutical Industry	Ref	Ref	Ref	Ref	Ref
Medical or Regulatory Affairs role (RL_I1)	Pharmaceutical Industry	47.66 *** (12.23)	(23.69,71.62)	19.00 (15.21)	(-10.81,48.80)	(-67,10)
Research and development role (RL_I2)	Pharmaceutical Industry	59.95 *** (10.74)	(38.90,81.00)	52.12 *** (10.98)	(30.60,73.63)	(-38,22)
Policy related role (RL_G0)	Government/Academia	Ref	Ref	Ref	Ref	Ref
Research or teaching role (RL_G1)	Government/Academia	-28.44 ** (9.58)	(-47.22,-9.67)	-6.22 (9.24)	(-24.34,11.89)	(-4,48)
Health-related role (RL_N0)	Non-pharmacy related sector	Ref	Ref	Ref	Ref	Ref
Non health related role (RL_N1)	Non-pharmacy related sector	-3.61 (11.27)	(-25.69,18.47)	-38.39 ** (12.08)	(-62.07,-14.71)	(-67,-2)
No flexible work schedule (NO-FL)	All sectors	Ref	Ref	Ref	Ref	Ref
Having flexible work schedule (FL)	All sectors	16.84 *** (3.96)	(9.07,24.60)	14.08 ** (4.47)	(5.31,22.84)	(-14,9)
No opportunities (CR0)	All sectors	Ref	Ref	Ref	Ref	Ref
Promotion and specialization opportunities (CR1)	All sectors	33.73 *** (5.09)	(23.75,43.70)	27.06 *** (5.11)	(17.05,37.07)	(-21,7)
Specialization opportunities only (CR2)	Hospital pharmacy/Community pharmacy/Primary care settings	10.60 (7.14)	(-3.40,24.60)	12.50 (7.93)	(-3.03,28.04)	(-19,23)
Urban location (LO0)	All sectors	Ref	Ref	Ref	Ref	Ref
Rural location (LO1)	All sectors	-45.06 *** (4.78)	(-54.44,-35.68)	-69.92 *** (5.05)	(-79.82,-60.02)	(-38,-11)

Table 5.4 (continued): WTP space MIXL results with ASCs being random parameters from FCSD and PCSD

Attributes	Alternatives	FCSD		PCSD		95% CI for the difference of means
		MWTP (SE)	95% CI	MWTP (SE)	95% CI	
Remote location (LO2)	All sectors	-67.64 *** (8.17)	(-83.66,-51.63)	-73.94 *** (6.26)	(-86.21,-61.68)	(-26,14)
Annual salary ($0,000) (SA)†	All sectors	0.02 *** (0.00)		0.01 *** (0.00)		
Standard Deviations						
NHOS	Hospital pharmacy	101.07 *** (10.61)		50.57 ** (15.32)		
NPRI	Primary Care Setting	72.24 *** (9.44)		1.58 (321.79)		
NIND	Pharmaceutical Industry	91.65 *** (10.46)		120.78 *** (13.81)		
NGOV	Government/Academia	82.30 *** (10.10)		66.37 *** (11.39)		
NNON	Non-pharmacy related sector	93.24 (12.14)		36.18 ** (17.63)		
Model statistics						
Respondents*		790		790		
Observations		2370		3160		
Log likelihood		-3743		-2802		

1. *p<0.1; **p<0.05;***p<0.0001
2. 95% confidence interval of WTP distributions in brackets
3. WTP values in $1000
4. † in preference space
5. ‡ Confidence interval for WTP values were computed using the Delta method
6. NHOS, NPRI, NIND, NGOV, NNON: Standard deviations of ASCs of Hospital pharmacy, Primary Care Setting, Pharmaceutical Industry, Government/Academia, Non-pharmacy related sector, respectively

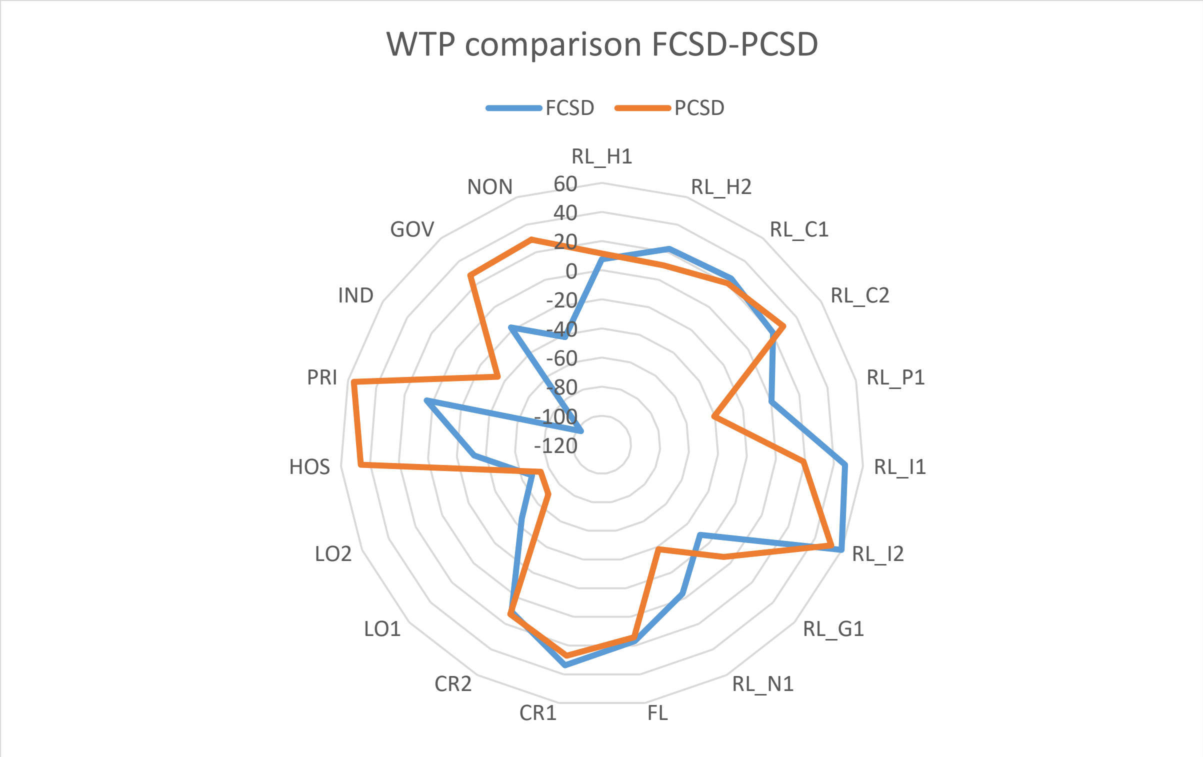

Figure 5.4: Comparison of WTP values across attributes between FCSD and PCSD from WTP space MIXL model with all ASCs being random parameters

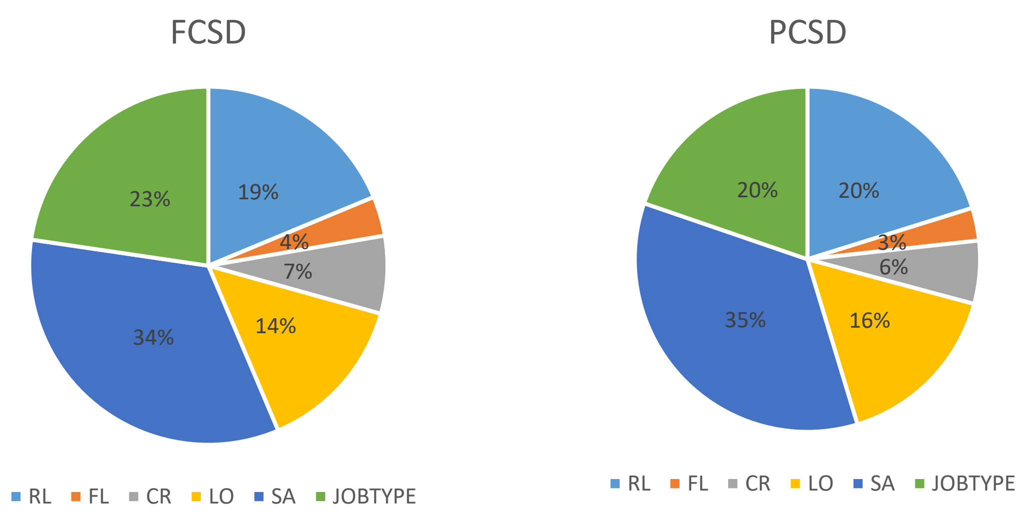

Figure 5.5: Relative importance of attribute levels from FCSD and PCSD from WTP space MIXL model with all ASCs being random parameters

In addition to parameter estimates, we compared standard errors and t-ratios from two designs. Overall, both designs produced similar standard errors for all attribute levels except for means and standard deviations of ASCs of which the PCSD produced larger standard errors than the FCSD (Figure 5.6). Furthermore, the comparison of observed t-ratios which represent the statistical power of revealing preferences by taking into account both parameters estimates and standard errors reveal an interesting observation. The observed t-ratios are similar for ASCs means and attribute levels in both designs except for ASCs' standard deviations which have larger t-ratios in the FCSD (Figure 5.7). This finding confirms our explanation that heterogeneity in process strategies around ASCs are larger in FCSD. Specifically, this may be due to the nature of the FCSD presenting all alternatives, of which some are more dominant, thus reducing the error variance (i.e. standard errors). On the other hand, the PCSD presents different subsets of alternatives, as such reducing the probability of presenting dominant alternatives, and thus, increasing standard error of ASCs. However, as PCSD with less complex choice tasks invokes less heterogeneity in process strategies, thus, standard deviations of ASCs have smaller t-ratios.

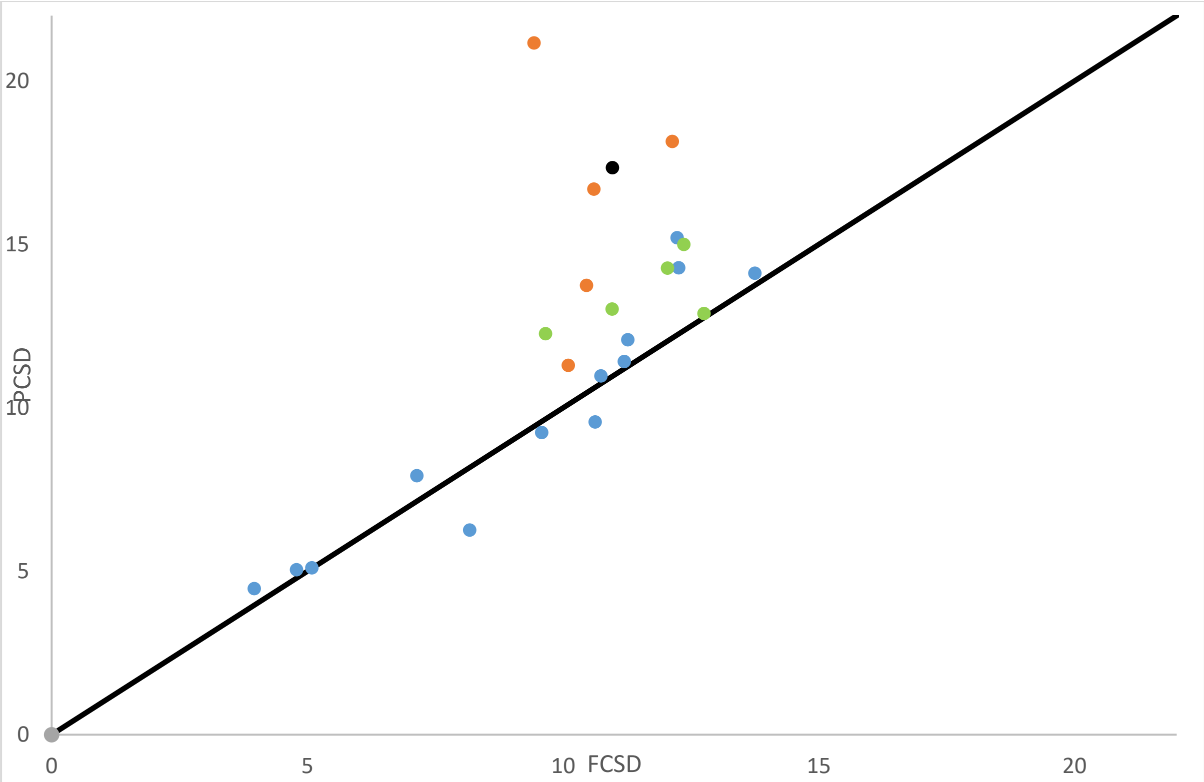

Figure 5.6: Standard errors from WTP space MIXL model with ASCs being random parameters
Notes: Green = ASCs' means, orange = ASCs' standard deviations, blue = non-random attribute levels, black = RL_C2

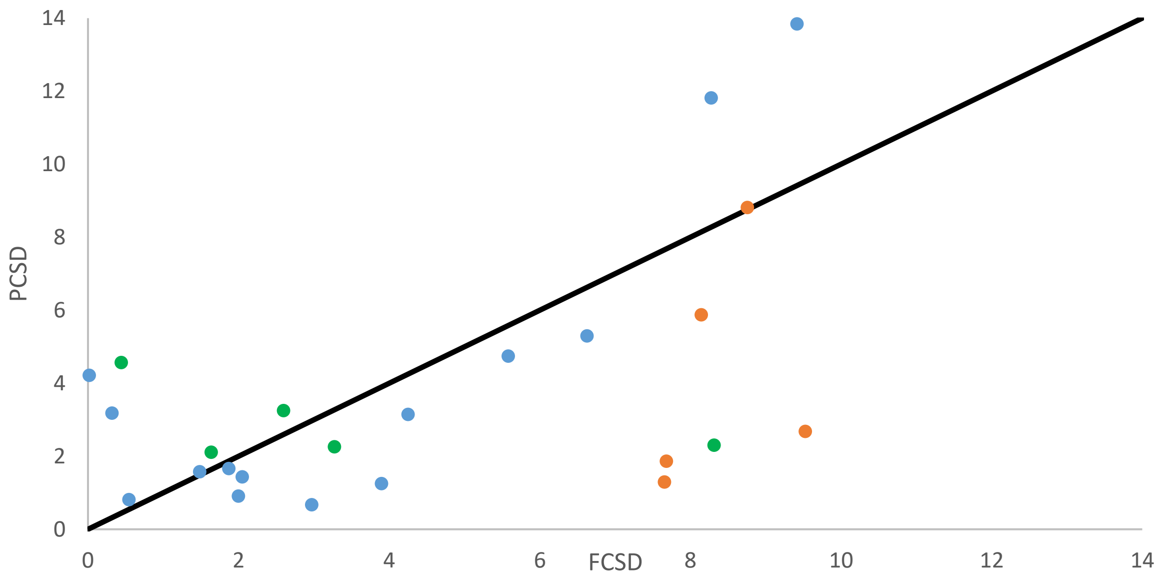

Figure 5.7: Observed t-ratio from WTP space MIXL model with ASCs being random parameters
Notes: Green = ASCs' means, orange = ASCs' standard deviations, blue = non-random attribute levels

5.4.4. Question 3: What factors affect respondents' preferences between designs?

Table 5.5 provides the descriptive statistics of respondents in terms of design preferences. In general, 39% of respondents have no preference, 30% preferred the FCSD while only 26.71% preferred the PCSD. While a majority of female respondents (42.45%) have no preference, more females prefer the PSCD (32%) to the FSCD (26%), the opposite is observed in male respondents. Interestingly, more respondents over 40 years old prefer the FCSD to the PCSD while respondents aged less than 40 years prefer the FCSD. Respondents using a mobile phone to complete the survey prefer the PCSD to the FCSD although most respondents have no preference regardless of the device used. As expected, respondents who find the FCSD (PCSD) easy are more likely to prefer the FCSD (PCSD). On average, respondents who spent more time on the DCE questions are more likely to prefer the FCSD.

Table 5.5: Descriptive statistics of respondents in terms of the design preferences

	FCSD **(%)**	PCSD **(%)**	Neither **(%)**	Obs (n)
Design preference	30	26.71	39.62	761
Gender				
Female	25.66	31.89	42.45	417
Male	40.08	22.36	37.55	237
Age (years)				
<40	32.9	33.42	33.68	383
40-60	29.65	22.11	48.24	199
>60	28.24	15.29	56.47	85
Device used				
Mobile phone	27.44	35.37	37.2	164
Non-mobile phone	32.16	25.63	42.21	597
Perceived difficulty of the choice tasks				
Easy to answer FCSD questions	36.42	20.6	42.99	335
Easy to answer PCSD questions	29.91	28.49	41.6	351
Total time (minutes)	5.08	4.57	4.15	754

Notes: FCSD: Full Choice Set Design; PCSD: Partial Choice Set Design

Table 5.6 reports the results of an MNL model on the preference for design types. Respondents who age more than 40 years are more likely to prefer the FSCD to PSCD. Females are less likely to prefer FSCD. If respondents used a phone to answer the survey they are more likely to prefer the PSCD while the effect of using a phone on the FSCD is insignificant. The more time respondents spent overall choice tasks, the more likely they prefer the FSCD. If the PSCD appeared first, respondents are less likely to prefer the PSCD. If respondents found the FSCD easy, they were more likely to prefer the FSCD and less likely to prefer the PSCD. However, if they found the PSCD easy, they were more likely to prefer the PSCD but have no preference over the FSCD.

Table 5.6: MNL estimates of the preference on experiment design

Variables	FSCD		PSCD	
	Coefficients	S.E	Coefficients	S.E
40-60 years old	-0.38 *	0.22	-0.80 **	0.23
>60 years old	-0.70 **	0.29	-1.16 **	0.35
Female	-0.55 **	0.20	0.15	0.22
Using phone	-0.16	0.27	0.42 *	0.25
Total response time	0.05 **	0.02	0.01	0.03
Order of design (0: FSCD appears first)	0.29	0.20	-0.49 **	0.21
Easy to answer FCSD questions	0.40 *	0.23	-0.92 ***	0.24
Easy to answer PCSD questions	-0.33	0.23	0.52 **	0.23
Constant	-0.11	0.27	0.14	0.28
Log likelihood	-655			
Observations	641			

Notes: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1
FSCD: Full Choice Set Design; PSCD: Partial Choice Set Design
Base: No preference

Regarding how respondents perceived the choice difficulty, females were more likely to find both FSCD and PSCD difficult. Interestingly, using the phone and time spent on the survey does not significantly affect the perceived choice difficulty. If PSCD appears before FSCD, respondents were less likely to find the FSCD easy and more likely to find the PSCD easy. Respondents ageing more than 60 years were less likely to find the PSCD easy than those ageing less than 40 years. In contrast, age does not affect respondents' perceived difficulty of the FSCD (Table 5.7).

Among 448 respondents who have a strong preference between FSCD and PSCD, 282 stated the reasons for their preference (Table 5.8). The most common reason respondents preferred the FCSD is that it provides more employment opportunities to consider. They claimed that the FCSD offered a big picture of the employment markets which "*generally a higher chance of one being obviously superior*". This may suggest different respondents may have levels of engagement with the choice exercise. More engaged respondents who desire to make the choice tasks best represent their true preferences, invest more effort to digest more information in the choice exercise. As such, a higher level of motivation positively influence the mental process and offset the choice task complexity, leading to the preferences for the FCSD.

Table 5.7: Factors affecting whether respondents find FSCD and PSCD easy

Variables	Easy to answer FCSD questions		Easy to answer PCSD questions	
	Coefficients	S.E	Coefficients	S.E
40-60 years old	-0.15	0.19	0.16	0.18
>60 years old	-0.29	0.26	-0.59 **	0.26
Female	-0.52 **	0.17	-0.54 **	0.17
Using phone	0.07	0.21	-0.09	0.21
Total response time	0.01	0.02	0.02	0.02
Order of design (reference: FSCD appears first)	-0.57 **	0.16	0.40 **	0.16
Constant	0.36 *	0.20	-0.11	0.20
Log likelihood	-428		-429	
Observations	641		641	

Notes: Standard errors in brackets *** p<0.01, ** p<0.05, * p<0.1
FSCD: Full Choice Set Design; PSCD: Partial Choice Set Design

Some respondents reported that they made a decision based on one or some particular alternatives/attributes, which the FCSD always presents. For example, one respondent reported, *"They were quite different and helped create divide between the jobs. The three jobs sometimes did not have a job that I particularly liked; it was just the best out of the lot. The 6 job group usually had a job that appealed above the rest".* This qualitative report provides evidence that the matching effect increases when the number of alternatives increases as explained earlier.

In contrast, the main reason for a preference for the PCSD is that it has fewer options, thus demanding less cognitive effort. These respondents often reported that the PCSD is *"easier to see all the details in each option and not too overwhelmed with information"* while the FCSD made it *"harder to differentiate between the different aspects of the jobs"*. These reported reasons are evidence of the choice complexity effect on respondents' cognitive burden discussed earlier. Another reason is that the PCSD is easier to read on mobile phones. However, some respondents claimed that they made their choice based on a few attributes or alternatives, hinting that they may have a strong preference for some particular attributes/alternatives.

Table 5.8: Reasons for design specific preference in order of frequency

Order of frequency	Full choice sets designs	Partial choice sets designs
1	More options- more comparative factors	Easier to read/less cognitive burden
2	Big picture	Considerations of one or several particular alternatives/attributes
3	Higher chance to have an option I prefer	Phone use
4	Considerations of one or several particular alternatives/attributes	

5.5. Discussion

This study contributes to the PCSD literature by (1) testing the performance of the PCSD on reducing the cognitive burden, (2) testing the convergent validity of the PCSD and FCSD, (3) providing insights into respondents' preferences between the conventional FCSD and the recently re-emerging PCSD. We do so by embedding a carefully designed within-respondent comparison of the two design types in a nationwide survey to investigate the employment preferences of Australian pharmacy degree holders. We show that the PCSD appeared to induce a smaller choice variance than the FCSD, which supports its purpose of reducing the cognitive burden. While generally, our study reveals that both a PCSD and FCSD capture the same preference for attributes/attribute levels, the FCSD appears to induce larger heterogeneity around alternative labels, perhaps because higher choice tasks complexity provokes larger heterogeneity in process strategies respondents in a FCSD than in a PCSD. Another beauty of our study lies in our within-respondent comparison of the two designs where respondents can experience the two designs successively and report their design preferences both quantitatively and qualitatively. The qualitative component of respondents' preferences provides additional evidence to some of our quantitative findings on the comparison between the PCSD and FCSD.

We provide empirical evidence that the PCSD can reduce the cognitive burden for respondents compared to the FCSD. Within the range of alternative numbers covered in the present study, we show that the PCSD of three alternatives significantly reduce choice variances compared to the FCSD of six alternatives. This suggests that respondents have a greater certainty in choice, thus making more consistent choices as their elaborated qualitative responses reported that they are not overwhelmed with the amount of information in PCSD choice tasks. We noted, however, our qualitative findings reported that not all respondents found the PCSD overwhelming and that a significant number of respondents preferred more information in larger FCSD choice tasks. This shows that on individual levels, there is significant heterogeneity in respondents' ability to handle task complexity. Additionally, we utilised a well-educated sample where all respondents are pharmacy-degree holders on a familiar choice (i.e. employment choice). As such, the ability of PCSDs to reduce the cognitive burden for populations having less mental capacity may be more promising.

An important finding from this research is that the PCSD satisfies the convergent validity test. Specifically, both FCSD and PCSD produced insignificantly different preference estimates for most attribute levels even using the MIXL model with all ASCs being specified as random variables to account for a flexible substitution pattern of alternatives. The patterns of WTP values and the relative importance order of attributes from the two designs present striking similarity. The formal test using confidence interval for the difference of means also confirms 16 out of 19 parameter estimates are statistically insignificantly different between the two designs.

Interestingly, the two designs appear to produce different results of preference heterogeneity around alternative labels (i.e. ASCs). Specifically, the FCSD produced a fewer number of statistically significant ASCs means. Furthermore, the FCSD produced higher t-ratios for standard deviations of ASCs' WTP distributions. We hypothesise that heterogeneity in process strategies due to choice task complexity may explain this unusual choice behaviour. Particularly, there may be more trade-offs among alternative labels in the PCSD perhaps respondents are not so overwhelmed with choice tasks and do not need to use simplifying decision rules. By contrast, respondents may adopt different decision rule strategies in the FCSD, for example, focusing on dominant alternatives and ignoring dominated ones. Such individual-specific heterogeneity in process strategies may confound with the heterogeneity in taste, thus manifesting itself in significant preference heterogeneity in the FCSD represented by higher t-ratios and more statistically significant ASCs' standard deviations.

Indeed, evidence from previous eye-tracking studies supports our hypothesis in terms of process heterogeneity in the FCSD. Meißner et al. (2017) show that the process strategies are very different between choice tasks of two and five options. In particular, respondents adopt a full compensatory decision-making process in which the relative benefit of each attribute is assessed independently from other attributes and the sum of benefit differences across attributes determines the most preferred options. By contrast, respondents were observed to adopt a variety of decision heuristics to simplify information across 30 pieces of information in choice tasks of five options As larger choice tasks, while more cognitively demanding, provide more information (i.e. choice tasks with six alternatives provides 5 data points while ones with three options only give 2 data points in a "choosing preferred option" format), more evidence on the process heterogeneity in PCSDs and FCSDs could gain more insights on the comparison between FCSDs and PCSDs.

Besides the stream of research using an eye-tracking methodology to understand respondents' information process in FCSDs and PCSDs, future research could use econometric modelling to shed light on heterogeneity in process strategies. One focus could be exploring decision heuristics as part of choice set formation by incorporating information on (1) attribute cut-off (Swait, 2001), (2) status-quo values, (3) past experience or (4) belief about future values as "pseudo cut-off" (Hensher et al., 2015a) to explore the use of heterogeneous reference points that respondents use to reach their choice outcome in FCSDs versus PCSD. Another focus could be on the effect of using alternative choice paradigms instead of utility maximisation such as minimising regret (Chorus et al., 2008) on process strategies in FCSDs versus PCSDs.

We also found some interesting aspects of choice behaviour from our within-respondent comparison. First, we found that the impact of the number of choice tasks from choice task 1 to the last have an (inverted) U-shaped form on the choice variance (scale factors) which is consistent with the literature (Louviere et al., 2008). This suggests that respondents may apply a higher level of effort as they answer the choice tasks up to a certain point after which the cognitive demanding is overwhelming and the fatigue effects take over, leading to higher choice variance. Second, we found that the order of the design types significantly influences the choice variance. When the PCSD is presented first, the choice variance appears to increase. This may be due to the increased fatigue after finishing the PSCD combined with an increase of alternatives in the FSCD appearing later could make respondents rely on simplifying information process strategies, hence making more random choices. In contrast, when the FSCD appears first, the learning effects may help respondents reduce choice errors during the beginning of the survey. Up to a point when the fatigue effects took over, the PSCD appeared with less information that could potentially offset the fatigue effects, reducing the choice variances. Our findings align with previous studies using an eye-tracking methodology which provide evidence that respondents adapt their process strategies following a change in choice task complexity (i.e. change in the number of alternatives) (Meißner et al., 2020). Third, respondents who used a phone to complete the survey were more likely to produce higher choice variances. Fourth, the choice variance was reduced when respondents spent more time answering the choice tasks. This means if respondents had taken the choice tasks seriously by putting more time (and effort) in answering the questions, their choice was more consistent. In terms of individual characteristics, females appeared to produce higher choice variances than males, ceteris paribus. Respondents who aged more than 40 years were more likely to produce higher choice variances.

Our qualitative findings also identify a potential factor that may significantly confound the cognitive process in a different choice set size. That is, how engaged respondents are with the choice exercise due to their personal relevance, awareness of their response on research results and policy implications, and their seriousness during the choice exercise. Respondents who have a greater interest in the choice tasks may invest more mental effort to grasp more information while a low level of engagement may hinder respondents' effort to search for relevant information. Thus, less engaged respondents may be more likely to simplify choice tasks even they have a similar mental capacity and face similarly complex choice tasks to their more engaged counterparts.

Based on our results in terms of behaviour response and design preferences, we made several suggestions for future research. First, we suggest using the PSCD if the questionnaire is accessible by phones. From respondents' standpoint, those who use phones are more likely to have higher choice variances and they explicitly prefer the PSCD to the FSCD. From a practical perspective, it is easier to display smaller choice tasks on phones' screens. Secondly, regarding the association between age and the type of designs, we recommend caution should be taken when considering the choice of designs. Although choice variances increase with age in general, the middle-aged respondents (40-60 years of age) prefer the FSCD while the older respondents who age more than 60 years are more likely to find the PCSD difficult. Given our sample of study are pharmacy degree holders who are considered homogenously high educated and may have a higher mental capacity to handle complex choice decisions, the generalization of our results should be taken cautiously.

The satisfied convergent validity test in this context, although may seem promising, it is not conclusive evidence of the validity of the PCSD or the FCSD (Janssen et al., 2017). As the true preferences are unknown, it is not possible to know whether both designs are valid or biased in the same direction (e.g. both designs may either overestimate or underestimate the true preferences) (Bishop & Boyle, 2019). Our results suggest that further exploration of the validity of the FCSD and PCSD is required to confirm the validity of both the PCSDs and FCSDs. One way could be to conduct multiple convergent validity studies of the two designs in different settings and evaluate the collective evidence on the validity of the FCSD and PCSD. Another way could be to investigate the external validity of the two designs by comparing the results of the stated preference from PCSDs with the revealed preference results. While we recommend more studies on the convergent and external validity of PCSDs, our finding shows a promising future use of PCSDs, indeed, we recommend their uses in studies where choice task complexity is likely a burden for respondents.

Our research is not limitation free. As we adopted a familiar choice situation (i.e. employment options) among highly-educated respondents, the generalization of our results may be limited and more research using samples of different intellectual capacities may provide more insights in this area. Another limitation of this study is its limited sample size which hinders our choice of modelling. As such, we only explore preference heterogeneity around alternative labels. Future research could address this limitation to understand the effects of different choice set size on the preference heterogeneity around attribute levels in the labelled DCE context.

5.6. Conclusion

Our findings indicate that the PCSD can reduce the cognitive burden and we suggest its use for surveys accessible by mobile phone. The PCSD satisfies the convergent validity test as it produces similar preference estimates to those from the FCSD for attribute levels. However, we found the FCSD induce larger preference heterogeneity around alternative labels, perhaps largely because choice task complexity leads to heterogeneity in process strategies. We urge more research on process heterogeneity to gain insights on the comparison of preference estimates for alternative labels in FCSDs and PCSDs.

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Chapter 6 Job Satisfaction and Involvement in Clinical Activities among Australian Pharmacists – An application of Herzberg' Two Factor Theory

Abstract

Background: The role expansion of hospital and community pharmacists has been implemented or discussed in several countries as a way to increase the capacity of the health workforce. However, pharmacist preferences for such a role and how that might be associated with their job satisfaction has not been studied in detail.

Objectives: This paper aims to investigate the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia based on Herzberg's Two Factor Principles framework. We also expand this framework by modelling the association of mismatch between actual and minimum acceptable job characteristics and pharmacists' job satisfaction.

Methods: Job satisfaction, work-related factors and individual characteristics are derived from the PAMELA (Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity), a nationwide cross-sectional survey conducted in Australia. The association between involvement in clinical activities and job satisfaction was modelled using ordinary least squares regression. The mismatch between actual and minimum acceptable levels of intrinsic and extrinsic characteristics was also included in the regression.

Results: The study sample consisted of 392 hospital and community pharmacists (mean age: 41 years, 62% female). A significantly positive association was found between an involvement in a clinical role and the level of job satisfaction among community pharmacists. In line with Herzberg's Two Factor Principles, we also find positive associations between the level of job satisfaction with intrinsic factors (the recognition for pharmacists' work) and extrinsic factors (having a flexible work schedule and salary). We show that the existence of any mismatch between respondents' actual and acceptable levels of extrinsic factors appears to have a negative association with the level of job satisfaction.

Conclusion: Our findings suggest that the policy of community pharmacist role expansion to include more clinical tasks may be aligned with the intrinsic motivation of pharmacists. The paper also underscores the importance of understanding workers' preferences and expectations in improving the well-being of workers.

Keywords: pharmacists, job satisfaction, clinical practice, Australia

6.1. Introduction

The role of pharmacists has shifted in recent decades from a product focus to a patient care focus across the world (Mossialos et al., 2013). Indeed, many countries have called for pharmacists to move away from a dispensing focus to performing more expanded roles as a way to deploy pharmacists' clinical skills and knowledge not only in hospital pharmacy but also in community pharmacy (Roughead et al., 2013). Increased involvement in clinical activities inevitably warrants an investigation into the relationship between job satisfaction and this transformation in pharmacists' roles to ensure the success of any health reform on the role expansion of pharmacists. On one hand, job satisfaction has been shown to influence employees' work behaviours such as productivity, performance, absenteeism, and professional commitment in other professions (Freeman, 1978; Gaither, 2009; Nikolova & Cnossen, 2020; Satuf et al., 2018). On the other hand, understanding job satisfaction among pharmacists is even more essential because as healthcare providers, pharmacists' job satisfaction also determines the quality of services and customer satisfaction (Rogers Jerry et al., 1994; Zelenski et al., 2008). Thus, future policy initiatives would benefit from evidence on the relationship between the proposed expanded roles and pharmacists' job satisfaction.

This paper contributes to the existing literature by quantitatively investigating the relationship between job satisfaction and involvement in clinical activities not only among hospital pharmacists but also among community pharmacists in Australia. While the literature on the association between job satisfaction and involvement in clinical activities among community pharmacists is limited and mainly qualitative, our quantitative findings which provide a more broader and objective of the current pharmacist workforce can contribute critical evidence to inform the ongoing policy discussion. We also explore whether mismatches between pharmacists' actual and minimum acceptable levels of extrinsic factors are negatively associated with job satisfaction. As extrinsic factors are contextual factors potentially amenable to policy intervention, this information offers policymakers a reasonable starting point to increase healthcare quality and consumer satisfaction.

This paper is a theory-driven investigation of the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists under the conceptual framework of Herzberg's Two Factor Theory (Herzberg, 1959). This theory has been widely used to investigate job satisfaction in many contexts such as in tourism (Lundberg et al., 2009), hospitality (Hsiao et al., 2017), mobile data services (Lee et al., 2009), and also in health professionals (Alrawahi et al., 2020; Goetz et al., 2012; Holmberg et al., 2016; Yasin et al., 2020). According to Herzberg's Two Factor Theory, two different sets of factors influence employees' job satisfaction. The first set is closely related to job content and is believed to lead to a long-term positive effect on job satisfaction. This set of factors, referred to as intrinsic factors, include the nature of the work itself, recognition, and advancement. By contrast, the second set of factors are related to job context including salary, work schedule flexibility, and working hours and are referred to as extrinsic factors. The presence of extrinsic factors are believed to prevent job dissatisfaction, but only when they meet employees' acceptable levels (Herzberg, 1959). As such, any improvement in extrinsic factors has a short-term positive effect on job satisfaction while any deprivation of these extrinsic factors leads to job dissatisfaction.

Based on his theory, Herzberg suggested several ways to motivate employees by modifying job content. One of Herzberg's applications is job enrichment which involves offering employees opportunities to take additional responsibilities, to learn and to experience a sense of achievement (Herzberg, 2003). Based on Herzberg' theory, several strategies to enrich job content have been proposed including improving employees' skill variety and task significance. The former refers to the involvement of diverse skills needed to complete the job. The use of a wider range of skills is believed to stimulate a sense of competence, thus increasing job satisfaction. The latter strategy refers to the extent to which one' job has an impact on other people' lives, which in turn, can motivate employees and increase their job satisfaction.

Applying Herzberg's theory in the case of pharmacists, the role expansion policy in which pharmacists are increasingly engaging in more clinical activities rather than traditional dispensing roles represents job enrichment. The non-exhaustive list of clinical activities performed by pharmacists may include medication review, health promotion services (e.g. stroke prevention campaigns, community health talks, vaccination, etc.), health screening or monitoring (blood pressure, blood glucose, cholesterol, etc.), and mental health services. As clinical activities require a wide range of skills and knowledge and allow pharmacists to experience the impact of their works on patients' health outcomes, it could be expected that increasing involvement in clinical activities could be positively associated with job satisfaction. However, evidence from the literature on the association between the involvement in clinical activities and job satisfaction among pharmacists does not provide a definite conclusion.

Indeed, evidence on the direct association between increasing involvement in clinical activities and job satisfaction is limited and mainly focused on hospital pharmacists. Specifically, several quantitative studies report that higher job satisfaction is more likely to be observed among hospital pharmacists who were more involved with clinical activities in the United States (Kerschen et al., 2006; Olson & Lawson, 1996; Schommer et al., 2018), or in Hong Kong (Lau et al., 2011). Other studies suggest a positive association between job satisfaction and either the perception of hospital pharmacists on their skill utilization (Cox & Fitzpatrick, 1999; Liu

& White, 2011) or their perception of job characteristics such as the levels of their task variety, significance, or autonomy. (Lin et al., 2007). As the link between pharmacists' perception of their skill utilization or job characteristics and their actual involvement in clinical activities is unclear[11], the results of these studies cannot provide information on the association between job satisfaction and involvement in clinical activities

By contrast, evidence among community pharmacists are mostly qualitative and report mixed results. A qualitative study in Alberta, Canada, where legislation has legally supported the expansion of clinical practice among community pharmacists, suggests that pharmacists are reluctant to relinquish their technical drug distribution roles for patient care roles (Schindel et al., 2017). In a different context, a qualitative study investigating the provision of vaccination services by pharmacists reported an increase in job satisfaction (Gerges et al., 2018). Another qualitative study in New Zealand reports that while community pharmacists are willing to adopt a new role, they appear unconfident in their ability to do these clinical roles (Bryant et al., 2017).

To address the gap in the literature, this paper aims to (1) explore the association between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia, (2) and test if mismatches between actual and acceptable levels of extrinsic factors are associated with job satisfaction in the case of pharmacists.

[11] For example, a question asking pharmacists to agree/disagree to the statement "My formal education overqualified me for my present job," does not explicitly refer to an involvement in clinical activities. As such, the survey questions in these studies may not have sufficient nuance to capture the pertinent research question of an actual involvement in clinical activities.

6.2. Data

6.2.1. Data collection

Data for the study come from a cross-sectional survey named *"Pharmacy in Australia: Measuring Employment, Labour preferences and Activities (PAMELA)"*. The questionnaire collected various information on job satisfaction, job and demographic characteristics, and employment preferences. The questionnaire was built on the online platform-SurveyEngine (https://surveyengine.com/).

The survey was pre-tested with a group of 15 respondents. Ten respondents provided detailed feedback regarding the survey length, wording and suggestions of additional questions. One convenient in-depth interview was conducted to gain more detailed feedback. Suggestions from the key stakeholders including the Board of the Pharmaceutical Society of Australia, the Heads of pharmacy schools, and PDHs themselves were also incorporated into the survey. A pilot was undertaken in July 2019 using the Griffith School of Pharmacy and Pharmacology alumni database. Only 23 responses from the pilot combined with responses from the main data collection were included in the final analysis.

All pharmacy degree holders with a Bachelor or a Master of Pharmacy obtained from one of the Australian academic institutions or internationally trained pharmacists if they are working in Australia were invited to participate in the survey via emails. Participation was voluntary. The data collection was conducted via several recruitment channels between October 2019 and January 2020 (More details see Chapter 2). The study was approved by the Ethical Review Committee of Griffith University (GU Ref No: 2017/881) and Monash University (MU Ref No: 11845).

6.2.2. Variables

Outcome variable: Job satisfaction was measured based on the short-form Warr-Cool-Wall job satisfaction questionnaire, previously validated in the Australian medical professional (Hills et al., 2012). We measure overall job satisfaction using the single item *"Taking everything into consideration, how do you feel about your current employment?"* Responses were based on a five-point Likert-style rating scale ranging from 1= *"very dissatisfied"* to 5= *"very satisfied"*. This single question can be interpreted as a global measure of all relevant job aspects and is used as the dependent variable for the main analysis.

Explanatory variables: The key explanatory variable of interest is the involvement in clinical activities. We considered this variable as one of several dummy variables representing the key roles/tasks respondents perform in their daily job for their primary employment. These include DISPENSE which refers to pharmacists' roles being dispensing medicines to patients/consumers. CLINICAL refers to roles that are exclusively focused on clinical activities. EDU/RESEARCH refers to the role *"education/clinical research"* which is only available in hospital pharmacies. COMBINATION refers to a combination of dispensing and clinical activities available only in community pharmacies.

Information on other intrinsic and extrinsic factors are also collected. Recognition opportunities in the form of promotion and/or specialisation were measured via the perception of PDHs about their future career opportunities *("Regarding your future career progression in your primary place of employment, would you describe it as having: (1) none, (2) specialization only, (3) promotion and specialization")*. We used two dummy variables to indicate two levels of career opportunities – SPECIALIZATION ONLY and PROMOTION&SPECIALIZATION, with NO OPPORTUNITY being the reference level. SALARY which was used as a continuous variable refers to the annual salary of respondents' primary employment (*What is your (approximate) total gross personal income (i.e. before tax) from your primary employment*?). Three dummy variables- URBAN, RURAL and REMOTE refer to the geographic location of respondents' primary employment where URBAN is the reference level. Information on work conditions includes HOURS WORKED which refers to the number of hours that respondents work per week in their primary employment. FLEXIBLE refers to whether respondents have a flexible work schedule (*Do you have a flexible working schedule (i.e. able to dictate your work schedule to suit your needs (after hours, weekend hours, etc.) in your primary employment?- Yes or No).*

The PAMELA survey collected information on respondents' 'acceptability levels' for some job characteristics (i.e. if they searched for a new job, respondents would not consider ones that do not meet their minimum requirements). Questions focus on employment sectors (*What sectors of employment would you never consider, even if they were the only jobs available at the time?)*, roles (*Which roles would you never consider when making your job decision, even if they were the only jobs available at the time?)*, flexibility *(Would you consider accepting a job that does not offer a flexible work schedule?)*, career opportunities *(What degree of opportunity for career progression would you never consider when making your job decision, even if they were the only jobs available at the time?)*, geographic location *(Which geographic locations would you never consider when making your job decision, even if they were the only jobs available at the time?)* and the minimum acceptable amount of salary *(What is the minimum annual salary you would be willing to accept, no matter what type of job?).*

A 'preference mismatch' was defined as discordance between respondents' actual (current) versus acceptable job characteristics. For example, if a respondent indicated that *"I would not* *consider hospital pharmacy, even if hospital pharmacy is the only job available at the time"* while her current job is hospital pharmacy, we recoded a mismatch in the employment sector. We define preference mismatches in the same manner for roles, career opportunities, a flexible work schedule and geographic locations. For salary which is a continuous variable, we defined a preference mismatch in salary if respondents' current standardised annual salary[12] falls short of their stated minimum acceptable annual salary. For example, a mismatch was recorded if a respondent has an annual salary of AUD50K while she stated her minimum acceptable amount of salary being AUD60K. We reasoned that people who stated that the minimum acceptable salary was higher than their current indicate that they felt been undervalued and they deserve a higher salary. To test Herzberg's Two Factor hypothesis that extrinsic factors affect work attitude only when they do not meet employees' acceptable level, we specifically focus on mismatches between extrinsic factors. As such, three separate dummy variables for mismatches in flexibility, location and salary were constructed, while mismatches between two intrinsic factors (i.e. role and advancement) are combined as one dummy variable.

Covariates: For other work-related characteristics, we controlled for current work hours and years working in the current job. To control for the possibility of job satisfaction spill-over, we accounted for whether respondents have secondary employment. Gender and age were included as they have long been considered to have a significant impact on job satisfaction not only in the economic literature (Clark et al., 1996) but also in the pharmacy literature (Carvajal & Popovici, 2018). We accounted for education effects via the inclusion of dummies on whether a pharmacy or non-pharmacy higher degree had been obtained, marital status, whether respondents have children less than 5-year-old and whether they reported having good health.

[12] To correct for different numbers of working hours across respondents, we calculated the hourly wage. This is used to calculate the standardised annual salary of a person working 37.5 hours per week for 52 weeks in a year.

6.2.3. Sample

We received 824 responses from pharmacy degree holders, both employed or unemployed. We excluded respondents who did not fit our inclusion (i.e. unemployed pharmacists, or those working in non-practising roles such as government, academia, pharmaceutical industry and non-pharmacy related sectors). The resulting sample includes 662 hospital and community pharmacists. Due to missing values on the dependent variable (i.e. job satisfaction), the final number of respondents available for analysis is 392 (59.2% of 662 respondents). Respondent characteristics were compared between the included and excluded samples due to missing data. The comparison shows our included sample is generally similar to the excluded ones except for age, hours worked and some roles (Appendix Table A6.1).

Table 6.1 reports the sample's descriptive statistics. Of 392 respondents, 62% are female, 73% are married, 18% have children less than five years old. Most of the respondents (63%) were aged less than 40 years while only 9% were aged more than 60 years. The average number of years working in the current job was 7.64 years and the average working hours were 34.73 per week. 69% of respondents are community pharmacists. 23% of respondents reported secondary employment and 59% had obtained higher degree education. The majority (84%) report having good health. In terms of work-related characteristics, 33% of respondents have a flexible work schedule. 19% perceived having promotion and specialization opportunities while 30% perceive having specialization opportunities only. 26% are working in rural areas while only 2% work in remote areas. The average annual salary was AUD83.2K. Of the sample, 20% had a dispensing role while 77% are either exclusively or partly involved in clinical activities during their daily tasks.

Table 6.1: Descriptive statistics for the study sample, N=392

Variables	n	Mean/%	Std. Dev.	Min	Max
Dependent variable					
Overall job satisfaction (1 to 5)	392	3.334184	1.129948	1	5
Control variables					
Female	392	61.99			
Married	392	73.47			
Having kids less than 5ys	392	0.25	0.584322	0	3
<40 years	392	63.27			
40-60 years	392	27.81			
>60 years	392	8.93			
Having pharmacy higher education	392	40.31			
Having non-pharmacy higher education	392	34.95			
Having good health	392	83.93			
Years employed in the current job	392	7.64	7.816633	1	47
Hours worked	392	34.73	9.28683	2.5	47.5
Having second employment	392	23.47			
Community pharmacy	392	65.82			
Intrinsic factors					
Dispensing role (Ref)	392	19.90			
Clinical practice role	392	29.85			
Int. Clinical practice in COM	392	2.55			
Education/Research role in HOS	392	3.06			
Dispensing and professional services in COM	392	47.19			
No career opportunities	392	50.77			
Promotion and specialization opportunities	392	18.88			
Specialization opportunities only	392	30.36			
Extrinsic factors					
Having a flexible work schedule	392	32.65			
Urban	392	71.68			
Rural	392	26.28			
Remote	392	2.04			
Annual salary ($0,000) †	392	83.20	33.37253	7.5	230
Mismatch between actual and minimum acceptable levels					
Mismatch in sector	392	3.57			
Mismatch in intrinsic factors	392	15.82			
Mismatch in flexibility	392	8.16			
Mismatch in geographic location	392	1.53			
Mismatch in salary	392	52.81			

Notes: COM: Community pharmacy, HOS: Hospital pharmacy

6.3. Empirical framework

Following the approach taken in previous studies on the treatment of job satisfaction as a cardinal variable (Clark, 2005; Danzer, 2019; Scott et al., 2006), an OLS regression was used to model the relationship between job satisfaction and involvement in clinical activities[13].

[13] We found the qualitative results of an *OLS* and ordered probit models are similar (Appendix) which is in line with the literature Ferrer-i-Carbonell, A., & Frijters, P. (2004). How Important is Methodology for the estimates of the determinants of Happiness?*. *The Economic Journal*, *114*(497), 641-659. https://doi.org/https://doi.org/10.1111/j.1468-0297.2004.00235.x .

Based on the framework of factors influencing job satisfaction outlined by Herzberg's Two Factor Theory, the flowing specification is estimated:

$$JS_i = \alpha + \beta_1 CLINICAL_i + \beta_2 COM_i + I_i'\lambda + E_i'\gamma + P_i'\delta + Z_i'\omega + \varepsilon_i \qquad (1)$$

where JS_i represents the level of job satisfaction for individual i and the constant α is the average job satisfaction as measured by JS in the sample. CLINICAL represents roles exclusively involving clinical activities and β_1 as the corresponding coefficient. COM represents the community pharmacy sector and β_2 is its corresponding coefficient with hospital pharmacy being the reference level. I_i, E_i, P_i *and* Z_i represent vectors of intrinsic factors (i.e. other roles and career opportunities), extrinsic factors (i.e. flexibility, geographic location, and annual salary), preference mismatches in intrinsic and extrinsic factors, and individual characteristics, respectively with λ, γ, δ, and ω are their corresponding coefficient vectors. ε_i represents an iid random error term.

To investigate the potential heterogeneity between pharmacists employed in different sectors on involvement in clinical activities and job satisfaction, an interaction term between involvement in clinical activities and sector was further included in Equation 2:

$$JS_i = \alpha + \beta_1 CLINICAL_i + \beta_2 COM_i + \beta_3 (CLINICALi \times COM) + I_i'\lambda + E_i'\gamma + P_i'\delta + Z_i'\omega + \varepsilon_i \qquad (2)$$

where $(CLINICALi \times COM)$ indicates the involvement in clinical activities in community pharmacy and β_3 is its coefficient.

We first ran a simple *OLS* to explore the association between job satisfaction and involvement in clinical activities. We further include the sector of employment and our main interaction term of clinical activities in community pharmacy. Finally, other intrinsic factors, extrinsic factors, and preference mismatches are successively added to the regression models to control for potential confounding that could affect both the choice of job content and the level of job satisfaction.

6.4. Results

Table 6.2 shows the results of the OLS models on overall job satisfaction. As expected, the inclusion of covariates to control for individual characteristics, preference mismatches, and extrinsic factors gradually lead to an improvement in the overall model fit with the final model including an exhaustive list of variables with the best fit (highest R^2 value).

The first columns show a highly significant association between involvement in clinical activities and job satisfaction. However, the inclusion of sector (i.e. community/hospital pharmacy) makes the significant association between clinical activities and job satisfaction disappear. This suggests that some underlying unobserved factors related to the sectors may influence the association between clinical activities and job satisfaction. The association between job satisfaction and sectors remains consistent even after controlling for an exhaustive list of variables in the final model (7). Specifically, involvement in clinical activities is not statistically significantly associated with job satisfaction (p-value = 0.152). Meanwhile, community pharmacy is negatively and significantly correlated with job satisfaction (β=-0.88, p-value = 0.001), suggesting that working in community pharmacy, in general, is associated with a lower level of satisfaction among pharmacists compared to hospital pharmacy.

When an interaction term between clinical involvement and sector was included to account for the influence of different sectors on the effect of clinical involvement and job satisfaction in model (3), the coefficient of this interaction term is statistically significant. This indicates that community pharmacists are more satisfied with their jobs if their roles are exclusively focused on clinical practice roles. Even when controlling for the most extensive set of variables, there remains a significantly positive correlation (p-value = 0.051) between involvement in clinical activities in community pharmacy and the level of job satisfaction in the final model (7).

The inclusion of preference mismatch information also revealed some interesting information. A mismatch in the preference of employment sectors was negatively associated with job satisfaction with the coefficient (-0.67) being the largest of all mismatches' coefficients. A mismatch in the ability to have a flexible working schedule has a negative association with job satisfaction with a smaller coefficient of -0.38. In contrast, mismatches in intrinsic factors, geographic location and salary were found insignificantly associated with job satisfaction.

Besides the variables of interest, the inclusion of factors guided by the Herzberg theory reveals some interesting findings. In terms of intrinsic factors, education and/or research roles in hospital pharmacy are negatively associated with job satisfaction when controlling for extrinsic factors and mismatches between actual and minimum acceptable levels of job characteristics. The combination of dispensing and clinical activities in community pharmacy is not significantly associated (p-value = 0.135) with job satisfaction even when the most extensive set of covariates are included. This may suggest an increase in workload or stress when community pharmacists are in charge of both dispensing and clinical activities.

Consistently, job satisfaction was positively correlated with an improvement in extrinsic factors. Specifically, job satisfaction is significantly higher among pharmacists having a flexible work schedule, having career opportunities or having specialization opportunities, the latter having the strongest association. As expected, salary is positively associated with job satisfaction. Interestingly, pharmacists working in rural areas are slightly more satisfied with their job while working in remote areas does not affect job satisfaction, compared to those working in urban areas.

In terms of covariates, several interesting findings emerged. First, female pharmacists were more satisfied with their job than their male counterparts. Second, job satisfaction among pharmacists aged more than 60 years was higher than those less than 40 years of age[14]. Having good health is significantly positively associated with job satisfaction. Furthermore, the attainment of higher education (either pharmacy related or non-pharmacy related), marital status, having children less than 5 years old, the number of years employed in the current job, number of working hours and having second employment were not significantly associated with the level of job satisfaction.

[14] The cut-offs for age were based on Figure 1.4 which shows a sharp drop in the number of registered pharmacists among age groups before 40 years. The number of pharmacists was flattened between the ages of 40-60 and then decreased until the age of 80. Different cut-offs for age were teste, however, the current cut-offs provide more meaningful results.

Table 6.2: OLS model on overall job satisfaction

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	β	S.E.	β	S.E.	β	S.E.	β	S.E.	β	S.E.	β	S.E.	β	S.E.
Intrinsic factor of interest														
Clinical practice role	0.73 ***	0.12	0.19	0.19	-0.08	0.23	-0.04	0.23	-0.20	0.27	-0.36	0.26	-0.37	0.25
Community pharmacy			-0.67 ***	0.18	-0.90 ***	0.21	-0.92 ***	0.21	-0.71 **	0.28	-0.90 **	0.27	-0.88 **	0.27
Clinical practice X Community pharmacy					0.85 **	0.41	0.74 *	0.41	0.72 *	0.42	0.84 **	0.41	0.99 **	0.40
Covariates														
Female							0.31 **	0.12	0.24 **	0.11	0.29 **	0.10	0.28 **	0.10
Married							0.05	0.13	0.05	0.12	0.03	0.11	0.04	0.11
Having kids less than 5ys							-0.03	0.10	0.00	0.09	-0.03	0.08	-0.02	0.09
40-60 years							0.16	0.14	0.26 **	0.12	0.16	0.12	0.17	0.12
>60 years							0.73 **	0.22	0.89 ***	0.20	0.67 **	0.20	0.65 **	0.20
Having pharmacy higher education							-0.18	0.11	-0.07	0.11	-0.13	0.10	-0.13	0.10
Having non-pharmacy higher education							0.08	0.11	0.00	0.10	-0.03	0.10	-0.03	0.10
Having good health							0.16	0.15	0.26 *	0.13	0.25 *	0.13	0.23 *	0.13
Years employed in the current job							0.00	0.01	0.00	0.01	-0.01	0.01	0.00	0.01
Hours worked							0.00	0.01	0.00	0.01	-0.01 **	0.01	-0.01	0.01
Having second employment							0.11	0.13	0.03	0.12	0.08	0.12	0.10	0.11
Other intrinsic factors														
Education/Research role in hospital pharmacy									-0.30	0.37	-0.70 *	0.36	-0.72 **	0.36
Dispensing and professional services in community pharmacy									0.21	0.14	0.19	0.14	0.20	0.13
Promotion and specialization opportunities									0.60 ***	0.13	0.54 ***	0.13	0.49 ***	0.13
Specialization opportunities only									1.12 ***	0.13	1.01 ***	0.13	0.96 ***	0.13

Table 6.2. (continued): OLS model on overall job satisfaction

	(1)		(2)		(3)		(4)		(5)		(6)		(7)	
	β	S.E.	β	S.E.	β	S.E.	β		β	S.E.	β	S.E.	β	S.E.
Extrinsic factors														
Having a flexible work schedule											0.48 ***	0.10	0.41 ***	0.11
Rural											0.18 *	0.11	0.18 *	0.11
Remote											0.23	0.33	0.13	0.33
Annual salary ($0,000) †											0.01 **	0.00	0.00 *	0.00
Mismatch between actual and minimum acceptable levels														
Mismatch in sector													-0.67 **	0.25
Mismatch in intrinsic factors													0.01	0.14
Mismatch in flexibility													-0.38 **	0.17
Mismatch in geographic location													0.33	0.38
Mismatch in salary													-0.18	0.11
Constant	3.12 ***	0.07	3.72 ***	0.18	0.00 ***	0.00	3.39 ***	0.37	2.87 ***	0.37	2.88 ***	0.36	3.07 ***	0.36
Sample	392		392		392		37.43		392		392		392	
R-squared	0.09		0.11		0.10		0.19		0.34		0.40		0.43	

Notes: 1. Omitted categories: Dispensing role, Hospital pharmacy, male, not married, not having second employment, not having a non-pharmacy higher degree, no flexible work schedule, no career opportunities, urban, no mismatch in sector/intrinsic factors/flexibility/geographic location/salary

2. *p<0.1; **p<0.05;***p<0.0001

6.5. Discussion

This paper has investigated the relationship between job satisfaction and involvement in clinical activities among both hospital and community pharmacists. Using data from the PAMELA survey, our results suggest that involvement in clinical activities was significantly and positively associated with a higher job satisfaction only among community pharmacists. We also add to the existing literature on job satisfaction by testing a hypothesis suggested by Herzberg's Two Factor Theory that extrinsic factors are negatively associated with job satisfaction when they fall short of employees' acceptable levels. We do so by incorporating the mismatch between actual and acceptable job characteristics in the empirical analysis of job satisfaction. Specifically, we find that mismatches in the preference for employment sectors and having a flexible working schedule were negatively associated with job satisfaction while mismatches on intrinsic factors, geographic location and salary were not significantly associated with job satisfaction.

Our paper contributes to the literature in several important ways. Firstly, our findings suggest that recent policy attention aimed at transitioning the roles of community pharmacists to be more focused on patient care may be aligned with community pharmacists' intrinsic motivation. This finding suggests that pharmacists are able to intrinsically satisfy themselves in jobs enriched by clinical activities when they can see their work outcomes, take greater responsibility and gain accomplishments as suggested by Herzberg's Two Factor Theory (Herzberg, 1959). As such, this finding has important implications for the policy of the role expansion of community pharmacists toward patient-centred care which appears not only to bring benefits to the general public but also help improve the job satisfaction of pharmacists at work. This may improve retention, reduce absenteeism and reduce the early recruitment of the pharmacist workforce. Furthermore, this finding is in line with recent research on work meaningfulness in economics in which a job is considered not only to provide material means but also to bring meaningfulness to employees (Nikolova & Cnossen, 2020). Furthermore, our finding regarding the positive association between involvement in clinical activities and job satisfaction is in line with the qualitative literature in which a provision of vaccination services, for example, may increase community pharmacists' job satisfaction (Gerges et al., 2018). However, there are a few other studies that reported mixed results on the willingness to perform clinical tasks and their job satisfaction (Bryant et al., 2017; Schindel et al., 2017). Given our data limitations in terms of a small sample size and unobserved factors, undertaking a similar analysis using a larger sample is encouraged.

Secondly, we formally test the association between job satisfaction and mismatches between actual and acceptable levels of extrinsic factors. We did so by utilising a unique set of questions on the job characteristics that pharmacists would avoid if they were looking for a new job. By explicitly controlling for these variables, we show that the existence of any mismatches between respondents' current job characteristics and their minimum acceptable levels appears to have a negative association with job satisfaction. Specifically, a preference mismatch in employment sectors and the choice to have a flexible work schedule are negatively and significantly correlated with the level of job satisfaction. While self-reported job satisfaction responses may partly reflect respondents' job preferences and values, explicitly unpacking the role of job values and work orientation provides new insights. It underscores the importance of understanding workers' preferences and expectations, which, in our views, is a crucial step to build future policy initiatives focusing on the well-being of workers at work (Brown et al., 2012). As such, future efforts to match individuals' work preferences and expectations may be a way to increase job satisfaction in the future (Zou, 2015).

Beyond the finding on the clinical activities, our paper also reveals some interesting findings aligning with Herzberg's Two Factor Theory (Herzberg, 1959). First, our study highlights the importance of personal growth and recognition for pharmacists' work through a positive association between having career opportunities (intrinsic factor) and the level of satisfaction among hospital and community pharmacists. Indeed, the effect of having specialization opportunities is stronger than having both promotion and specialization opportunities. As the involvement in clinical practice either in a hospital or in community pharmacy provides more areas for specialization opportunities, policy-makers should consider this intrinsic factor to improve pharmacists' job satisfaction. Our results also show positive associations between extrinsic factors, including flexible work schedules, and the level of job satisfaction. As these factors are job context and amenable to organisational change (Herzberg, 1959), future policy initiatives should ensure the availability of flexible work schedules to avoid a decrease in job satisfaction among pharmacists. However, we did not find evidence that mismatches in geographic location or deprivation of salary are associated with job (dis)satisfaction. Further research should explore this issue in other contexts to confirm our findings.

In line with the literature on job satisfaction, we find a variety of individual characteristics significantly associated with the reported job satisfaction. First, female pharmacists are more likely to be satisfied with their job than males. A potential reason behind the job satisfaction difference due to gender could be because women have lower job expectations than men (Clark, 1997). Another reason could be that males and females value different aspects of their job differently, which could be attributable to their involvement with childcare and household tasks (e.g. females usually bearing the main responsibility for childcare and other household tasks), being extrinsically motivated by the availability of a flexible work schedule to accommodate non-work commitments at different stages of their life (Carvajal et al., 2017). As our sample is relatively small which limits the statistical power of our findings, we urge future research to pay attention to the role of job values and work orientations on the gender-job satisfaction paradox. We do not find a typical U-shaped correlation between age and job satisfaction (Clark et al., 1996). Instead, we find that older pharmacists are more likely to be satisfied with their job than younger pharmacists. Lastly, the associations between marital status and higher education with job satisfaction are not significant in our study. While evidence from previous studies regarding marital status and job satisfaction are inconclusive (Gazioglu & Tansel, 2006), higher levels of education are usually found negatively correlated with the level of job satisfaction (Clark et al., 1996).

Our study has some limitations. Although we utilised different avenues of recruitment (social media, pharmacy schools etc.), selection bias may be an issue in this study. However, selection bias is not uncommon in studies using a self-reported survey. The cross-sectional nature of our data and small sample size have limited the ability to test causality between clinical activity involvement and job satisfaction, which could be tested in the future if longitudinal data become available. A comparison with other t health practitioner groups would also add value.

As previously noted, unobserved factors are another limitation of this study. Some existing operational issues may confound the relationship between involvement in clinical activities and job satisfaction which are well reported in the literature including low remuneration (Mak et al., 2013), increased workload within time constraints (Berbatis et al., 2007; Hermansyah et al., 2017), and a lack of interdisciplinary collaboration (Mossialos et al., 2013).

These barriers were not accounted for in our study and may negatively affect pharmacists' job satisfaction, thus distorting a possibly true positive relationship between involvement in clinical activities and job satisfaction, especially among hospital pharmacists. Future research into these existing factors may expand the evidence-based capacity to inform policymakers about the potential effect of the role expansion on pharmacists themselves.

6.6. Conclusion

Our study found a positive association between involvement in clinical activities and job satisfaction among community pharmacists but not among hospital pharmacists in Australia. Our analysis also reveals other intrinsic factors (i.e. career opportunities) and extrinsic factors (i.e. flexible work schedule, and salary) which are positively associated with job satisfaction. Mismatches between actual and minimum acceptable levels of extrinsic characteristics are negatively associated with job satisfaction, aligning with Herzberg's Two Factor theory. Policymakers can positively influence community pharmacists' job satisfaction by increasing their involvement in clinical activities (i.e. role expansion) and ensuring to satisfy their acceptable levels for extrinsic factors.

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Chapter 7 Conclusion

7.1. Key findings and implications

Despite the importance of the pharmacy workforce in Australia, there has been little empirical evidence examining the characteristics of this workforce beyond descriptive statistics. There are a number of longitudinal studies that have been undertaken in Australia examining other health workforce groups, for example, doctors (Joyce et al., 2010) and nurses (Doiron et al., 2014). The pharmacy workforce is particularly interesting because of their potential in increasing contribution to the healthcare system under the pressure of the rising healthcare demand. The research presented in this thesis is useful for policymakers considering a policy shift to extend the practice role of pharmacists in the future.

Drawing on the findings of four empirical studies using diverse techniques including qualitative and quantitative research methodologies, this thesis has made several distinct and original contributions from empirical and methodological standpoints. These contributions are discussed in detail below, by summarising the main findings and interpreting the implications from each chapter.

7.1.1. Empirical contributions

The integration of community pharmacists into the Australian primary healthcare system

A significant contribution of this thesis was to better understand the reasons why the integration of community pharmacists (CPs) in primary healthcare has not been addressed at the national level in Australia through the lens of a policy process framework—the Multiple Stream Framework (MSF)–using data generated via interviews with healthcare leaders across relevant disciplines.

One of the obstacles to better integration of CPs in primary care was found to be **inter-organisational tensions not only between the pharmacy and other health professions but also among several pharmacy associations**. These interest groups do not share the same vision on the policy's direction, which has, in turn, prevented nationwide support of the policy proposal on the integration of CPs in primary care. Specifically, the conflicts between pharmacy associations over what direction the policy moves constrain how best to advocate the policy proposal to gain wider support from other interest groups, which then accounts for inter-professional tension.

A number of strategies were presented to enhance pharmacist integration in primary care in Australia (Chapter 1). **These strategies include evidence accumulation, role development in light of population needs, and inter-organisational collaboration across members of the healthcare network.** Most importantly, it is critical to ensure any policy proposal can survive by accumulating evidence on the health gains of integrating CPs, which can then gain more acceptance from the wider policy community. More rigorous clinical and cost-effectiveness evidence of integrated pharmacy services are needed to enhance the acceptance of the potential for an expanded role in practice. This could help reduce inter-professional tensions, thus gaining wider support among key stakeholders. To ensure any policy proposal's technical feasibility, a shared health record in primary healthcare is an important enabler to provide accurate clinical information to ensure the quality of pharmacists' expanded services and to enhance collaboration among health professionals. More importantly, to resolve inter-professional conflicts, one option could be to frame the policy proposal with a focus on patient needs and their health benefits to adopt a more flexible approach to the training program of health professionals to specifically address the population's needs (Duckett, 2005). This may take the debate away from the boundary of professions into a more task-oriented focus may also help to reorient the debate into a positive light and bring forth new solutions not yet developed.

Characteristics influencing Australian pharmacy degree holders' job preferences

Although it was found that there is support from a number of key stakeholders to better integrate CPs into the primary care sector, there have been no previous studies examining the preference of the Australian pharmacist workforce for such an initiative. To facilitate evidence-based policy reform, this study examines the employment preferences of Australian pharmacy degree holders (PDHs) using a discrete choice experiment (DCE). This chapter adopted a labelled DCE to elicit what PDHs value when making choices between various employments options in the whole labour market including some extended roles for community pharmacy jobs.

PDHs prefer roles that are involved with professional services in community pharmacy sectors. This shows general support from PDHs for policy reforms on the role expansion in community pharmacies.

There is strong evidence on the preference of PDHs between primary care settings compared to community pharmacies. This indicates a general willingness from PDHs to work in primary health care settings to expand their roles beyond the traditional community pharmacies.

The study highlights **the relative importance of intrinsic and extrinsic factors influencing PDH's job choice across employment sectors.** Salary is the most important attribute across all sectors while the geographic location is the second most important in all sectors except for hospital pharmacy where roles were considered the second most influential. Promotion and/or specialisation opportunities have varied influences on PDHs' job choices across employment sectors. Both opportunities were not desirable in community pharmacy but were strongly preferred in the pharmaceutical industry, government/academia and non-pharmacy related sector. By contrast, only promotion opportunities were desirable in hospital and primary settings. In terms of geographic location, a consistent pattern of preferences was observed with urban being the strongest preference, followed by rural and remote areas.

Employment choices are independent of household income while the current geographic location positively influenced the job choice in the same location. These findings suggest that employment choices are a joint household choice in terms of geographic location rather than monetary factors. This means other factors such as employment opportunities for their partners, social networks etc. in their current geographic location may influence their employment choices.

Choice inertia testing shows that state-dependence does exist. This suggests that past choices influence preferences and may reduce the extent to which established pharmacists are willing to consider positions in other industries. As such, early exposure to various sectors such as internship programs etc. may help increase the uptakes of jobs, especially in primary care settings where the number of jobs is still small.

The findings in **Chapter 4** are crucial for policymakers who want to design a successful policy reform on the role expansion in several ways. On one hand, policymakers have to take into account the dynamic of the labour market for PDHs when introducing a reform on one or several job attributes in one sector. This study not only provides evidence on these dynamics but also quantifies the anticipated movements under several policy reform scenarios. On the other hand, this study provides evidence on the willingness of PDHs to adopt expanded roles with small or no financial incentives in rural and remote areas. This is an important implication to tackle both the shortage of pharmacists while implementing the role expansion of pharmacists in rural and remote areas.

Job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia

Building on the literature factors that influence job satisfaction of pharmacists, this chapter explores the relationship between job satisfaction and involvement in clinical activities among hospital and community pharmacists in Australia using Herzberg's Two Factor Principles as a conceptual framework. This framework is expanded to accommodate the association of mismatch between actual and minimum acceptable job characteristics and pharmacists' job satisfaction

An involvement in clinical activities was significantly associated with a level of job satisfaction only among community pharmacists. This finding suggests that recent policy attention aimed at transitioning the roles of community pharmacists to patient care may be aligned with their intrinsic motivation to provide more patient care. As such, this finding provides evidence that the policy of the role expansion of community pharmacists toward patient-centred care benefits not only the general public but also pharmacists themselves through increased job satisfaction. This may improve retention, reduce absenteeism and reduce the early recruitment of the pharmacist workforce.

Extrinsic factors (i.e. flexible work schedule, and salary) are positively associated with job satisfaction. As these factors are job context and granted to employees by employers (Herzberg, 1959), policymakers could use these factors in future policy initiatives to increase the level of job satisfaction.

Mismatches on the preference for employment sectors and flexible working schedule were negatively associated with job satisfaction while mismatch on intrinsic factors was not significantly associated with job satisfaction. While self-reported job satisfaction responses may partly reflect respondents' job preferences and values, explicitly unpacking the role of job values and work orientation provides new insights into the research area of job satisfaction. It underscores the importance of understanding workers' preferences and expectations, which, in our views, is a crucial step to building future policy initiatives focusing on the well-being of workers at work. As such, future efforts to match individuals' work preferences and expectations may be a way to increase job satisfaction in the future (Zou, 2015). As pharmacy associations and other key stakeholders design future policy directions, it is important to remember that a sufficient workforce will depend on the alignment of the proposed policy with CP preferences

7.1.2. Methodological contributions

This thesis makes a number of important methodological contributions in the area of DCE, in particular in the design of choice questions.

Intrinsic and extrinsic characteristics influencing Australian pharmacy degree holders' job preferences

Chapter 4 provides a comparison between forced and unforced choices in the context of a dual response discrete choice experiment to better understand the external validity of the DCE method. This study identifies that **the two forced and unforced choice datasets produce different preference estimates and welfare measures.** However, the direction of attributes' influence on the employment choices are consistent and as expected. Furthermore, the relative importance of attributes across alternatives and predictive uptakes differs between the two forced and unforced sets. These findings uniquely contribute to the existing literature on the differences in preference estimates between forced and unforced choices (Dhar & Simonson, 2003; Kallas & Gil José, 2012; Veldwijk et al., 2014) through the use of dual format while previous studies in which the unforced choice sets consist of all alternatives of the forced choice sets and an additional opt-out alternative have made the complexity of the forced and unforced choices sets incomparable. As the increase in choice complexity is expected to increase the choice of opt-out alternatives (Boxall et al., 2009), the differences between the forced and unforced choice set in these studies may be confounded with the effect of choice complexity. By utilising the dual-response format (Brazell et al., 2006) in the study presented in Chapter 4 disengaged the effect of choice complexity with differences between forced and unforced choice sets. This study underscores the importance of presenting unforced choices in DCEs to better represent the real market situation and reduce the hypothetical bias (Boxall et al., 2009; Ryan & Skåtun, 2004) by confirming that the forced and unforced choice sets produce different preference estimates even when controlling for the choice complexity.

A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment

Chapter 5 presents empirical evidence on how a PCSD with three alternatives can capture the same preference for attributes/attribute levels as the FCSD with six alternatives while reducing the cognitive burden by producing lower choice variances. However, the FCSD appears to induce larger heterogeneity around alternative labels, perhaps because more complex choice tasks provoke larger heterogeneity in processing strategies in a FCSD than in a PCSD. While there is a need for more studies on the convergent and external validity of PCSDs, this study shows a promising future use of PCSDs, indeed, their use is recommended in studies where choice task complexity is likely a burden for respondents. The results of this chapter support the use of PCSDs for surveys accessible by mobile phone as explicitly preferred by respondents and easy to read on a small screen.

7.2. Limitations and recommendations for future research

While each empirical chapter includes detailed discussions on limitations specific to each chapter, this section extends the discussion on some recurring limitations throughout the thesis, especially the three quantitative chapters. It also provides suggestions for future research.

Selection bias

Selection bias, a natural product of the limited sample size combined with the self-reported survey is perhaps a key limitation throughout three quantitative empirical chapters. Respondents who chose to complete the survey may be more motivated than those who did not. As such, this cohort of respondents is more likely to be advocates for any reform in the profession. The information collected from this group may not be representative of the whole population but it likely indicates the views of the most influential group of respondents on the future of the Australian Pharmacy workforce. Nonetheless, different approaches have been invested to mitigate this issue. For example, to overcome difficulties in respondent recruitment, different avenues of recruitment including the alumni databases, membership databases and media sources were used. Furthermore, a detailed investigation did show that the study sample is representative of the PDH population in terms of observed characteristics.

The pilot wave of PAMELA undertaken here has proven it possible to record a nationally representative sample of pharmacists. A range of recruitment strategies were tried to maximise recruitment, which provides valuable information to recruit for future waves. With additional support from pharmacy organisations and recognitions of the PAMELA 'brand' over time, it is expected that better recruitment rates can be achieved in the future. Ther are a few strategies are worth considering next time such as bigger financial incentives, paper mailing to individual pharmacy degree holders,

Small sample size

Another key limitation is that there were recruitment constraints for the PAMELA survey, which formed the basis of Chapters 4, 5, and 6. This led to a relatively small sample size which has constrained a number of econometric strategies across these three quantitative empirical chapters. Specifically, more advanced models to understand preference heterogeneity around attribute levels in Chapters 4 and 5 are limited due to the constraints on the number of observations. Although preference heterogeneity around the alternative labels as explored in these chapters has provided unique insights into the employment preferences of PDHs in (Chapter 4) and the influence of different choice set size (Chapter 5), further research would be valuable into the preference heterogeneity around attribute levels with the necessary data. The limited sample size combined with the cross-sectional nature of the data limited the ability to utilise different econometric strategies to infer causality between an extended clinical role and job satisfaction. Omission of information on some extant issues that may confound the relationship between involvement in clinical activities and job satisfaction may distort the relationship and bias results.

Generalisability

Care must be taken when generalising the results presented in this thesis to other settings. In terms of policy relevance, data are collected from Australia, a high-income county which has a very distinct healthcare system in which the current contribution of pharmacists is different from those in other countries. As such, findings may not be directly generalizable due to some unobserved factors. In terms of methodology, a highly educated sample of PDHs with higher mental capacity may limit the generalisability of the findings on the influence of the choice set size to intellectually different groups or general population in terms of heterogeneity and size of effects.

Despite some limitations, the PAMELA survey is one of the few examples internationally of attempting to analyse the preferences of the pharmacy workforce in response to proposed policy change. The PAMELA survey was designed as a pilot to determine the feasibility and acceptability of undertaking a larger, longitudinal pharmacist workforce study. The evidence produced from this pilot highlights the usefulness of collecting more detailed workforce data which can better inform evidence-based workforce planning.

7.3. Conclusion

The pharmacy workforce is an important part of the health system, especially given the pressures of an aging population, chronic disease epidemic and increasing workload of other health practitioners, such as doctors. This thesis provides new insights into the Australian pharmacy workforce, in particular providing evidence into the challenges and opportunities to better integrate community pharmacists into primary care to enhance population health. Additionally, the methodological contributions of this thesis extend the knowledge in the field of discrete choice experiments. The importance of the pharmacist workforce as a solution for the rising healthcare demand in Australia necessitates further works in this exciting and important area.

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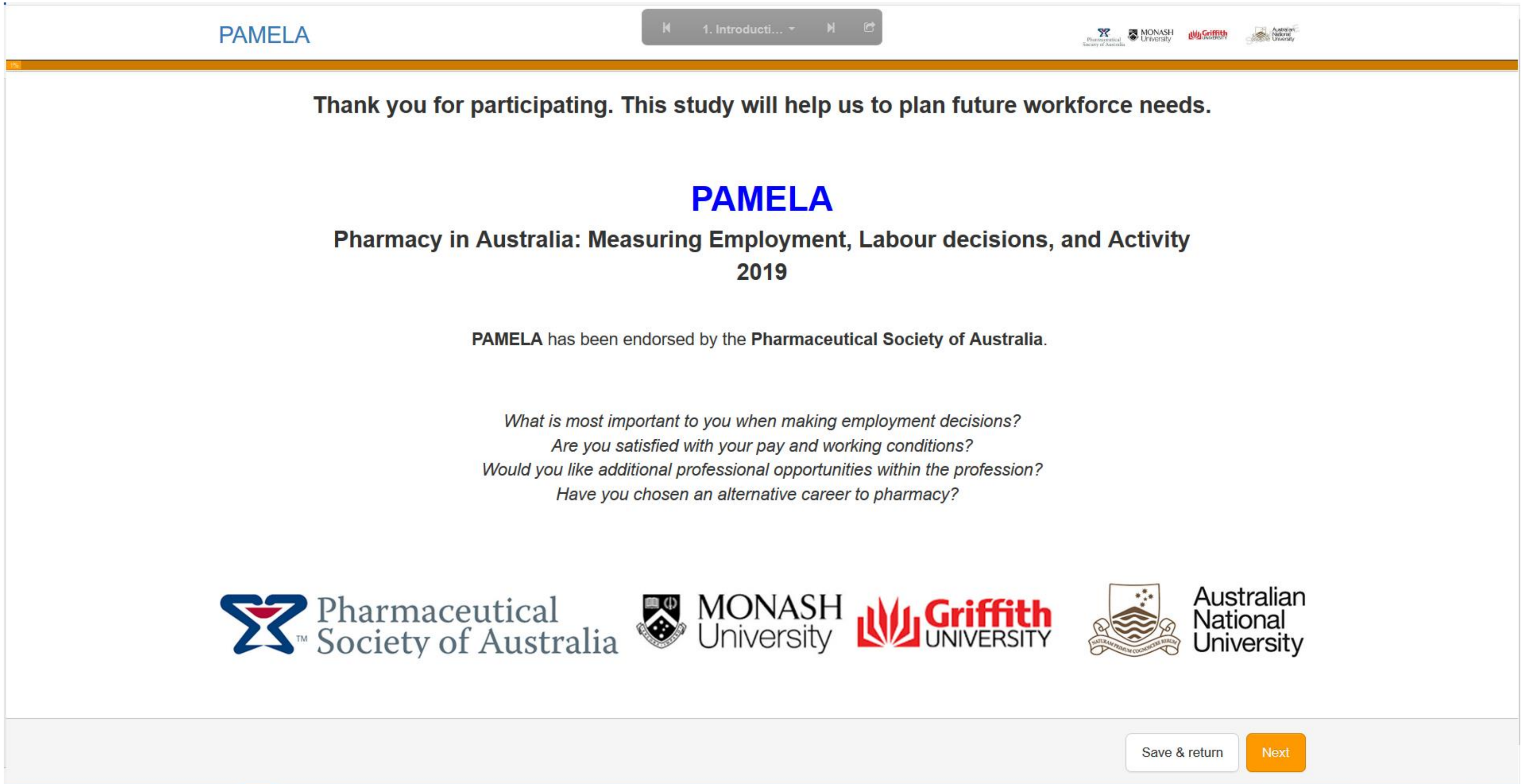
Appendix

Appendix 1. The PAMELA questionnaire



You are invited to take part in this **Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity (PAMELA)** survey. Please read this Participant Information and Consent Form in full before deciding whether or not to participate in this study.

If you have any questions about this survey, or you have problems completing it, please contact Thao Thai: (03) 99029847 / thao.t.thai@monash.edu

Participant Information and Consent Form

What is the purpose of this survey?

The purpose of this survey is to investigate the job choices, preferences and the workforce satisfaction of Australian pharmacy graduates. The aim is to provide policymakers, health professional groups and training institutions with more information about the changing nature of the pharmacy profession and how this impacts on workforce decisions.

By completing this online survey, you will help us to understand the issues of importance to contemporary pharmacists. We greatly appreciate your time and hope that you will find the questions and scenarios interesting and thought provoking. The survey will take approximately 20 minutes to complete.

Who is responsible for this research study?

This study is being run by the Centre for Health Economics, Monash University and the Centre for Applied Health Economics, Griffith University. It is supported by the Pharmaceutical Society of Australia (PSA) and pharmacy schools across Australia. The research team is led by Dr. Jean Spinks (Griffith University).

Possible benefits and risks

Whilst the research team do not anticipate any direct benefits from your participation in this survey, we expect the combined results to inform future pharmacy workforce policies.

By completing the survey you will have a chance to enter the prize draw to win one of five vouchers worth $200. Please enter your contact details at the end of the survey to enter the draw. Please note that the prize draw is voluntary and we do not store contact information in the same data file as survey responses. Your responses are kept anonymous regardless your participation in the prize draw.

There are no foreseeable risks associated with your participation.

Confidentiality

The research team is legally obliged to keep all data (i.e. your answers to survey questions) in a password protected electronic file at Monash and Griffith Universities for a period of five years before being destroyed.

Responses from all survey participants will be anonymised and combined. You will not be identifiable by name or locality in any presentation or publication arising from the results of this survey.

Results

The results of this research will guide pharmacy workforce policies, including the delivery of professional services by pharmacists. The results will also help to inform decisions about the remuneration of pharmacists, as well as future training requirements.

The results will be published in academic journals and conference presentations, and will be in part fulfilment of a doctoral thesis for a student researcher (Thao Thai).

If you would like a plain language summary of the study results, you may request this by contacting Thao Thai: thao.t.thai@monash.edu

Instruction for participants

If you cannot complete the survey in one attempt, the "save and return" button provides you a link which you have to save for later use. Please note that the link which you save will expire after one week.

Ethics Approval

This study has been approved by the Human Research Ethics Committees for Griffith University (GU Ref No: 2017/991) and Monash University (MU Ref No: 11845).

If you have any concerns or complaints about the ethical conduct of this research study, you are encouraged to contact the Manager, Griffith University Research Ethics Committee: 07 3735 4375 / research-ethics@griffith.edu.au

CONSENT FORM

Participation is voluntary and you may withdraw at any time. However, after submitting the survey, you will not be able to revise your answers nor withdraw from the study as all responses will be combined and anonymised at that point.

By agreeing to participate in the survey, I confirm that:

- I have read the Participant Information Sheet.
- I understand the purpose of the research study and my involvement in it.
- I understand that I may withdraw from the research study at any stage and that this will not affect my status now or in the future.
- I understand that while information obtained from the survey may be published, I will not be able to be identified and my personal results will remain confidential unless, in the extremely unlikely event, they are required by law.

Do you agree to participate?

I do not agree to participate

I agree to participate

Section1: Your current situation

1. Which of the following statements **best** describes your **current** employment status?

    empstat

Answers:

Practicing as a pharmacist (a fulltime/part-time or casual job that requires an AHPRA pharmacist registration)

Working in a pharmacy/non-pharmacy related position and practicing as a pharmacist

Working in a pharmacy-related field or position, but not practicing as a pharmacist at all

Working in a career not related to pharmacy and not practicing as a pharmacist at all

Undertaking pharmacy-related higher education

Undertaking non-pharmacy-related education

Unemployed but seeking employment

Unemployed but not seeking employment

Retired, I no longer practice pharmacy

Other, please specify

$empstat==4

1. You are working in a career not related to pharmacy. What is your current **occupation?**

Answer

$empstat==6

2. Please specify your **field of study**.

Answer

If $empstat>4 and $empstat<10, go to "DCE" section

Section 2: About your primary employment (i.e. in which you are working most of the time)

1. Which of the following settings best describes your **primary sector of employment**?

   If you are working in a career not related to pharmacy, please choose "Non-pharmacy related job".

   Answers:

   Hospital pharmacy

   Community pharmacy

   Primary healthcare settings (Non-dispensing pharmacist)

   Pharmaceutical industry

   Pharmacy government sector or Academic institution

   Other, please describe:

   If $priplace=1

2. Which of the following best describes **your current role**?

   Answers:

   Medicine distribution

   and dispensing

   Clinical practice

   Education/clinical research

   Other, please describe

   If $priplace=2

   Answers:

Mainly dispensing

Professional services

Combination of dispensing and professional services

Other, please describe

If $priplace=3

General practice pharmacist

Aged/residential care pharmacist

Other, please describe

If $priplace==4

Which of the following best describes your current role?

Answers:

Sales or marketing

Medical or regulatory affairs

Research and development

Other, please describe

$priplace==5

Which of the following best describes your current role?

Answers:

Policy-related

Teaching and/or Research

Other, please describe

If $emstat==4|| $priplace ==6

Which of the following best describes your current role?

Answers:

Health-related (e.g. doctor/nurse/ etc.)

Non-health related (e.g. accountant/lawyer, etc.)

Other, please describe

3. Do you have **a flexible working schedule** (i.e. able to dictate your work schedule to suit your needs (after hours, weekend hours, etc.) in your primary employment?

Answers:

No. My working schedule is set by my employer and I cannot dictate it to suit my need

Yes. I can set my working schedule to suit my needs in most cases

Other, please specify

4. Regarding your **future career progression** in your primary place of employment, would you describe it as having:

Answers:

None- No opportunity for promotion (e.g. higher positions) or specialization (e.g. accrediting as a specialist in your area of work)

Specialization only-Opportunity for specialization (e.g. accrediting as a specialist in your area of work) but no opportunity for promotion (e.g. higher positions)

Promotion and specialization-Opportunity for promotion (e.g. higher positions) and specialization (e.g. accrediting as a specialist in your area of work)

Other, please specify

5. Please indicate your **main** work locality?

Answer:

Urban

Rural

Remote

6. What is your (approximate) **total gross personal income** (i.e. before tax) from your primary employment? **Answers:**

$1-$149 weekly ($1-$7,799 per annum)

$150-$299 weekly ($7,800-$15,599 per annum)

$300-$399 weekly ($15,600-$20,799 per annum)

$400-$499 weekly ($20,800-$25,999 per annum)

$500-$649 weekly ($26,000-$33,799 per annum)

$650-$799 weekly ($33,800-$41,599 per annum)

$800-$999 weekly ($41,600-$51,999 per annum)

$1,000-$1,249 weekly ($52,000-$64,999 per annum)

$1,250-$1,499 weekly ($65,000-$77,999 per annum)

$1,500-$1,749 weekly ($78,000-$90,999 per annum)

$1,750-$1,999 weekly ($91,000-$103,999 per annum)

$2,000-$2,999 weekly ($104,000-$155,999 per annum)

$3,000 or more weekly ($156,000 or more per annum)

Prefer not to say

7. Thinking back to when you decided to accept your current job, what other jobs were offered at the time? **(Tick all that apply)**

Hospital pharmacy

Community pharmacy

Primary healthcare settings (Non-dispensing pharmacist)

Pharmaceutical industry

Pharmacy government sector or Academic institution (e.g. university)

Non-pharmacy related employment

I was not offered other jobs

I cannot remember

Other, please describe

Section 3: Preferences for different types of employment

Imagine you are looking for a new job. In the section that follows, you will be asked a series of choice questions concerning six different (types of) jobs. These jobs are defined as follows:

Alternatives	Definitions
Hospital pharmacy	Employment in a hospital pharmacy department
Community pharmacy	Employment in a community pharmacy
Primary healthcare setting	Non-dispensing pharmacists employed in general practices or aged/residential care facilities
Pharmaceutical Industry	Employment in a pharmaceutical firm
Government/Academia	Employment in a national/local government organisation or an academic institution such as a university/research centre
Non-pharmacy related sector	Employment in another field, which may be health-related (e.g. medicine, dentistry, etc.) or non-health related (e.g. accounting, law, etc.)

Each job is described by the following five attributes

Attributes	Definitions
Your role	Duties that you are expected to perform in the context of your job
Flexible work schedule	Whether you are able to dictate your work schedule to balance your work and non-work commitments (e.g. after hours, weekend hours, etc.)
Career progression	Whether you have opportunities for career progression
Geographic location	Your place of work
Annual salary	Your annual earnings for a full-time equivalent position, including any bonuses

*Please note that all jobs differ according to the characteristics outlined above while **all other characteristics are assumed to be the same across all jobs**.*

These definitions below are added as "hover" definitions attached to levels

Attributes	Attributes levels	Definitions
Your role	**Medicine dispensing/ distribution**	Your roles may include procuring stocks and supplying medicines to other departments or reviewing and dispensing medicines for patients attending outpatient clinics or at discharge from the hospitals
	Clinical practice	Your roles may include reviewing medication charts in hospital wards/transitional care and collaborating with other health professionals to ensure the Quality Use of Medicine and improve patients' quality of life
	Clinical research/Education	Your roles may include providing education and training on pharmaceutical knowledge for other healthcare professionals and students or conducting clinical trials/ research in hospitals
	Mainly dispensing	Your roles may include preparing, distributing and administering medication, dose aid administration (webster packs, dosette box, etc) packing and patient counselling, as required
	Providing professional services	Your roles may include providing Medication review services (e.g. MedsCheck, Diabetes) and/or other patient care services not related to medication dispensing (e.g. immunisations, physical examinations etc.)
	Combination of dispensing and providing professional services	Your roles may include dispensing medicines, patient counselling, medication review and other patient care services based on customers' demand
	General practice Pharmacist	As a non-dispensing pharmacist embedded in a general practice, you work directly and collaboratively with GPs and other health professionals to support the quality use of medicines
	Aged care pharmacist	As a non-dispensing pharmacist embedded in an aged/residential care facility, you work directly and collaboratively with other health professionals to support the quality use of medicines
	Sales or Marketing	You roles may include promotes company's products to clients and manage the performance and profitability of company products
	Medical or Regulatory Affairs	Your roles may include providing medical information and reporting drug safety information or preparing and reviewing new drug applications, labels, reports and regulatory submissions
	Research and Development	Your roles may include develop or conduct clinical trials for the development of new drugs
	Policy-related role	Your roles may include undertaking activities and projects to inform policy and strategic directions

	Teaching or Research	Your roles may include teaching (e.g. composing and presenting lecture materials) or conducting research
	Health related role	You are working in a health-related occupation such as medicine, dentistry, etc.
	Non health related role	You are working in a non-health related occupation such as accounting, law, etc.
Flexible work schedule	**No**	Your schedule are set by employer and you cannot dictate it to suit your need
	Yes	You can set your own working schedule to suit your need in most cases
Career progression	**Limited**	Limited promotion opportunities
	Sufficient	There are sufficient promotion opportunities
	Limited but having specialization opportunities	Limited promotion opportunities but having opportunities for specialization
Geographic location	**Urban**	
	Rural	
	Remote	
Annual salary	**$60,000**	
	$100,000	
	$140,000	
	$180,000	
	$220,000	

Please note that all jobs differ according to the characteristics outlined above while all other characteristics are assumed to be the same.

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Example: In the following scenario, the participant chooses "Hospital pharmacy" as their preferred job. When comparing this choice to their current job, the participant considers their preferred choice is better than their current job.

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Clinical practice	Mainly providing professional services	Aged/residential care pharmacists	Sales or Marketing	Policy related	Non-health related
Flexible work schedule	Yes	Yes	No	No	No	No
Career opportunities	Specialization only	Promotion and specialization	None	Promotion and specialization	None	Promotion and specialization
Geographic location	Rural	Remote	Rural	Rural	Urban	Urban
Annual Salary	$180,000	$180,000	$180,000	$180,000	$100,000	$180,000
Which job would you choose?	✓	○	○	○	○	○

Compare your chosen job to your current job and indicate which one you prefer?

Select only one answer

My choice above	My current job
✓	○

Please note that this is an example only. You are not required to make choices as these have been pre-selected. When you have finished reading, press "next" to proceed.

In the following choice scenarios, please choose your **preferred** job.

Although the questions may appear to be similar, please note that the descriptions **differ** in every choice scenario. Please read each scenario carefully before making your choice.

Please answer all questions and assume that these are **all full-time** positions and they are the only options **available** to you**.** <u>There are no right or wrong answers</u>.

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In the following choice scenario, please choose your preferred job.

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Education/Clinical research	Combination of dispensing and providing professional services	Aged/residential care pharmacists	Research and Development	Policy related	Health-related
Flexible work schedule	No	No	No	No	No	Yes
Career opportunities	None	Specialization only	Specialization only	Promotion and specialization	Promotion and specialization	Promotion and specialization
Geographic location	Rural	Remote	Urban	Urban	Urban	Remote
Annual Salary	$100,000	$180,000	$140,000	$140,000	$60,000	$100,000
Which job would you choose?	○	○	○	○	○	○

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**
○	○

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17. Q1 E1

PAMELA

In the following choice scenario, please choose your preferred job.

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Education/Clinical research	Mainly providing professional services	Aged/residential care pharmacists	Medical or Regulatory Affairs	Research or Teaching	Health-related
Flexible work schedule	No	No	No	Yes	No	Yes
Career opportunities	Promotion and specialization	None	Promotion and specialization	Promotion and specialization	Promotion and specialization	None
Geographic location	Urban	Urban	Remote	Rural	Rural	Urban
Annual Salary	$140,000	$100,000	$60,000	$100,000	$180,000	$140,000
Which job would you choose?	○	○	○	○	○	○

Compare your chosen job to your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**
○	○

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PAMELA

In the following choice scenario, please choose your preferred job.

	Hospital pharmacy	Community pharmacy	Primary healthcare setting	Pharmaceutical Industry	Government/ Academia	Non-pharmacy related job
Your role	Clinical practice	Combination of dispensing and providing professional services	Aged/residential care pharmacists	Medical or Regulatory Affairs	Policy related	Non-health related
Flexible work schedule	No	Yes	Yes	Yes	Yes	No
Career opportunities	None	Promotion and specialization	Promotion and specialization	None	Promotion and specialization	Promotion and specialization
Geographic location	Rural	Rural	Urban	Urban	Urban	Urban
Annual Salary	$60,000	$60,000	$140,000	$100,000	$60,000	$60,000
Which job would you choose?	○	○	○	○	○	○

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	My current job
○	○

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How difficult was it to make a choice in the first three presented scenarios that contained **6** different jobs?

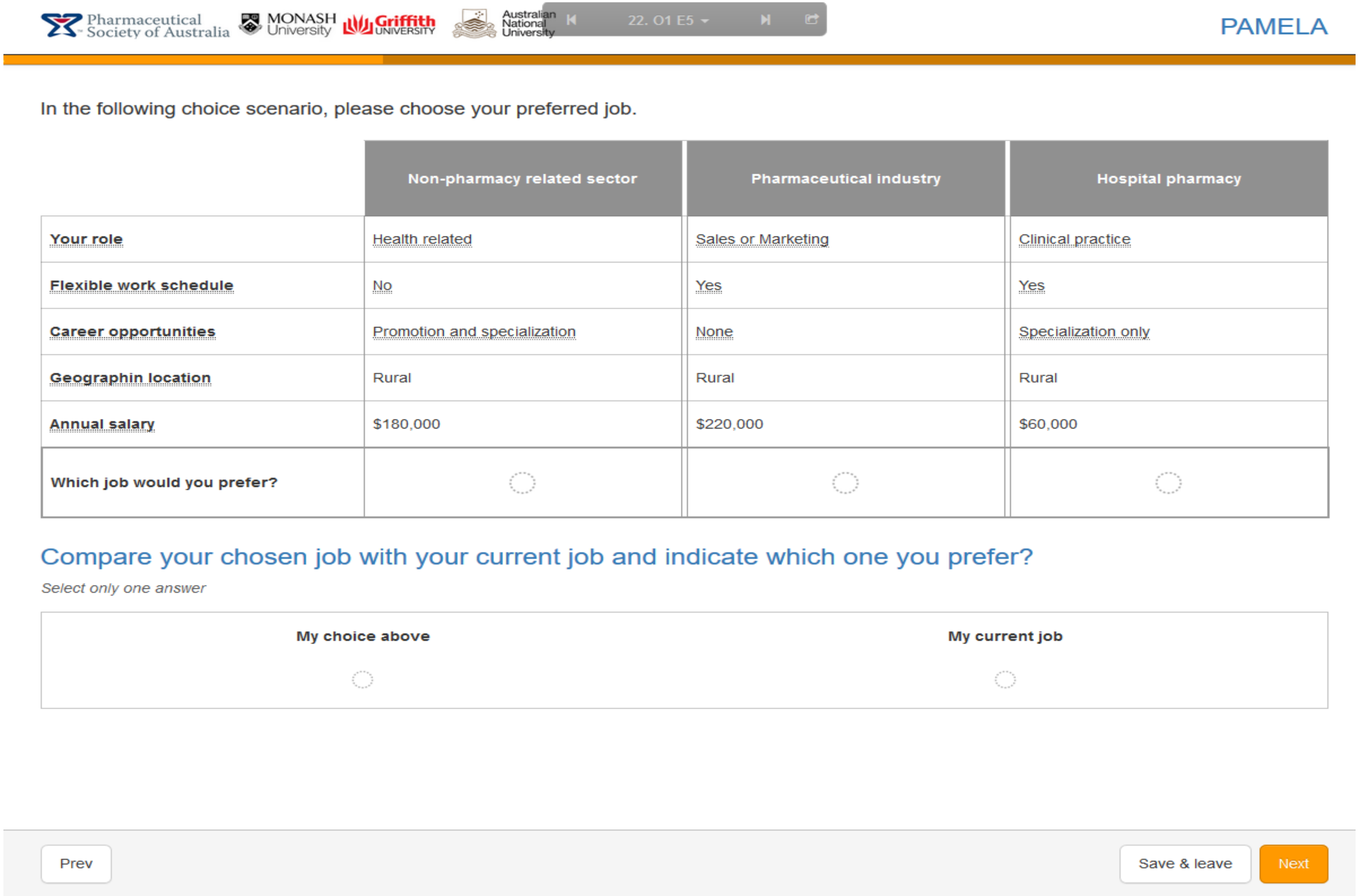
Very difficult

Difficult

Neutral

Easy

Very easy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22. Q1 E5
PAMELA
In the following choice scenario, please choose your preferred job.
Non-pharmacy related sector
Pharmaceutical industry
Hospital pharmacy
Your role
Health related
Sales or Marketing
Clinical practice
Flexible work schedule
No
Yes
Yes
Career opportunities
Promotion and specialization
None
Specialization only
Geographin location
Rural
Rural
Rural
Annual salary
$180,000
$220,000
$60,000
Which job would you prefer?
Compare your chosen job with your current job and indicate which one you prefer?
Select only one answer
My choice above
My current job
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25. O1 E7

PAMELA

In the following choice scenario, please choose your preferred job.

	Pharmaceutical industry	Government/Academia	Community pharmacy
Your role	Sales or Marketing	Teaching and/or research	Combination of dispensing and professional services
Flexible work schedule	Yes	No	Yes
Career opportunities	Promotion and specialization	None	None
Geographin location	Urban	Rural	Rural
Annual salary	$100,000	$60,000	$60,000
Which job would you prefer?	○	○	○

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	My current job
○	○

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PAMELA

In the following choice scenario, please choose your preferred job.

	Government/Academia	Government/Academia	Non-pharmacy related sector
Your role	Policy related	Teaching and/or research	Health related
Flexible work schedule	No	No	Yes
Career opportunities	Promotion and specialization	None	None
Geographin location	Rural	Urban	Urban
Annual salary	$60,000	$180,000	$180,000
Which job would you prefer?	○	○	○

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**
○	○

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In the following choice scenario, please choose your preferred job.

	Non-pharmacy related sector	Primary healthcare settings	Government/Academia
Your role	Health related	General practice pharmacist	Policy related
Flexible work schedule	Yes	No	No
Career opportunities	None	None	None
Geographin location	Rural	Remote	Rural
Annual salary	$60,000	$60,000	$180,000
Which job would you prefer?	○	○	○

Compare your chosen job with your current job and indicate which one you prefer?

Select only one answer

My choice above	**My current job**
○	○

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How difficult was it to make a choice in the last four presented scenarios that contained 3 different jobs?

Very difficult

Difficult

Neutral

Easy

Very easy

Debriefing

1. Thinking about all the job choice questions you have answered, you were presented with scenarios that contained 6 jobs and asked to choose between the jobs. You were also presented with another set of scenarios that contained 3 jobs and asked to choose between the jobs. Which type of scenarios did you prefer? Please use the pop-up embedded in the blue text in each option to remind yourself the type of choice questions.

Answer

I preferred choice questions which presented 6 jobs like THIS (Pop-up example)

I preferred choice questions which presented 3 jobs like THIS (Pop-up example)

I had no preference

Followed by an open question:

Why did you prefer questions that presented 6 jobs?/ **Why** did you prefer questions that presented 3 jobs?

2. What employment sectors have you worked in?

Hospital pharmacy

Community pharmacy

Primary healthcare settings (Non-dispensing pharmacist)

Pharmaceutical industry

Pharmacy government sector or Academic institution (e.g. university)

Non-pharmacy related employment

Other, please describe

Please think about your life situation and imagine undertaking a search for another job. Now answer the questions below

3. What sectors of employment would you NEVER consider, even if they were the only jobs available at the time? (Check all that apply)

Please answer this question and assume all other characteristics are the same across these jobs.

Hospital pharmacy

Community pharmacy

Primary healthcare setting

Pharmaceutical industry

Government/Academia

Non-pharmacy related

I would consider all jobs

4. Which roles would you NEVER consider when making your job decision, even if they were the only jobs available at the time? (Check all that apply)

Please answer this question and assume all other characteristics are the same across these jobs.

Medicine distribution/dispensing

Clinical practice

Education

Research

Providing professional services

Combination of dispensing and professional services

General practice pharmacist

Aged/residential care pharmacist

Sales or marketing

Medical or regulatory affairs

Policy-related

Non-pharmacy but health-related role

Non-health related role

I would consider all roles

5. Would you consider accepting a job that does not offer a flexible work schedule?

Please answer this question and assume all other characteristics are the same across these jobs.

Yes

No

Other

6. What degree of opportunity for career progression would you NEVER consider when making your job decision, even if they were the only jobs available at the time?

Please answer this question and assume all other characteristics are the same across these jobs.

None- No opportunity for promotion (e.g. higher positions) or specialization (e.g. accrediting as a specialist in your area of work)

Specialization only-Opportunity for specialization (e.g. accrediting as a specialist in your area of work) but no opportunity for promotion (e.g. higher positions)

Promotion and specialization-Opportunity for promotion (e.g. higher positions) and specialization (e.g. accrediting as a specialist in your area of work)

Other, please specify:

I would consider all jobs regardless of career progression opportunities

7. Which geographic locations would you NEVER consider when making your job decision, even if they were the only jobs available at the time? (Check all that apply)

Please answer this question and assume all other characteristics are the same across these jobs.

Urban

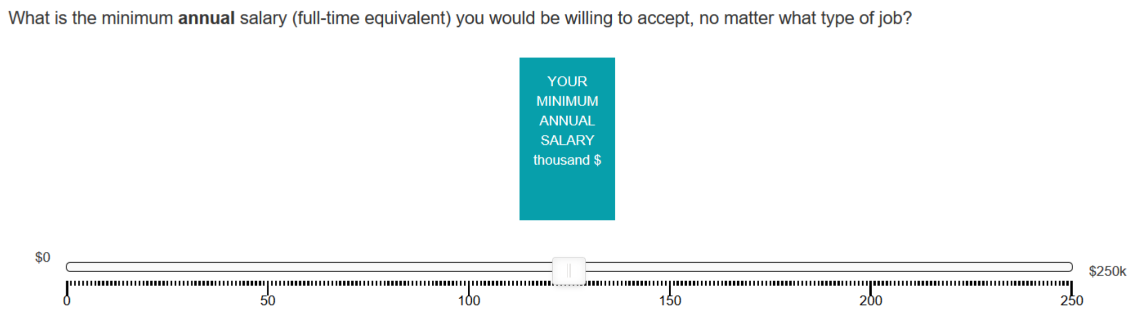
Rural

Remote

I would consider all jobs regardless of geographic location

Other, specify

8. What is the minimum **annual** salary you would be willing to accept, no matter what type of job?



Section 4: About your Work

1. When did you start working in your current primary employment?

Answers: drop down year

2. How many **paid hours** do you work in a **typical week** at your primary employment?

Answers:

Less than 5 hours

5-10 hours

10-15 hours

15-20 hours

20-25 hours

25-30 hours

30-35 hours

35-40 hours

40-45 hours

45+ hours

3. Would you like to **change** your **paid hours** of work?

Answers:

No

Yes, I'd like to increase my hours

Yes, I'd like to decrease my hours

4. Please indicate how **satisfied or dissatisfied** you are with each of the various aspects of your work in **your primary employment**

Row Questions:

The work itself (what you do)

Your total pay

Opportunities to use your training and skills

Your hours of work

The flexibility available to balance work and non-work commitments

Your promotion opportunities

Taking everything into consideration, how do you feel about your current employment?

Answers:

Very dissatisfied

Dissatisfied

Neither

Satisfied

Very satisfied

5. Please indicate how **easy or difficult** it would be for you to **find another job** with better characteristics than your current job. These characteristics are listed below**;** if an item is not applicable, please tick N/A.

Row Questions:

Better schedule

Better career progression opportunities

Better geographic location

Better pay

In general, how easy would it be to find an acceptable job alternative?

Answers:

Very difficult

Difficult

Neither difficult nor easy

Easy

Very easy

N/A

6. Currently, do you have **secondary** employment from another employer?

Answers:

Yes

No

$secondjob==1

7. Which of the following **settings** best describe your secondary place of employment?

Answers:

Hospital pharmacy

Community pharmacy

Primary healthcare setting

Pharmaceutical industry

Government/Academia

Non-pharmacy related

Other, please describe:

8. How many **hours** do you work in a typical week at your secondary employment?

Answers:

Less than 5 hours

5-10 hours

10-15 hours

15-20 hours

20-25 hours

25-30 hours

30-35 hours

35-40 hours

40-45 hours

45+ hours

9. What are your (approximate) total gross personal income (i.e.before tax) from your second employment? (If possible, base this on your last personal income tax return or payslip)

Answer

$1-$149 weekly ($1-$7,799 per annum)

$150-$299 weekly ($7,800-$15,599 per annum)

$300-$399 weekly ($15,600-$20,799 per annum)

$400-$499 weekly ($20,800-$25,999 per annum)

$500-$649 weekly ($26,000-$33,799 per annum)

$650-$799 weekly ($33,800-$41,599 per annum)

$800-$999 weekly ($41,600-$51,999 per annum)

$1,000-$1,249 weekly ($52,000-$64,999 per annum)

$1,250-$1,499 weekly ($65,000-$77,999 per annum)

$1,500-$1,749 weekly ($78,000-$90,999 per annum)

$1,750-$1,999 weekly ($91,000-$103,999 per annum)

$2,000-$2,999 weekly ($104,000-$155,999 per annum)

$3,000 or more weekly ($156,000 or more per annum)

Prefer not to say

10. Consider your **career plans** for the next **three** years, how likely are you to be working in the following areas?

Row Questions:

Practising as a pharmacist (in hospital, community pharmacy or primary healthcare setting, etc.)

Working in pharmacy-related sectors (e.g. pharmaceutical industry, government or academia) but not practising as a pharmacist

Working in a different profession from pharmacy

Not working at all (due to retirement, returning to study, family commitment, etc.)

Answers:

Very unlikely

Unlikely

Neutral

Likely

Very likely

N/A

11. Please use the scale below to share your thoughts about **pharmacy as a profession**.

Row Questions:

If I could do it all over again, I would still choose to work in the pharmacy profession

For me, pharmacy is the ideal profession for my life's work

I am disappointed that I entered the pharmacy profession

I like this profession too much to give it up

If I could go into a different profession, but which paid the same as pharmacy, I would probably do so.

Answers:

Strongly disagree

Disagree

Neutral

Agree

Strongly agree

12. Are you currently a member of any professional association (e.g. PSA, SHPA, etc)?

Yes

No

13. Please consider the following statements about **professional development opportunities**, and answer all that apply. (Please insert N/A if the statement does not apply)

If you would like to further specialize and improve your clinical skills, please specify the areas of clinical practice:

If you would like to work more with other health professionals, please state which health professionals:

If you would like more opportunities to learn management skills, please specify which particular skills (e.g. personnel, budget)

If you would like access to a mentor for your clinical practice, please type "YES"

14. The PSA document "Pharmacists in 2023" proposes that future remuneration of professional community pharmacist services should be linked to quality and outcome measures. Please rank the following options for professional services remuneration in order of preference where 1=least preferred and 5=most preferred.

Row Questions:

Continue community pharmacy agreement funding on a fee-for-service basis (e.g. MedsCheck, Diabetes MedsCheck, HMR, clinical intervention)

Switch to Medical Benefits Scheme (MBS) funding on a fee-for-service basis

Switch to a fee-for-outcome funding model (e.g. “Percentage of patients with a pharmacy-led medicines reconciliation within 24 hours after discharge from hospital”)

A combination of fee-for-service and fee-for-outcome system

Answer

1_least preferred

2

3

4

5_most preferred

Section 6: About your work history

Display Condition ($empstat>1)

1. Have you ever **practised** as a pharmacist (a role that requires an **AHPRA pharmacist registration**) since graduating with your first pharmacy degree?

Answers:

Yes

No

If ($pastphar==1)

2. How **long (in total)** have you practised as a pharmacist?

Answers:

Less than one year

1-2 years

2-3 years

3-4 years

4-5 years

5-6 years

6-7 years

7-8 years

8-9 years

9-10 years

10-11 years

11-12 years

12-13 years

13-14 years

14-15 years

15-16 years

16-17 years

17-18 years

18-19 years

19-20 years

20-21 years

21-22 years

22-23 years

23-24 years

24-25 years

25-26 years

26-27 years

27-28 years

28-29 years

29-30 years

30+ years

3. In which **areas of pharmacy** have you practised?

Answers:

Hospital pharmacy

Community pharmacy

Primary healthcare setting

Other, please describe:

4. In which area of pharmacy did you **last** practise?

Answers:

Hospital pharmacy

Community pharmacy

Primary healthcare setting

I have not practised anywhere

Other, please describe:

If ($empstat>1)

5. What was the reason that you **no longer practice** as a pharmacist?

Answers:

I wanted a job with better career progression opportunities.

I wanted a job with better pay.

I wanted a job with more flexible working hours.

I wanted higher job satisfaction.

I wanted a job without weekend and night shifts.

I wanted a job with more intellectual challenges

Pharmacy was always a stepping stone to other things

Ill health

Family reasons

Retired

Other, please describe

If ($empstat>1)

6. Do you intend to **return to practice** as a pharmacist in the future?

Answers:

Yes

No

Unsure

Section 7: About your family

1. What is your relationship status?

Answers:

Single

Partnered/Married

Separated/Divorced

Widowed

Other

If $marital==2

2. What is the current employment status of your partner/spouse?

Answers:

Not currently in the paid work force

Engaged in unpaid work (e.g. caring for dependents, studying)

Currently seeking paid work

In full-time employment

In part-time employment

Retired from paid employment

Other, please describe

3. How many children under the age of **5** live with you (whether part-time or full time)?**Answers:**

4. What is your total **gross HOUSEHOLD income (before tax) per week**? (Include y**our and your partner's** earnings, and any income from other business interests, dividends,

etc.)

Answers:

Less than $499 weekly (Less than $25,999 per annum)

$500-$649 weekly ($26,000-$33,799 per annum)

$650-$799 weekly ($33,800-$41,599 per annum)

$800-$999 weekly ($41,600-$51,999 per annum)

$1,000-$1,249 weekly ($52,000-$64,999 per annum)

$1,250-$1,499 weekly ($65,000-$77,999 per annum)

$1,500-$1,749 weekly ($78,000-$90,999 per annum)

$1,750-$1,999 weekly ($91,000-$103,999 per annum)

$2,000-$2,999 weekly ($104,000-$155,999 per annum)

$3,000-$3,999 weekly ($156,000-$207,948 per annum)

$4,000-$4,900 weekly ($208,000-$259,948 per annum)

$5,000-$5,999 weekly ($260,000-$311,948 per annum)

$6,000 or more weekly ($312,000 or more per annum)

Prefer not to say

5. Where do you live? (postcode). Please write "**9999**" if you are living overseas.

Text Question

Section 8: About you

1. What year were you born?

Answers:

Drop down

2. gender Single Choice

Answers:

Male

Female

Gender diverse

Prefer not to say

3. Where did you complete your Bachelor of Pharmacy (or equivalent undergraduate pharmacy qualification)?

Answers:

Australia

Other country, please specify

4. In which **Australian university** did you complete your Bachelor of Pharmacy

(or equivalent undergraduate pharmacy qualification)?

Answers:

Charles Darwin University [CDU]

Charles Sturt University [CSU]

Curtin University of Technology [CURTIN]

Griffith University [GRIFFITH]

James Cook University [JCU]

La Trobe University [LA TROBE]

Monash University [MONASH]

Queensland University of Technology [QUT]

RMIT University [RMIT]

University of Canberra [CANBERRA]

University of Newcastle [NEWCASTLE]

University of Queensland [QUEENSLAND]

University of South Australia [UniSA]

University of Sydney [SYDNEY]

University of Tasmania [TASMANIA]

University of Technology Sydney [UTS]

University of Western Australia [UWA]

Other

5. In **which year** did you complete your Bachelor of Pharmacy degree (or equivalent Undergraduate pharmacy qualification)?

Answers:

6. What is your level of **registration with AHPRA**?

Answers:

Practicing

Provisional

Limited

Non-practicing

I don't currently have an AHPRA registration

7. What is your highest **pharmacy-related qualification**?

Answers:

Bachelor degree

Certificate

Postgraduate diploma

Master degree

Doctorate (PhD)

Other

8. Have you obtained any other **non-pharmacy related qualifications**?

Answers:

Yes

No

If $nonpqua==1

9. What is your highest **non-pharmacy qualification**?

Answers:

Bachelor degree

Certificate

Postgraduate diploma

Master degree

Doctorate (PhD)

Other

10. Below are five statements that you may agree or disagree with. Using the 1-7 scale below, please indicate your agreement with each item. Please be open and honest in your responding.

In most ways, my life is close to my ideal.

The conditions of my life are excellent.

I am satisfied with my life.

So far I have gotten the important things I want in life.

If I could live my life over, I would change almost nothing.

Answer

Strongly disagree

Disagree

Slightly disagree

Neither agree or disagree

Slightly agree

Agree

Strongly agree

11. Would you describe your **health** as:

Answers:

Poor

Fair

Good

Very good

Excellent

12. Are you, in general, a person who takes risks or do you evade risks?

Answers:

Not at all prepared to take risks

Not much prepared to take risks

Neutral

Somewhat prepared to take risks

Very much prepared to take risks

13. Are you happy for us to contact you **in 12 months** for a follow-up survey?

Please note that all responses will remain **anonymous**, even if you provide contact details. Your details **will not** be passed on to any third party organizations.

Answers:

Yes

No

14. Would you like to enter the draw for a chance to win a $200 voucher?

Yes

No

If agreed, respondents was routed to a separate survey to collect their email address for recontact and/or incentive payment.

15. A. Can we have your permission to contact you via email as part of the **prize draw**?

Yes

No

B. Can we have your permission to contact you via email for **further studies?**

Yes

No

16. Please provide your **email address.**

Please note that all responses will remain **anonymous**, even if you provide contact details. Your details will not be passed on to any third party organizations.

Thank you for completing the survey

Appendix 2. Data collection

Appendix 2.1. PSA invitation email

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Have your say on the future of the Pharmacy Workforce

Dear <<First Name>>,

Are you satisfied with your pay and working conditions?
What is most important to you when making employment decisions?
Would you like additional professional opportunities within the profession?
Have you chosen an alternative career to pharmacy?

Your answers to these questions will help us understand your preferences, your motivation and work satisfaction. In the era of rising health care costs and continuing demands for quality improvements, understanding what you want is crucial for pharmacy workforce planning and patient care.

"It is critical that you have your say to help guide the future of the pharmacy workforce, I strongly urge you to participate" *A/Prof Chris Freeman, PSA President*

PSA invites you to participate in the national survey of pharmacists (**PAMELA**), which is being conducted by the Centre for Applied Health Economics, Griffith University, and the Centre for Health Economics, Monash University, in conjunction with the Pharmaceutical Society of Australia and collaborating Universities. The information you provide in the PAMELA survey will be used to:

- Facilitate future policies on the recruitment and retention of the pharmacy workforce
- Improve the integration of pharmacists into the healthcare system
- Improve your work satisfaction and well-being
- Improve patient care

PAMELA has been endorsed by the Pharmaceutical Society of Australia and supported by pharmacy schools across Australia.

Please access the survey by clicking on the following link:

Access The Survey

- Please complete the survey within two weeks

- Please set aside 20-25 minutes to complete the survey. If you cannot complete the survey in one attempt, the "save and return" button provides you with a link which you have to save for later use.
- Some survey questions cannot be read on a mobile phone. Please use a desktop, laptop or tablet to open the link and complete the survey.

If you have any queries, please feel free to contact Monash researcher Thao Thai by email.

Have your say to shape the Australian pharmacy workforce. On behalf of the research team and Griffith University's Dr Jean Spinks BPharm PhD, PSA sincerely thanks you in anticipation.

Yours sincerely,
PSA Member Services

Pharmaceutical Society of Australia
Level 1, 17 Denison St, Deakin ACT 2600
1300 369 772
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Appendix 2.2. SHPA e-newsletter

From: news@shpa.org.au
Date: 14 November 2019 at 8:40:30 am AEDT
To: "SHPA Staff" <staff@shpa.org.au>
Subject: SHPA eNews 13 November 2019 | Warning on antibiotic overprescribing; Tech Standard published; MM2019 to take over Gold Coast!
Reply-To: news@shpa.org.au

Not loading properly? View this email in your browser

eNews

Wednesday 13 November 2019

Major moment for technicians as new Standard of Practice released

In a **milestone for SHPA's Tech Role Redesign Project**, Chapter 12 of the Clinical Pharmacy Standards – the *Standard of Practice for Pharmacy Technicians to support Clinical Pharmacy Services* has been updated and released online this week.

Trudy Teasdale, SHPA Board Director and Chair of the Pharmacy Technician Role Redesign Steering Committee, says the Standard outlines how – with appropriate education, training and competency assessment – pharmacy technicians can undertake a range of ward-based administrative, supply, technical and cognitive activities.

PAMELA is now live! Take the survey today

- What is **most important to you** when making employment decisions?
- **Are you satisfied** with your pay and working conditions?
- Would you like **additional professional opportunities** within the profession?
- Have you chosen an **alternative career** to pharmacy?

The Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity(PAMELA) 2019 survey is now open, gathering data to better understand the current

work decisions, preferences and job satisfaction levels of pharmacists and what factors are key in making decisions.

SHPA members are encouraged to participate, as hospital pharmacy data gathered will allow us to continue to improve our advocacy, initiatives and services.

Take the 2019 PAMELA survey

Appendix 2.3. Invitation email wording suggestion for Pharmacy Schools

Header: Have your say on the future of the Pharmacy Workforce

Dear Pharmacy Graduate [NOTE: Personalised if at all possible],

Are you satisfied with your pay and working conditions?

What is most important to you when making employment decisions?

Would you like additional professional opportunities within the profession?

Have you chosen an alternative career to pharmacy?

Your answers to these questions will help us understand your preferences, your motivation and work satisfaction. In the era of rising health care costs and continuing demands for quality improvements, understanding what you want is crucial for pharmacy workforce planning and patient care.

"It is critical that you have your say to help guide the future of the pharmacy workforce, I strongly urge you to participate" *A/Prof Chris Freeman, PSA President*

We are writing to invite you to participate in the national survey of pharmacists (**PAMELA**), which is being conducted by the Centre for Applied Health Economics, Griffith University, and the Centre for Health Economics, Monash University, in conjunction with the Pharmaceutical Society of Australia and collaborating Universities. The information you provide in the PAMELA survey will be used to:

- Facilitate future policies on the recruitment and retention of the pharmacy workforce
- Improve the integration of pharmacists into the healthcare system
- Improve your work satisfaction and well-being
- Improve patient care

PAMELA has been endorsed by the Pharmaceutical Society of Australia and supported by pharmacy schools across Australia.

Please access the survey by clicking on the following link:

PAMELA link

- Please complete the survey within two weeks
- By completing the survey you will go into the prize draw to win one of five vouchers worth AUD200.
- Please remind your pharmacy friends and colleagues, even if they are not working in pharmacy

- Please set aside 20-25 minutes to complete the survey. If you cannot complete the survey in one attempt, the "save and return" button provides you a link which you have to save for later use.
- Some survey questions cannot be read on a mobile phone. Please use a desktop, laptop or tablet to open the link and complete the survey.

If you have any queries, please feel free to contact our researcher-Thao Thai by email (thao.t.thai@monash.edu).

On behalf of the research team, I sincerely hope you will participate in this important study by completing the PAMELA survey and having your say in shaping the future of the Australian pharmacy workforce. We look forward to receiving your response. Thank you in anticipation.

Appendix 2.4. First promotion on AJP

Link: (https://ajp.com.au/news/how-do-you-want-to-practice-in-five-years-time/)

AJP.com.au

NEWS SPONSORED

HOW DO YOU WANT TO PRACTICE IN FIVE YEARS TIME?

GUEST AUTHOR 06/11/2019

The PSA, in conjunction with a collaborative research team being led by Griffith and Monash Universities, have launched the pharmacist workforce survey PAMELA. It's your chance to have your say and make a difference – every voice counts!

The aim of the survey is to better understand the current work decisions, preferences and job satisfaction levels of pharmacists and what factors are key in making decisions.

"Pharmacists practice in a range of roles and environments across Australia" says Dr Jean Spinks, who is leading the research team. "Work decisions are more than just about pay and conditions. Family and personal circumstances, location and professional roles are also important. We want to better understand what is motivating pharmacists to make their work decisions and how policy change can enhance their job satisfaction and promote work/life balance. Without this information, we do not know what the bulk of the pharmacist workforce want".

One of the key actions from PSA's Pharmacists in 2023 report calls for the development of a national approach to workforce planning, including engagement with systems to measure trends and the impact of the pharmacist workforce on health outcomes, to support decision making and inform workforce capacity and development needs. "It is critical that you have your say to help guide the future of the pharmacy workforce, I strongly urge you to participate" says PSA President Chris Freeman.

Anyone with a pharmacy degree, even if they are not registered or practising, is eligible to participate so that we can better understand why some people choose to leave the profession.

Pharmacy schools are also supporting the survey by alerting alumni to the survey. "It is just as essential to know why people leave the profession as why they stay" says Prof Lisa Nissen, Head of the Health Faculty at QUT. "Pharmacy schools are training the pharmacists of the future – we need to adapt our curriculum to be relevant to the changing practice of pharmacy".

We also want to hear from pharmacists who are practicing in a non-traditional role, as well as in rural and remote locations.

PAMELA will be open until the end of November. "More participation from pharmacists means better informed policy development. We are all busy – however, by setting aside 15-20 minutes of time to directly communicate what is important to you can make a huge difference to the future of pharmacy.
It's time to have your say".

Please access the survey by clicking on the following link:

https://griffith.surveyengine.com/survey/108/263

More information about PAMELA and who is involved can be found here:

https://www.griffith.edu.au/menzies-health-institute-queensland/about-menzieshiq/epic-health-systems/centre-for-applied-health-economics/pamela-survey

Previous
A complex issue

Next
Community pharmacy suffering as pharmacists leave

Appendix 2.5. Second promotion on AJP

Link: https://ajp.com.au/news/are-you-satisfied-with-your-pay-and-working-conditions/

AJP.com.au

NEWS

ARE YOU SATISFIED WITH YOUR PAY AND WORKING CONDITIONS?

SHESHTYN PAOLA 19/11/2019

Many pharmacy graduates say they are turning their backs on the industry, but how much do satisfaction levels or work-life balance play a role

While there are many anecdotal reports that pharmacy graduates are leaving the profession, there is no real evidence to back these up or quantify the impact, says Dr Jean Spinks from the Centre for Applied Health Economics at Griffith University.

This was the motivation for launching a new survey for people who have a pharmacy degree in Australia, the researcher and pharmacist tells *AJP*.

Dr Spinks and colleagues want to find out "if that was the case, whether the levels of satisfaction within the profession are a driving factor, or whether there's other reasons why people would be leaving the profession."

A recent survey by Professional Pharmacists Australia found morale in the profession is not good, with more than 80% of pharmacists saying they would not recommend pharmacy as a career.

The top three factors contributing towards unhappiness across all community pharmacists were the 'pressure/stress of work', 'inadequate staffing' and 'poor pay'.

"Many pharmacists are turning their backs on the industry, saying they see no future in the profession," said the PPA in a statement.

However Dr Spinks wants to look into all potential factors that could be at play and what could be done to improve job satisfaction.

"We're collecting information about how influential wage and conditions are on employment decision or whether it's more general factors that we know can influence [employment] like having a young family or working in a rural location versus an urban location," she says.

"Work decisions are more than just about pay and conditions. Family and personal circumstances, location and professional roles are also important.

"We want to better understand what is motivating pharmacists to make their work decisions and how policy change can enhance their job satisfaction and promote work/life balance.

"Without this information, we do not know what the bulk of the pharmacist workforce want."

> **It's about trying to understand from the grassroots up the experience of people who have a pharmacy degree and why they're making particular decisions.**

The PAMELA (Pharmacy in Australia: Measuring Employment, Labour decision, and Activity 2019) survey is open to anyone with a pharmacy degree.

It has been endorsed by the PSA and supported by pharmacy schools across Australia.

"Even people who have left the profession can answer the survey, so we ask them why they've left and to see whether they look different in a number of ways to the people who have stayed," says Dr Spinks.

Data on the pharmacy workforce "is a bit of an evidence-free zone at the moment," she explains.

"It's about trying to understand from the grassroots up the experience of people who have a pharmacy degree and why they're making particular decisions, so the more people that are involved the better we understand that decision making.

"People can have their say, for example, saying 'this is making me happy to do these particular roles' or 'I'd rather be doing something else', and whether that differs by age and gender and those types of factors is very important."

"We want to give that information back to the profession. We're working closely with PSA and SHPA and we're happy to work with the Pharmacy Guild and government departments as well, to help provide some evidence around employment decisions and how factors influence that for pharmacists and some of the leaders, policymakers and professional organisations can use to improve the profession going forward."

She encourages all people with a pharmacy degree to get involved in the survey.

"The more people that have their say, the more powerful the information is," says Dr Spinks.

"Ultimately too we really want to link the workforce with the population health need. Very often workforce planning is done based on previous services provided.

"However because the pharmacy profession is changing so much and people are moving into extended roles … we want to link workforce planning with the population health need."

The PAMELA survey will be open until the end of November. Have your say today!

Please access the survey by clicking on the following link:

https://griffith.surveyengine.com/survey/108/263

More information about PAMELA and who is involved can be found here:

https://www.griffith.edu.au/menzies-health-institute-queensland/about-menzieshiq/epic-health-systems/centre-for-applied-health-economics/pamela-survey

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Research Roundup

Next
'Concern is growing.'

Appendix 2.6. Griffith website

Link:https://www.griffith.edu.au/menzies-health-institute-queensland/about-menzieshiq/epic-health-systems/centre-for-applied-health-economics/pamela-survey

Home > Menzies Health Institute Queensland > Our institute > EPIC Health Systems > Centre for Applied Health Economics > PAMELA Survey

PAMELA SURVEY

Pharmacy in Australia: Measuring Employment, Labour decisions, and Activity 2019

Menu

Have your say on the future of the Pharmacy Workforce

Are you satisfied with your pay and working conditions?

What is most important to you when making employment decisions?

Would you like additional professional opportunities within the profession?

Have you chosen an alternative career to pharmacy?

Your answers to these questions will help us understand your preferences, your motivation and work satisfaction. In the era of rising health care costs and continuing demands for quality improvements, understanding what you want is crucial for pharmacy workforce planning and patient care.

"It is critical that you have your say to help guide the future of the pharmacy workforce, I strongly urge you to participate" *A/Prof Chris*

Freeman, PSA President

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- Improve patient care

PAMELA has been endorsed by the Pharmaceutical Society of Australia and supported by pharmacy schools across Australia. Please access the survey by clicking on the following link:

Access The Survey >

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- Please remind your pharmacy friends and colleagues, even if they are not working in pharmacy
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If you have any queries, please feel free to contact Monash researcher Thao Thai by email.

Have your say to shape the Australian pharmacy workforce. On behalf of the research team and Griffith University's Dr Jean Spinks BPharm PhD, PSA sincerely thanks you in anticipation.

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First Peoples of Australia

Appendix 3. The Integration of Community Pharmacists into the Australian Primary Healthcare System: A Qualitative Study

Appendix 3.1. Interview guide

The interview guide comprised open-ended questions about respondents' perceptions about CPs' current contribution to primary care in Australia. Respondents were encouraged to discuss the arguments behind any recognised problems and possible solutions as well as the political environment related to the integration of CPs. The interview guide was piloted with five pharmacy academics, of whom two are also working in a community pharmacy as their second employment and one economist academic who has an interest in pharmacy research. The interview guide (see below) was refined based on the pilot's results.

The Interview Guide

- Describe your experience/interest in the pharmacy profession
- The level of medication-related problems at a population level
- Difficulties of primary health professionals regarding quality use of medicines
- The current roles of CPs in the primary care network
- How to tackle the problems
- Why/How pharmacists are integrated into primary care network
- Benefits/drawbacks of the CP integration
- Enablers/ barriers for a policy change
- Key drivers for the change

Appendix 3.2. Themes and Quotes

Appendix 3.2.1. The Problem Stream

Respondents brought up issues in the Australian primary healthcare system, both from the demand and supply sides of the healthcare market.

Table A.3.1 Problem stream

Themes	Quotes
Increasing medication-related problems	People are living with much more complex comorbidities. So they don't just have diabetes or they don't just have heart disease; they have diabetes, heart disease, you know, smoking. There's a whole bunch of complexities. So the people are being prescribed more and more drugs and there's a lot of harm associated with inappropriate medicine use. So we know one in five things that go wrong in health care is related to medicine. (GovP18)
Costs of medication-related problems	A significant issue that we have with medicine use in this country. What, 230,000 hospital admissions each year because of medication misadventure costs $1.2 billion. They're the enablers. That we've actually got significant medication misadventure so it's generally the use of the medicine that pharmacists can fix. We've also got a significant issue with chronic disease, airways disease, diabetes, cardiovascular disease so when it comes to improved medicines management a lot of those interventions for those conditions require medicines (PAR01)
Costs of medication-related problems	We spend something like, I don't know, nearly $400 million just in the hospital dealing with emergency presentations across Australia because they're drug related. So from a society perspective lots of people are being harmed by medicines. It's costing us a lot of money. (GovP18)
Inefficient use of GPs for screening and preventive services	accessing a general practitioner and paying for it, just to get your blood pressure taken or to get a diabetes blood glucose test, is just a terrible waste of resources for the patient (CR07)
Difficulties faced by GPs	keeping up with the latest kind of medicines and the evidence base support them (GPs) other than what the drug companies come up with […] getting some independent advice […] I remember finding challenging, especially as a junior doctor (GP, P30)
Discontinuity of care	They [patients] are discharged on just two or three days' worth of medication and often can't access a GP quickly enough to continue on medication. Often they don't have clear instructions about what their new medications are that have been started when they're in hospital. Often doses have changed while they're in hospital, and that's not well communicated to the GP (GP21).

Discontinuity of care	people on discharge from hospital, particularly people with complex and chronic conditions being discharged or having their medication regime changed when they're in hospital from the one the GP has them on, and then you know, being discharged, not necessarily going back to their GP in a seamless or timely way, you know, and particularly with older people, a lot of confusion and poor compliance with the changes (CR22).
Underuse of community pharmacists	We just have got this very expensive technician [pharmacists] that have just spent five years training, and they're putting their money to do all of this stuff, and then we just ask them to do something that a technician could do with maybe six to eight months' worth of training. (Gov18)
Underuse of community pharmacists	When you look at dispensing there's a technical task associated with that which is the entering of the patient details, the claiming, the picking of the medicine. It's an industry task anybody can do that. Dispensary technicians should be doing those things, fine. (PAR01)
Lack of CPs' contribution in primary healthcare network	when a patient is discharged from hospital with a multiple medications it's rare that the pharmacist gets to hear about it (GP26)
Lack of collaboration between CPs and GPs	(CP) don't get out very much, other practitioners come to our practice and introduce themselves and talk about what they can offer and seek referral [..] it's only when you make a glaring error or if you prescribe something that is not available, that the pharmacist might actually pick up the phone and ring you. But I get very little communication back from pharmacists at all, apart from in those circumstances. (GP21)

Appendix 3.2.2. The Policy Stream

Table A. 3.2 Provision of expanded services

Themes	Quotes
Medicine related services	I don't think we should be going into turf wars and trying to do things that other professionals are already doing. I think it needs to be where the gap is and I think the gap is I think obviously around medication management. And really supporting medication management and you know focusing on that unique and particular skill set that a pharmacist does have and it should be around, it's consumer directed care so it's really looking at how to improve self-management, management of chronic disease and supporting the whole health care team which is the general practitioners and the rest of that patient's team to achieve those goals for patients. So I think ultimately it's about medication management. (PAR03)
Support non-medicine related services: accessibility	They are an accessible location that they often have longer opening hours than say a community health clinic, that they are, there's more of them. There might be one community health clinic in a suburb whilst there might be 10 pharmacies in the suburb. Being able to from a patient's perspective, being able to go and receive something like blood pressure monitoring or sugar monitoring, diabetes monitoring from a community pharmacist can be a lot more convenient than a community medical centre. (Econ06)
Non-medicine related services- contribution to chronic disease management	I don't expect pharmacists to prescribe or to manage hypertension. But I do expect the CP to be able to screen people for and monitor people for [..] If you get a person with hypertension they might see the doctor twice a year. They see the pharmacist 12 times a year. Why wouldn't the pharmacist every time someone comes in for a repeat prescription with anti-hypertensions to take their blood pressure, record it on the MyHealth record so when the patient goes back, the doctor can look at a 6 months period of blood pressure readings (PA02)
Objection for non-medicine related services: Potential fragmented healthcare	Any further fragmentation of services should occur. I think if services are already occurring in a general practice then there's no benefit to either the health system or the patient to offer them (**PAR03)**
Objection for non-medicine related services: Potential fragmented healthcare	If you fragment people's care and you encourage them to stay away from GPs, rather than engage with GPs, you lose continuity and when you lose continuity, you lose effectiveness. Patients should not be disconnected with general practitioners in any ways (GP21)

Table A. 3.3 Co-locating CPs with other health professionals

Themes	Quotes
Co-location in General practices	I think the next role that really needs to be developed in Victoria is pharmacists in GP practices. Because I think that would actually help GPs to understand what a pharmacist can do besides dispensing, get them used to working collaboratively, open up that relationship more, and then once there's more pharmacists in GP clinics, that's when you could I feel start sending services outside. You need to develop that relationship more. And that's like when I came on and we started developing the chronic disease management pilot, that was, I think it could have been more successful if it started in a GP clinic and then brought it out. Just because that relationship needs to build with the GP. (GovP09)
Co-location- Aged care facilities	I think, given that pharmacists have this skill, knowing a lot about pharmaceuticals and interactions and that kind of thing, I think that's probably underused, particularly given that the levels of prescribing that are prevalent in aged care homes. That's a big issue, and that particular issue, how do you solve that one? It might be about getting GPs in aged care homes, but they have to be paid to do that, they're reluctant to do that, they're busy. Can pharmacists do that, as well? (person 10)
Co-location- Objections	It potentially replicates the work of CPs and potentially to the detriment of their professional opportunity if there is a model that separates medicine dispensing and supply from the support, medicine management. It creates that risk and also that complexity for the patient. The patient will one day be talking to their CP about their medicines and medicine management and then the next day if they are in the GP practice with another pharmacist they may get told something different (PAR20)

Appendix 3.2.3. The Policy Stream – The Survival Ability Criteria

The MSF suggested that the survival ability of the policy proposal is one of the keys to the success of the policy adoption. Specifically, to satisfy the criteria for survival, the policy proposal must be widely acceptable, financially viable and technically feasible. Here, we examined the survival ability of the CP integration policy to understand whether the policy stream is ready to enable a policy change.

Table A. 3.4 The survival ability criteria

Themes	Quotes
Financial viability-focus on pharmaceutical supply	[T]he only way that owners make money is through dispensing […] If you've got a really keen pharmacist, and they take their own initiative to do some sort of chronic disease management, or asthma counselling or something like that, they don't actually get reimbursed for it. **(Gov9)**
Financial viability-focus on pharmaceutical supply	People [CPs] have no incentive to spend every patient being counselled because they get no more money for that than if they simply supply a brown paper bag [of pharmaceuticals] **(PA02)**
Financial viability-limited funding for CPs outside community pharmacies	The government could require, for example that those people [pharmacists] that work in GP practice have access to government money. The problem with that is that the Guild (Pharmacy Guild of Australia who represent the community pharmacy owners) says it is our money (**PA2**)
Technical feasibility-training	I think your profession itself and what you're actually trained - you're probably trained to do a lot of this. You are trained and capable, you just can't. You know what I mean? I think it's in your scope. You may need a bit of education, training, changing in your accreditation standards, but I think you're not far from it. **(AHP14)**
Technical feasibility-shared health records	Pharmacists work largely in an information vacuum. So often what happens is the only information that you've got about a patient is your dispensing history. And what they may tell you which may or may not be accurate. Certainly not verifiable clinical information. (PAR01)

Appendix 3.2.4. The Politics Stream

The political environment emerged as the most influential barrier to the integration of CPs in Australia. Respondents reported organisational tensions among the pharmacy and other health professions. The tensions appear to prevent the adoption of the integration policy.

Table A. 3.5 Inter-professional tensions

Themes	Quotes
Inter-professional tensions	[t]he other barrier is the medical profession, particularly the organised groups within the medical profession. I don't think individual doctors are barriers, but I think the groups like RACGP and to a lesser extent the AMA - the AMA not so much. The RACGP are very territorial in terms of this is doctors' work, and pharmacists can't stay over here (PAR24)
Inter-professional tensions	If you're at loggerheads with the College of GPs they'll just resist you and they're may be not as powerful as the Pharmacy Guild but they're powerful enough to block things […] they'll (AMA) never support it and their level of paranoia is probably the highest […] the nurses on a scale of 1 to 10, the AMA's 10, the nurse resistance would be about a 1 (GP26)
Lack of inter-professional collaboration in the development of the policy proposal	There is no kind of formal communication avenue between even the College of General Practice and the pharmacy bodies[…] they don't talk to each other to actually explain those kinds of things. So often it's a battle for territory rather than coming together to discuss these kinds of issues. (GP21)

Notes:
RACGPs: The Royal Australian College of General Practitioners
AMA: The Australian Medical Association

Table A. 3..6 Inter-association tensions within the pharmacy profession

Themes	Quotes
Conflicts arose from the different missions among associations	They [Pharmaceutical Society of Australia]'ve got the interests of the profession and its career pathways and ensuring that work ready pharmacists are getting as many opportunities to exercise their scope of practice and their skills as possible. (CR22)
Conflicts arose from the different missions among associations	[T]he Guild (Pharmacy Guild of Australia) […] goes down the path of they're advocating for increased services, increased remuneration. Because their prime role […] is to ensure the viability and functionality of community pharmacies. (PAR19)
Conflicts in service evaluations	I think the Guild is interested in funding for professional services, but only as much as it's involved with their overall community pharmacy agreement. I think they want to see professional services funded through the community pharmacy agreements with government, but they don't see it very much as educational and professional focus. They are focussed on seeing it as part of the remuneration. […] I think their idea of assessment or evaluation is very shallow, is very – it's not rigorous in the same way that a lot of us would expect for evaluation or assessment of something, to show its cost-effectiveness and its clinical effectiveness. (CR07)
Conflicts in remuneration models	"The employment of pharmacists in general practice, […]. So the government could require […] that those people that work in GP practice have access to government money. The problem with that is that the Guild says it is our money" (PA, P02)
Support for fee-for-service model	"they [pharmacist] should be funded in the same way as other health professionals which is a certain degree of MBS (medical benefit scheme) funding" (PAR3)
Objections for fee-for-service objections	The fear, I think, is if we start to pay the pharmacists for the services they provide then the community pharmacy building, which is what the business owners own, is no longer the central point for all the money coming in through the services [...] at the moment the business owners have an advantage because the money's coming in to do with the supply of the medicines [...] and then they pay a salary for the pharmacist. Whereas if we paid for the services directly then a pharmacist independently could then claim for services directly to the - the commonwealth, for example, and then the business owner can't get a cut - wouldn't be eligible to get a proportion of those funds. Business owner can't get a cut - wouldn't be eligible to get a proportion of those funds if pharmacist independently could claims for services directly (Gov18).

Objections for fee-for-service objections	If you separate it out, you run into all sorts of potential disconnects with pharmacists in pharmacies providing professional services for patients whose medicines are being supplied somewhere else so there is a disconnect between supply and support and management. In our view we think it makes great sense for the pharmacy to be the recipient of the funding and to be able to use that funding to provide the broadest array of professional services.(PAR20)
Funding distortion by political unbalance	I think the guild negotiates very much on behalf of business owners. I don’t believe that the deals represent, appropriately, the professional workforce. I think the professional workforce is really going to be the army that delivers any of this change in the future, but they are very much out of the picture in terms of negotiating partnerships and mutual program arrangements with government. (CR07)
Funding distortion by political unbalance*	[t]he profession can't expect its future to be determined by one lobby group, because […] they're very transparent about their interests [which] are the community pharmacy owners. They're not interested in non-owner pharmacists, that's not who they're advocating for. So I think for the profession to kind of say, well, we'll let the Guild negotiate everything for us […] it's not the right way, for the pharmacists to accept that's just how it is. (PAR24)

*At the time of writing, for the first time, the Pharmaceutical Society of Australia joined the Pharmacy Guild of Australia in the funding negotiation with the Government [1].

Appendix 3.2.5. Policy entrepreneurs

To promote the integration policy to the national decision-making process, respondents recommended that the national government, the pharmacy profession, and consumers should play leading roles in the policy advocacy.

Table A. 3.7 Key advocates for the policy proposal

Themes	Quotes
Consumers	The community should have a strong voice around what they need. […] I think we need to listen to the community and what they want in the healthcare space. (AHP15) if the consumer has no need for it or if the consumer has a need but does not know that the [pharmacy] profession is the potential solution to their need then there is nothing (PA04)
Government	Any future directions for community pharmacy I think need to be considered in the context of a primary and integrated care strategy for Australia, which we currently don't have. […] that's got to be best done within a primary care system road map (CR22)
Government - examples from other countries	They [other countries] had the ability of the government setting the agenda, saying "This is what we want out of pharmacy", and that happened both in the UK and New Zealand. And that to me makes it a more structured and a more targeted approach, and easiest to meet (PAR19)
The pharmacy profession	It's got to be made by the profession because nobody, no one else in the medical profession and the government itself doesn't owe community pharmacists a future. They have to determine their own future (Econ06)

Appendix 3.2.6. Strategies for Next Policy Window

To ensure success the next time a policy window opens, respondents suggested some strategies to enable the survival of the policy proposal and resolve the political barriers.

Table A.3.8 Strategies for the next policy window

Themes	Quotes
The survival of the policy: Develop the roles of pharmacists in light of the population's care needs	As a profession we missed the opportunity to have a proper look at how do we grow the role of the pharmacist, and how to make sure that the services that we're delivering are actually meeting the needs of consumers across the population. It's all structured around how do we ensure that each of the pharmacies gets a payment for this? As opposed to, how do we ensure that the community needs are met, and we'll, of course, pay people to deliver those services? (PAR24)
The survival of the policy: the value acceptability	[F]or a change to take hold it's got to be good for pharmacists, it's got to be good for the patients, it's got to be good for the funder […] It's got to be good for the medical neighbourhood so everybody that pharmacists works in partnership with in terms of who the local health practitioners are. (GP26)
The survival of the policy: Remuneration reforms	If you think about how physiotherapists are paid, how doctors are paid, and other health professionals, they're paid a fee based on the time and the complexity. […] If we shifted that [MBS funding], I think it would be a game changer, because it would give us the flexibility to deliver the services when the patient needed it, and where they needed it, and it would go to the people who need it most. (PAR24)
The survival of the policy: Remuneration reforms	you [government] could give pharmacy a bite of - because I'm pretty sure you [pharmacists] don't have it now - of the few chronic disease numbers that allied health have (AHP14)

The survival of the policy: Technical feasibility	So access to the My Health record where we're going to have nearly a 100% of patients in this country who have a My Health record we'll have discharge summary, shared health summaries, pathology information, event summaries, specialist letters, all those types of components of work allows a pharmacist to actually apply their clinical skills because they've got more pieces of the jigsaw puzzle. (PAR01)
Resolving the political barriers: focus on a shared goal - a better public health	I think we should be saying that a whole range of clinical and program services can be delivered by doctors, nurses and pharmacists, and there will be opportunities in different parts of the country for different models of how a program or a service is delivered, and by whom. We cannot be so restrictive around boundaries anymore. […] It is not the boundaries of profession but what needed and who can deliver the services in where. Then any profession can deliver and they don't want to worry about their turf (CR07)
Resolving the political barriers: Evidence accumulation	[G]enerating the evidence that is needed to show that what a pharmacist does makes a difference and adds value to a health system and we need to generate that evidence to make sure that it aligns with the priorities of what health is looking at.(PA27)
Resolving the political barriers: inter-organisational collaboration	The Pharmacy Guild could enhance what they do by ensuring that they have all the professional groups involved. […] greater alignment and professional collaborations with the allied groups in health. […] to go as a united front in negotiations with the government (PA27)

References

[1] Department of Health. New (7th) Community Pharmacy Agreement. 2020.

Appendix 4. Intrinsic or extrinsic characteristics? Understanding Australian Pharmacy Degree Holders' Job Preferences

Appendix 4.1. DCE design

Table A. 4.1 Attributes included and excluded in the DCE

Attribute included	**Attributes used as**	**Attributes excluded**	**Reasons to exclude**
Career path	Alternative labels	Job availability	Job market related and not easily amendable to policy change
Intellectual satisfaction	Role	Job satisfaction	Represents the latent construct of the decision making rule in DCE
Ability to use clinical knowledge		Meaning of job	Represents the latent construct of the decision making rule in DCE
Type of human interaction		Public transport availability	The least mentioned attribute in qualitative study
Flexibility of working hours	Flexible work schedule	Working environment	The second least mentioned attribute in qualitative study
Learning environment	Career opportunities	Work condition	"Community pharmacy" specific and less important
Professional development		Work as part of a team	Ranked as the least important from the first pre-test
Promotion opportunities		Job security	Excluded after the second pre-test
Geographic location	Geographic location		
Salary	Salary		

Table A. 4.2. Choices and definitions of alternatives

Alternatives	Definitions
Hospital pharmacy	Employment in a hospital pharmacy department
Community pharmacy	Employment in a community pharmacy
Primary healthcare setting	Non-dispensing pharmacists employed in general practices or aged/residential care facilities
Pharmaceutical Industry	Employment in a pharmaceutical firm
Government/Academia	Employment in a national/local government organisation or an academic institution such as a university/research centre
Non-pharmacy related sector	Employment in another field, which may be health-related (e.g. medicine, dentistry, etc.) or non-health related (e.g. accounting, law, etc.)

Table A. 4.3. Definitions of attributes

Attributes	Definitions
Your role	Duties that you are expected to perform in the context of your job
Flexible work schedule	Whether you are able to dictate your work schedule to balance your work and non-work commitments (e.g. after hours, weekend hours, etc.)
Career opportunities	Whether you have opportunities for career development
Geographic location	Your place of work
Annual salary	Your annual earnings for a full-time equivalent position, including any bonuses

Table A.4.4. Definitions of attribute levels

Attributes	Attributes levels	Definitions
Your role	Medicine dispensing/ distribution	Your roles may include procuring stocks and supplying medicines to other departments or reviewing and dispensing medicines for patients attending outpatient clinics or at discharge from the hospitals
	Clinical practice	Your roles may include reviewing medication charts in hospital wards/transitional care and collaborating with other health professionals to ensure the Quality Use of Medicine and improve patients' quality of life
	Clinical research/Education	Your roles may include providing education and training on pharmaceutical knowledge for other healthcare professionals and students or conducting clinical trials/ research in hospitals
	Mainly dispensing	Your roles may include preparing, distributing and administering medication, dose aid administration (webster packs, dosette box, etc.) packing and patient counselling, as required
	Providing professional services	Your roles may include providing Medication review services (e.g. MedsCheck, Diabetes) and/or other patient care services not related to medication dispensing (e.g. immunisations, physical examinations etc.)
	Combination of dispensing and providing professional services	Your roles may include dispensing medicines, patient counselling, medication review and other patient care services based on customers' demand
	General practice Pharmacist	As a non-dispensing pharmacist embedded in general practice, you work directly and collaboratively with GPs and other health professionals to support the quality use of medicines
	Aged care pharmacist	As a non-dispensing pharmacist embedded in an aged/residential care facility, you work directly and collaboratively with other health professionals to support the quality use of medicines
	Sales or Marketing	Your roles may include promotes the company's products to clients and manage the performance and profitability of company products
	Medical or Regulatory Affairs	Your roles may include providing medical information and reporting drug safety information or preparing and reviewing new drug applications, labels, reports and regulatory submissions
	Research and Development	Your roles may include develop or conduct clinical trials for the development of new drugs
	Policy-related role	Your roles may include undertaking activities and projects to inform policy and strategic directions
	Teaching or Research	Your roles may include teaching (e.g. composing and presenting lecture materials) or conducting research
	Health-related role	You are working in a health-related occupation such as medicine, dentistry, etc.

	Non-health related role	You are working in a non-health related occupation such as accounting, law, etc.
Flexible work schedule	No	Your schedule is set by employer and you cannot dictate it to suit your need
	Yes	You can set your working schedule to suit your need in most cases
Career opportunities	None	No opportunity for promotion (e.g. higher positions) or specialization (e.g. accrediting as a specialist in your area of work)
	Specialization only	Opportunity for specialization (e.g. accrediting as a specialist in your area of work) but no opportunity for promotion (e.g. higher positions)
	Promotion and specialization	Opportunity for promotion (e.g. higher positions) and specialization (e.g. accrediting as a specialist in your area of work)
Geographic location	Urban	
	Rural	
	Remote	
Annual salary	$60,000	
	$100,000	
	$140,000	
	$180,000	
	$220,000	

Appendix 4.2. Data analysis

Appendix 4.2.1. Equality test of alternative specific parameters of job attributes

Table A.4.5. Equality test of alternative specific parameters of design attributes

	Unrestricted model	Restricted model (Generic parameter)					
	ASPs model	Flexibility	Career progression-Both promotion and specialisation opportunities	Career progression-Specialisation only	Location-Rural	Location-Remote	Salary
LL	-3994	-3996	-4000	-3995	-4003	-3998	-3997
K	44	39	39	42	39	42	39
$\chi 2t$		4.47	11.72	2.56	18.17	7.48	6.12
$\chi 2c$		11.07	11.07	5.99	11.07	5.99	11.07
Conclusion		Generic	ASP	Generic	ASP	ASP	Generic

Table A. show the LR test results of the equality of alternative specific parameters for generic attribute levels. Based on the test statistics, the career profession level of having both promotion and specialisation opportunities, two location levels have ASPs and the flexible work schedule attribute, the career progression level of having specialization opportunities only and salary have generic parameters.

Appendix 4.2.2. Model selection

Table A. 4.6. shows that we can safely reject the generalised mixed logit model based on AIC, BIC and LR test. Although AIC and LR test are in favour of the mixed logit model, BIC supports the choice of conditional logit (CL) model. Given the fact that the CL model is relatively easy to estimate with the outputs are easy to interpret (Hensher et al, 2015), we chose the CL model based on its merits as a practical but useful tool to understand the employment preferences of Australian pharmacists.

Table A. 4.6. Comparison of the goodness of fit indicators across estimated models

	CL	Nested logit	MIXL	Error component MIXL		
				(H, P) & (I,G,N)	(H, P) &(I,G)&(N)	(H, P, I,G, N)
logL	-4002	-4001	-3950	-3940	-3941	-3937
AIC	8068	8069	7973	7959	7962	7951
BIC	8253	8260	8188	8185	8193	8171

Appendix 4.2.3. Testing categorical specification of salary attribute

Figure A. 4.1 shows the plot of the partial utility contribution of each level of the salary attribute which suggests that the attribute has a linear effect.

Figure A. 4.1 Partial utility contribution of salary levels

Further, the continuous specification of salary has a higher AIC (AIC = 8067.7) than the categorical specification (AIC = 8061.5), however, a Vuong test confirmed that the difference is not significant (V= 1.51<1.96). As such, we used a continuous specification of salary.

Appendix 4.2.4. Choice of random parameters in mixed logit model

Table A.4.7. Model comparison based on AIC between CL and MX with random parameters

	All ASCs	All roles	All career opp.	All LO	salary	All ASCs and roles	All ASCs and flexibility	All ASCs and career opp.	All ASCs and location	All ASCs and salary
logL	-3950	-3971	-3993	-3973	-4000	-3935	-3948	-3949	-3944	-3948
AIC	7973	8021	8065	8028	8065	7962	7973	7984	7973	7972
BIC	8188	8253	8291	8266	8257	8228	8193	8233	8222	8193

Appendix 4.2.5. Comparison of the results of CL models using full sample and sample without missing data on individual characteristics

Table A.4.8. Results of CL models using the full sample and one without missing data individual characteristics

Attributes	Alternatives	Full sample Coefficient (S.E.)	Completed responses Coefficient (S.E.)
Hospital pharmacy constant	Hospital pharmacy	Ref	Ref
Community pharmacy constant	Community pharmacy	0.11 (0.16)	0.02 (0.19)
Primary Care Setting constant	Primary Care Setting	0.51 *** (0.16)	0.49 *** (0.16)
Pharmaceutical Industry constant	Pharmaceutical Industry	-1.01 *** (0.19)	-1.04 *** (0.18)
Government/Academia constant	Government/Academia	0.03 (0.16)	0.10 (0.16)
Non-pharmacy related sector constant	Non-pharmacy related sector	-0.27 * (0.15)	-0.27 (0.17)
Dispensing/distribution role	Hospital pharmacy	Ref	Ref
Clinical practice role	Hospital pharmacy	0.07 (0.16)	0.06 (0.19)
Education/Research role	Hospital pharmacy	0.23 * (0.13)	0.28 * (0.16)
Dispensing role	Community pharmacy	Ref	Ref
Combination of dispensing and professional services role	Community pharmacy	0.39 ** (0.17)	0.37 * (0.19)
Professional services role	Community pharmacy	0.26 * (0.15)	0.18 (0.18)
General practice role	Primary Care Setting	Ref	Ref
Aged care facility role	Primary Care Setting	0.02 (0.12)	0.01 (0.14)
Sales or marketing role	Pharmaceutical Industry	Ref	Ref
Medical or Regulatory Affairs role	Pharmaceutical Industry	0.64 *** (0.15)	0.54 *** (0.17)
Research and development role	Pharmaceutical Industry	0.79 *** (0.16)	0.90 *** (0.18)
Policy related role	Government/Academia	Ref	Ref
Research or teaching role	Government/Academia	-0.33 ** (0.13)	-0.36 ** (0.15)
Health-related role	Non-pharmacy related sector	Ref	Ref
Non health related role	Non-pharmacy related sector	-0.08 (0.14)	0.02 (0.16)
No flexible work schedule	All sectors	Ref	Ref
Having flexible work schedule	All sectors	0.18 *** (0.06)	0.16 ** (0.06)
No opportunities	All sectors	Ref	Ref
Promotion and specialization opportunities	Hospital pharmacy	0.27 ** (0.13)	0.24 (0.15)
Promotion and specialization opportunities	Community pharmacy	0.20 (0.14)	0.12 (0.16)
Promotion and specialization opportunities	Primary Care Setting	0.33 ** (0.13)	0.25 * (0.15)
Promotion and specialization opportunities	Pharmaceutical Industry	0.61 *** (0.12)	0.52 *** (0.14)

Promotion and specialization opportunities	Government/Academia	0.52 *** (0.12)	0.39 *** (0.14)
Promotion and specialization opportunities	Non-pharmacy related sector	0.36 *** (0.14)	0.34 ** (0.16)
Specialization opportunities only	Hospital pharmacy/Community pharmacy/Primary care settings	0.05 (0.09)	0.05 (0.11)
Urban location	All sectors	Ref	Ref
Rural location	Hospital pharmacy	-0.41 *** (0.12)	-0.45 *** (0.14)
Rural location	Community pharmacy	-0.22 * (0.13)	-0.30 ** (0.15)
Rural location	Primary Care Setting	-0.95 *** (0.14)	-1.01 *** (0.16)
Rural location	Pharmaceutical Industry	-0.65 *** (0.12)	-0.57 *** (0.14)
Rural location	Government/Academia	-0.58 *** (0.12)	-0.57 *** (0.14)
Rural location	Non-pharmacy related sector	-0.59 *** (0.16)	-0.64 *** (0.18)
Remote location	Community pharmacy	-0.82 *** (0.16)	-0.80 *** (0.18)
Remote location	Primary Care Setting	-1.03 *** (0.14)	-0.89 *** (0.16)
Remote location	Non-pharmacy related sector	-0.47 *** (0.16)	-0.45 ** (0.19)
Annual salary ($0,000)	All sectors	0.01 *** (0.00)	0.01 *** (0.00)

Notes:
1. *p<0.1; **p<0.05;***p<0.0001
2. ASC: Alternative specific constant
3. The model does not incorporate covariates

Appendix 4.2.6. Models exploring preference heterogeneity using observable characteristics

Table A.4.9. Conditional logit and mixed logit models including individual characteristics and interaction terms

Attributes	Alternatives	Conditional logit		Mixed logit	
		Coefficient (SE)	MWTP ($000)	Coefficient (SE)	MWTP ($000)
Hospital pharmacy constant	Hospital pharmacy	Ref		Ref	
Community pharmacy constant	Community pharmacy	-0.07 (0.44)		-0.25 (0.58)	
S.D.	Community pharmacy			1.24 *** (0.26)	
Primary Care Setting constant	Primary Care Setting	0.32 (0.44)		0.45 (0.55)	
S.D.	Primary Care Setting			0.88 *** (0.31)	
Pharmaceutical Industry constant	Pharmaceutical Industry	-0.40 (0.45)		-0.54 (0.56)	
S.D.	Pharmaceutical Industry			1.25 *** (0.26)	
Government/Academia constant	Government/Academia	0.23 (0.44)		0.44 (0.56)	
S.D.	Government/Academia			0.63 (0.40)	
Non-pharmacy related sector constant	Non-pharmacy related job	-0.01 (0.46)		-0.36 (0.64)	
S.D.	Non-pharmacy related job			1.54 *** (0.32)	
Dispensing/distribution role	Hospital pharmacy	Ref	Ref	Ref	Ref
Clinical practice role	Hospital pharmacy	0.12 (0.20)	$9	0.19 (0.26)	$12
Education/Research role	Hospital pharmacy	0.34 ** (0.17)	$25	0.45 ** (0.23)	$29
Dispensing role		Ref	Ref	Ref	Ref
Combination of dispensing and professional services role	Community pharmacy	0.29 (0.21)	$22	0.39 (0.25)	$25
Professional services role	Community pharmacy	0.21 (0.19)	$15	0.24 (0.22)	$15
General practice role	Primary Care Setting	Ref	Ref	Ref	Ref
Aged care facility role	Primary Care Setting	0.01 (0.15)	$1	0.04 (0.19)	$2
Sales or marketing role	Pharmaceutical Industry	Ref	Ref	Ref	Ref

Medical or Regulatory Affairs role	Pharmaceutical Industry	0.50 *** (0.18)	$37	0.59 ** (0.24)	$38
Research and development role	Pharmaceutical Industry	0.86 *** (0.19)	$63	0.98 *** (0.23)	$63
Policy related role	Government/Academia	Ref	Ref	Ref	Ref
Research or teaching role	Government/Academia	-0.30 * (0.16)	-$22	-0.35 * (0.18)	-$22
Health-related role	Non-pharmacy related job	Ref	Ref	Ref	Ref
Non health related role	Non-pharmacy related job	0.06 (0.17)	$5	0.12 (0.22)	$8
No flexible work schedule	All sectors	Ref	Ref	Ref	Ref
Having flexible work schedule	All sectors	0.04 (0.12)	$3	0.05 (0.14)	$3
No opportunities	All sectors	Ref	Ref	Ref	Ref
Promotion and specialization opportunities	Hospital pharmacy	0.35 ** (0.17)	$26	0.43 ** (0.21)	$27
Promotion and specialization opportunities	Community pharmacy	0.11 (0.17)	$8	0.08 (0.20)	$5
Promotion and specialization opportunities	Primary Care Setting	0.30 * (0.16)	$22	0.39 * (0.22)	$25
Promotion and specialization opportunities	Pharmaceutical Industry	0.55 *** (0.15)	$41	0.63 *** (0.20)	$40
Promotion and specialization opportunities	Government/Academia	0.43 *** (0.15)	$32	0.50 *** (0.18)	$32
Promotion and specialization opportunities	Non-pharmacy related job	0.31 * (0.17)	$23	0.41 * (0.23)	$26
Specialization opportunities only	Hospital pharmacy/Community pharmacy/Primary care settings	0.14 (0.12)	$10	0.13 (0.14)	$8
Urban location	All sectors	Ref	Ref	Ref	Ref
Rural location	Hospital pharmacy	-0.26 (0.17)	-$19	-0.32 (0.22)	-$20
Rural location	Community pharmacy	-0.18 (0.18)	-$13	-0.16 (0.22)	-$10
Rural location	Primary Care Setting	-0.73 *** (0.19)	-$54	-0.84 *** (0.22)	-$53
Rural location	Pharmaceutical Industry	-0.36 ** (0.17)	-$27	-0.48 ** (0.20)	-$31
Rural location	Government/Academia	-0.38 ** (0.17)	-$28	-0.42 ** (0.20)	-$27
Rural location	Non-pharmacy related job	-0.38 * (0.21)	-$28	-0.51 * (0.29)	-$33
Remote location	Community pharmacy	-0.57 *** (0.22)	-$42	-0.60 ** (0.25)	-$38

Remote location	Primary Care Setting	-0.36 * (0.20)	-$27	-0.44 * (0.24)	-$28
Remote location	Non-pharmacy related job	-0.04 (0.24)	-$3	-0.11 (0.31)	-$7
Annual salary ($0,000) †	All sectors	0.01 *** (0.00)		0.02 *** (0.00)	
Ratio of salary and household income †	All sectors	-0.06 (0.13)		-0.09 (0.15)	
Female	Hospital pharmacy	Ref		Ref	
	Community pharmacy	-0.38 * (0.22)		-0.52 * (0.29)	
	Primary Care Setting	-0.07 (0.23)		-0.16 (0.30)	
	Pharmaceutical Industry	-0.97 *** (0.22)		-1.25 *** (0.31)	
	Government/Academia	-0.30 (0.22)		-0.43 (0.28)	
	Non-pharmacy related job	-0.34 (0.24)		-0.41 (0.35)	
Having kids less than 5ys	Hospital pharmacy	Ref		Ref	
	Community pharmacy	-0.05 (0.32)		0.01 (0.41)	
	Primary Care Setting	-0.59 * (0.35)		-0.66 (0.50)	
	Pharmaceutical Industry	-0.42 (0.33)		-0.43 (0.45)	
	Government/Academia	-0.30 (0.31)		-0.28 (0.43)	
	Non-pharmacy related job	-0.18 (0.36)		-0.25 (0.53)	
Having non-pharmacy higher education	Hospital pharmacy	0		Ref	
	Community pharmacy	-0.14 (0.18)		-0.16 (0.24)	
	Primary Care Setting	0.19 (0.17)		0.23 (0.23)	
	Pharmaceutical Industry	0.10 (0.18)		0.11 (0.25)	
	Government/Academia	0.39 ** (0.18)		0.42 * (0.23)	
	Non-pharmacy related job	0.08 (0.20)		0.13 (0.28)	
40-60 ys	Hospital pharmacy	Ref		Ref	
	Community pharmacy	0.48 ** (0.20)		0.58 ** (0.27)	
	Primary Care Setting	0.25 (0.19)		0.35 (0.26)	
	Pharmaceutical Industry	-0.01 (0.20)		0.06 (0.28)	
	Government/Academia	-0.03 (0.20)		0.03 (0.25)	
	Non-pharmacy related job	-0.14 (0.22)		-0.14 (0.31)	
>60 ys	Hospital pharmacy	Ref		Ref	

	Community pharmacy	1.45 *** (0.29)	1.81 *** (0.39)
	Primary Care Setting	0.45 (0.31)	0.62 (0.38)
	Pharmaceutical Industry	0.10 (0.31)	0.15 (0.44)
	Government/Academia	0.12 (0.32)	0.24 (0.43)
	Non-pharmacy related job	0.33 (0.33)	0.45 (0.44)
Previous experience	Hospital pharmacy	0.50 *** (0.14)	0.62 *** (0.19)
	Community pharmacy	0.22 (0.31)	0.23 (0.36)
	Primary Care Setting	0.35 ** (0.18)	0.37 * (0.22)
	Pharmaceutical Industry	1.00 *** (0.19)	1.28 *** (0.27)
	Government/Academia	0.53 *** (0.15)	0.59 *** (0.19)
	Non-pharmacy related job	0.47 *** (0.17)	0.59 ** (0.26)
Int: Female & Flexibility	Hospital pharmacy	0.09 (0.21)	0.03 (0.27)
	Community pharmacy	0.16 (0.22)	0.19 (0.27)
	Primary Care Setting	0.20 (0.21)	0.21 (0.26)
	Pharmaceutical Industry	0.39 * (0.22)	0.46 * (0.27)
	Government/Academia	0.03 (0.22)	0.03 (0.26)
	Non-pharmacy related job	0.11 (0.24)	0.00 (0.31)
Int: Having kids less than 5 ys and Flexibility	Hospital pharmacy	0.14 (0.33)	0.33 (0.48)
	Community pharmacy	-0.02 (0.38)	0.03 (0.47)
	Primary Care Setting	0.84 ** (0.36)	1.04 ** (0.50)
	Pharmaceutical Industry	0.09 (0.37)	0.08 (0.47)
	Government/Academia	0.36 (0.36)	0.37 (0.46)
	Non-pharmacy related job	-0.03 (0.41)	0.18 (0.59)
Job has same locations as current employment	Hospital pharmacy	0.39 *** (0.15)	0.45 ** (0.21)
	Community pharmacy	0.49 *** (0.17)	0.64 *** (0.21)
	Primary Care Setting	0.70 *** (0.16)	0.78 *** (0.19)
	Pharmaceutical Industry	0.49 *** (0.16)	0.60 *** (0.19)

	Government/Academia	0.47 ***	0.52 ***
		(0.16)	(0.18)
	Non-pharmacy related job	0.59 ***	0.67 **
		(0.20)	(0.27)
Error component for alternatives			
Standard Deviation	All sectors		0.94 ***
			(0.28)
logL		-2681	-2649
AIC		5526	5475
BIC		5972	5953
Observations		2434	2434

Notes:
1. *p<0.1; **p<0.05;***p<0.0001
2. The mixed logit model assumes the normal distribution for the community pharmacy constants and pharmaceutical industry constant.
3. Marginal willingness to pay (MWTP) values in both models are the ratio of coefficient estimates for each attribute levels and the coefficient estimate of annual salary

Appendix 4.2.7. Relative Importance

Table A.4.10. Computing relative importance of attributes

		Hospital pharmacy				Community pharmacy				Primary Care Setting				Pharmaceutical Industry				Government/Academia				Non-pharmacy related			
	Level	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D
Roles	R0	-0.13				-0.31								-0.58				0.41				0.06			
	R1	-0.04				0.26				-0.05				0.24				-0.41	0.41	0.11	4	-0.06	0.06	0.02	5
	R2	0.17	0.30	0.09	4	0.05	0.57	0.15	3	0.05	0.05	0.01	5	0.35	0.93	0.20	2								
Flexibility	No	-0.22				-0.22				-0.22				-0.22				-0.22			0	-0.22			
	Yes	0.22	0.22	0.07	5	0.22	0.22	0.06	4	0.22	0.22	0.06	4	0.22	0.22	0.05	5	0.22	0.22	0.06	5	0.22	0.22	0.07	4
Career op.	No	-0.15				-0.09				-0.18				-0.76				-0.61				-0.45			
	P&S	0.23	0.38	0.12	3	0.10	0.19	0.05	5	0.29	0.46	0.12	3	0.76	0.76	0.17	4	0.61	0.61	0.17	3	0.45	0.45	0.14	3
	S	-0.08				-0.02				-0.11				NA				NA				NA			
Location	Urban	0.54				0.42	1.00	0.27	2	0.79	1.26	0.33	2	0.88	0.88	0.19	3	0.65	0.65	0.18	2	0.43	0.73	0.23	2
	Rural	-0.54	0.54	0.17	2	0.17				-0.33				-0.88				-0.65				-0.30			
	Remote	NA				-0.59				-0.47				NA				NA				-0.14			
Salary		0.01	1.78	0.55	1	0.01	1.78	0.47	1	0.01	1.78	0.47	1	0.01	1.78	0.39	1	0.01	1.78	0.48	1	0.01	1.78	0.55	1
Sum of differences in utility of all attributes			3.22					3.77				3.78				4.57				3.68				3.24	

Notes
Utility
*: Difference between the highest and lowest level of a single attribute
Importance
Ranking
H0: Dispensing/distribution role; H1: Clinical practice role; H2: Education/Research role
C0: Dispensing role; C1: Combination of dispensing and professional services role; C2: Professional services role
P0: General practice role; P1: Aged care facility role
I0: Sales or marketing role; I1: Medical or Regulatory Affairs role; I2: Research and development role
G0: Policy related role; G1: Research or teaching role
N0: Health-related role; N1: Non health related role
P&S: Promotion and specialization
S: Specialization only

Table A.4.11. Relative Importance and ranking for attributes in each sectors

	Hospital pharmacy	Community pharmacy	Primary Care Setting	Industry	Government/Academia	Non-pharmacy related sector
Roles	0.09 (4)	0.15 (3)	0.01 (5)	0.20 (2)	0.11 (4)	0.02 (5)
Flexibility	0.07 (5)	0.06 (4)	0.06 (4)	0.05 (5)	0.06 (5)	0.07 (4)
Career opportunities	0.12 (3)	0.05 (5)	0.12 (3)	0.17 (4)	0.17 (3)	0.14 (3)
Geographic location	0.17 (2)	0.27 (2)	0.33 (2)	0.19 (3)	0.18 (2)	0.23 (2)
Salary	0.55 (1)	0.47 (1)	0.47 (1)	0.39 (1)	0.48 (1)	0.55 (1)

Appendix 4.3. Construction of the current employment alternative

This appendix reported how we constructed the attribute levels of the current employment alternative based on data collected in the PAMELA survey. Missing values were observed for respondents who are undertaking higher education or retiring or currently unemployed, and such, these questions were not presented to them.

For the alternative label, the answers of the question *"Which of the following settings best describes your primary sector of employment?"* corresponded to six alternative labelled used in the DCE. For those who chose *"Others"* option, we further classified their employment into six alternative labels as much as possible. For example, respondents' answer is "Professional organisation' which was then classified as *"government/academia"*.

For the *"Role"* attribute, the question *"Which of the following best describes your current role?"* the answered choice were matched correspondingly to the levels used in the DCE. There are a number of respondents who chose "others" option and then specified their current roles. For those respondents, we classified those *"other roles"* into one of the "role' levels in DCE based on the nature of their current *"role"*. For example, in hospital alternative, the role *"Informatics"* were classified as *"Clinical practice"* level. Some respondents have management roles which were not specified in the DCE levels. For those respondents, the "role" levels were assigned the most common role of that alternative (i.e. Clinical practice in Hospital, both dispensing and professional services in Community pharmacy, etc.) as we assume those respondents have to supervise/oversee the common roles the most.

For the *"flexible work schedule"*, two answered choices are identical to the DCE levels and were classified correspondingly.

For the *"career development"* attribute, the choice of the question *"Regarding your future career progression in your primary place of employment, would you describe it as having: None/ Specialization only/ promotion and specialization"*. Three choices are matched exactly with the DCE levels. Noted that the three alternatives do not have *"specialization only"* option (i.e. industry, government/academia and non-pharmacy alternatives), if respondents specified that they have *"specialization only"* opportunities in these sectors, we reclassified it as "promotion and specialization" option to be in line with the DCE levels.

For the *"geographic location"*, the question in the questionnaire *"Please indicate your main work locality?"* has three options which corresponded to the DCE levels. For alternatives which do not have level *"rural area"* in the DCE, we classified the response *"rural area"* of the current employment as *"rural area"* levels to match with the DCE levels.

The "annual salary" were extracted from the answer to the question "What is your (approximate) total gross personal income (i.e. before tax) from your primary employment?". This reported income may depend on the number of hours worked where some respondents may work part-time or overtime. The values of "annual salary" were standardised by using the hourly wage rate which was then multiplied by 37.5 hours (considered full-time job) for 52 weeks. Details of the coding are available upon request.

References

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Appendix 5. A Comparison of Full and Partial Choice Set Designs in a Labelled Discrete Choice Experiment

Appendix 5.1. Ngene design code for labelled and unlabelled experiments

Appendix 5.1.1. Unlabelled design

```
design

;alts = alt1, alt2, alt3

;rows = 24

;eff = 13*(mnl,d) + 2*(mnl,a)
;block = 6

;cond:
if(alt1.JOBTYPE = 0, alt1.HOSP = 1), if(alt1.JOBTYPE <> 0, alt1.HOSP = 0),
if(alt1.JOBTYPE = 1, alt1.COMM = 1), if(alt1.JOBTYPE <> 1, alt1.COMM = 0),
if(alt1.JOBTYPE = 2, alt1.PRIM = 1), if(alt1.JOBTYPE <> 2, alt1.PRIM = 0),
if(alt1.JOBTYPE = 3, alt1.IND = 1),  if(alt1.JOBTYPE <> 3, alt1.IND = 0),
if(alt1.JOBTYPE = 4, alt1.GOV = 1),  if(alt1.JOBTYPE <> 4, alt1.GOV = 0),
if(alt1.JOBTYPE = 5, alt1.NONP = 1), if(alt1.JOBTYPE <> 5, alt1.NONP = 0),

if(alt2.JOBTYPE = 0, alt2.HOSP = 1), if(alt2.JOBTYPE <> 0, alt2.HOSP = 0),
if(alt2.JOBTYPE = 1, alt2.COMM = 1), if(alt2.JOBTYPE <> 1, alt2.COMM = 0),
if(alt2.JOBTYPE = 2, alt2.PRIM = 1), if(alt2.JOBTYPE <> 2, alt2.PRIM = 0),
if(alt2.JOBTYPE = 3, alt2.IND = 1),  if(alt2.JOBTYPE <> 3, alt2.IND = 0),
if(alt2.JOBTYPE = 4, alt2.GOV = 1),  if(alt2.JOBTYPE <> 4, alt2.GOV = 0),
if(alt2.JOBTYPE = 5, alt2.NONP = 1), if(alt2.JOBTYPE <> 5, alt2.NONP = 0),

if(alt3.JOBTYPE = 0, alt3.HOSP = 1), if(alt3.JOBTYPE <> 0, alt3.HOSP = 0),
if(alt3.JOBTYPE = 1, alt3.COMM = 1), if(alt3.JOBTYPE <> 1, alt3.COMM = 0),
if(alt3.JOBTYPE = 2, alt3.PRIM = 1), if(alt3.JOBTYPE <> 2, alt3.PRIM = 0),
if(alt3.JOBTYPE = 3, alt3.IND = 1),  if(alt3.JOBTYPE <> 3, alt3.IND = 0),
if(alt3.JOBTYPE = 4, alt3.GOV = 1),  if(alt3.JOBTYPE <> 4, alt3.GOV = 0),
if(alt3.JOBTYPE = 5, alt3.NONP = 1), if(alt3.JOBTYPE <> 5, alt3.NONP = 0),

if(alt1.ROLE_H1 = 1, alt1.ROLE_H2 = 0), if(alt1.ROLE_H2 = 1, alt1.ROLE_H1 =
0),
if(alt2.ROLE_H1 = 1, alt2.ROLE_H2 = 0), if(alt2.ROLE_H2 = 1, alt2.ROLE_H1 =
0),
if(alt3.ROLE_H1 = 1, alt3.ROLE_H2 = 0), if(alt3.ROLE_H2 = 1, alt3.ROLE_H1 =
0),

if(alt1.CAREER_H1 = 1, alt1.CAREER_H2 = 0), if(alt1.CAREER_H2 = 1,
alt1.CAREER_H1 = 0),
if(alt2.CAREER_H1 = 1, alt2.CAREER_H2 = 0), if(alt2.CAREER_H2 = 1,
alt2.CAREER_H1 = 0),
if(alt3.CAREER_H1 = 1, alt3.CAREER_H2 = 0), if(alt3.CAREER_H2 = 1,
alt3.CAREER_H1 = 0),

if(alt1.ROLE_C1 = 1, alt1.ROLE_C2 = 0), if(alt1.ROLE_C2 = 1, alt1.ROLE_C1 =
0),
if(alt2.ROLE_C1 = 1, alt2.ROLE_C2 = 0), if(alt2.ROLE_C2 = 1, alt2.ROLE_C1 =
0),
if(alt3.ROLE_C1 = 1, alt3.ROLE_C2 = 0), if(alt3.ROLE_C2 = 1, alt3.ROLE_C1 =
0),
```

```
if(alt1.CAREER_C1 = 1, alt1.CAREER_C2 = 0), if(alt1.CAREER_C2 = 1,
alt1.CAREER_C1 = 0),
if(alt2.CAREER_C1 = 1, alt2.CAREER_C2 = 0), if(alt2.CAREER_C2 = 1,
alt2.CAREER_C1 = 0),
if(alt3.CAREER_C1 = 1, alt3.CAREER_C2 = 0), if(alt3.CAREER_C2 = 1,
alt3.CAREER_C1 = 0),

if(alt1.LOCATION_C1 = 1, alt1.LOCATION_C2 = 0), if(alt1.LOCATION_C2 = 1,
alt1.LOCATION_C1 = 0),
if(alt2.LOCATION_C1 = 1, alt2.LOCATION_C2 = 0), if(alt2.LOCATION_C2 = 1,
alt2.LOCATION_C1 = 0),
if(alt3.LOCATION_C1 = 1, alt3.LOCATION_C2 = 0), if(alt3.LOCATION_C2 = 1,
alt3.LOCATION_C1 = 0),

if(alt1.CAREER_P1 = 1, alt1.CAREER_P2 = 0), if(alt1.CAREER_P2 = 1,
alt1.CAREER_P1 = 0),
if(alt2.CAREER_P1 = 1, alt2.CAREER_P2 = 0), if(alt2.CAREER_P2 = 1,
alt2.CAREER_P1 = 0),
if(alt3.CAREER_P1 = 1, alt3.CAREER_P2 = 0), if(alt3.CAREER_P2 = 1,
alt3.CAREER_P1 = 0),

if(alt1.LOCATION_P1 = 1, alt1.LOCATION_P2 = 0), if(alt1.LOCATION_P2 = 1,
alt1.LOCATION_P1 = 0),
if(alt2.LOCATION_P1 = 1, alt2.LOCATION_P2 = 0), if(alt2.LOCATION_P2 = 1,
alt2.LOCATION_P1 = 0),
if(alt3.LOCATION_P1 = 1, alt3.LOCATION_P2 = 0), if(alt3.LOCATION_P2 = 1,
alt3.LOCATION_P1 = 0),

if(alt1.ROLE_I1 = 1, alt1.ROLE_I2 = 0), if(alt1.ROLE_I2 = 1, alt1.ROLE_I1 =
0),
if(alt2.ROLE_I1 = 1, alt2.ROLE_I2 = 0), if(alt2.ROLE_I2 = 1, alt2.ROLE_I1 =
0),
if(alt3.ROLE_I1 = 1, alt3.ROLE_I2 = 0), if(alt3.ROLE_I2 = 1, alt3.ROLE_I1 =
0),

if(alt1.LOCATION_N1 = 1, alt1.LOCATION_N2 = 0), if(alt1.LOCATION_N2 = 1,
alt1.LOCATION_N1 = 0),
if(alt2.LOCATION_N1 = 1, alt2.LOCATION_N2 = 0), if(alt2.LOCATION_N2 = 1,
alt2.LOCATION_N1 = 0),
if(alt3.LOCATION_N1 = 1, alt3.LOCATION_N2 = 0), if(alt3.LOCATION_N2 = 1,
alt3.LOCATION_N1 = 0),

if(alt1.ROLE_H1 = 0 and alt1.ROLE_H2 = 0, alt1.CAREER_H2 = 0),
if(alt2.ROLE_H1 = 0 and alt2.ROLE_H2 = 0, alt2.CAREER_H2 = 0),
if(alt3.ROLE_H1 = 0 and alt3.ROLE_H2 = 0, alt3.CAREER_H2 = 0),

if(alt1.ROLE_C1 = 0 and alt1.ROLE_C2 = 0, alt1.CAREER_C2 = 0),
if(alt2.ROLE_C1 = 0 and alt2.ROLE_C2 = 0, alt2.CAREER_C2 = 0),
if(alt3.ROLE_C1 = 0 and alt3.ROLE_C2 = 0, alt3.CAREER_C2 = 0)

;model:

U(alt1) = jobtype.dummy[0|0|0|0|0] * JOBTYPE[1,2,3,4,5,0]

        + role_h1                * ROLE_H1[0,1]            * HOSP[0,1]
        + role_h2                * ROLE_H2[0,1]            * HOSP
        + flex_h                 * FLEX_H[0,1]             * HOSP
        + career_h1              * CAREER_H1[0,1]          * HOSP
        + career_h2              * CAREER_H2[0,1]          * HOSP
        + loc_h                  * LOCATION_H[0,1]         * HOSP
```

```
        + salary_h                 * SALARY_H[60,100,140,180]  * HOSP

        + role_c1                  * ROLE_C1[0,1]              * COMM[0,1]
        + role_c2                  * ROLE_C2[0,1]              * COMM
        + flex_c                   * FLEX_C[0,1]               * COMM
        + career_c1                * CAREER_C1[0,1]            * COMM
        + career_c2                * CAREER_C2[0,1]            * COMM
        + loc_c1                   * LOCATION_C1[0,1]          * COMM
        + loc_c2                   * LOCATION_C2[0,1]          * COMM
        + salary_c                 * SALARY_C[60,100,140,180]  * COMM

        + role_p                   * ROLE_P[0,1]               * PRIM[0,1]
        + flex_p                   * FLEX_P[0,1]               * PRIM
        + career_p1                * CAREER_P1[0,1]            * PRIM
        + career_p2                * CAREER_P2[0,1]            * PRIM
        + loc_p1                   * LOCATION_P1[0,1]          * PRIM
        + loc_p2                   * LOCATION_P2[0,1]          * PRIM
        + salary_p                 * SALARY_P[60,100,140,180]   * PRIM

        + role_i1                  * ROLE_I1[0,1]              * IND[0,1]
        + role_i2                  * ROLE_I2[0,1]              * IND
        + flex_i                   * FLEX_I[0,1]               * IND
        + career_i                 * CAREER_I[0,1]             * IND
        + loc_i                    * LOCATION_I[0,1]           * IND
        + salary_i                 * SALARY_I[100,140,180,220] * IND

        + role_g                   * ROLE_G[0,1]               * GOV[0,1]
        + flex_g                   * FLEX_G[0,1]               * GOV
        + career_g                 * CAREER_G[1,0]             * GOV
        + loc_g                    * LOCATION_G[1,0]           * GOV
        + salary_g                 * SALARY_G[60,100,140,180]  * GOV

        + role_n                   * ROLE_N[0,1]               * NONP[0,1]
        + flex_n                   * FLEX_N[0,1]               * NONP
        + career_n                 * CAREER_N[0,1]             * NONP
        + loc_n1                   * LOCATION_N1[0,1]          * NONP
        + loc_n2                   * LOCATION_N2[0,1]          * NONP
        + salary_n                 * SALARY_N[60,100,140,180]  * NONP

/

U(alt2) = jobtype   * JOBTYPE

        + role_h1   * ROLE_H1     * HOSP
        + role_h2   * ROLE_H2     * HOSP
        + flex_h    * FLEX_H      * HOSP
        + career_h1 * CAREER_H1   * HOSP
        + career_h2 * CAREER_H2   * HOSP
        + loc_h     * LOCATION_H  * HOSP
        + salary_h  * SALARY_H    * HOSP

        + role_c1   * ROLE_C1     * COMM
        + role_c2   * ROLE_C2     * COMM
        + flex_c    * FLEX_C      * COMM
        + career_c1 * CAREER_C1   * COMM
        + career_c2 * CAREER_C2   * COMM
        + loc_c1    * LOCATION_C1 * COMM
        + loc_c2    * LOCATION_C2 * COMM
        + salary_c  * SALARY_C    * COMM

        + role_p    * ROLE_P      * PRIM
```

```
        + flex_p    * FLEX_P       * PRIM
        + career_p1 * CAREER_P1    * PRIM
        + career_p2 * CAREER_P2    * PRIM
        + loc_p1    * LOCATION_P1 * PRIM
        + loc_p2    * LOCATION_P2 * PRIM
        + salary_p  * SALARY_P     * PRIM

        + role_i1   * ROLE_I1      * IND
        + role_i2   * ROLE_I2      * IND
        + flex_i    * FLEX_I       * IND
        + career_i  * CAREER_I     * IND
        + loc_i     * LOCATION_I   * IND
        + salary_i  * SALARY_I     * IND

        + role_g    * ROLE_G       * GOV
        + flex_g    * FLEX_G       * GOV
        + career_g  * CAREER_G     * GOV
        + loc_g     * LOCATION_G   * GOV
        + salary_g  * SALARY_G     * GOV

        + role_n    * ROLE_N       * NONP
        + flex_n    * FLEX_N       * NONP
        + career_n  * CAREER_N     * NONP
        + loc_n1    * LOCATION_N1 * NONP
        + loc_n2    * LOCATION_N2 * NONP
        + salary_n  * SALARY_N     * NONP

/

U(alt3) = jobtype  * JOBTYPE

        + role_h1   * ROLE_H1      * HOSP
        + role_h2   * ROLE_H2      * HOSP
        + flex_h    * FLEX_H       * HOSP
        + career_h1 * CAREER_H1    * HOSP
        + career_h2 * CAREER_H2    * HOSP
        + loc_h     * LOCATION_H   * HOSP
        + salary_h  * SALARY_H     * HOSP

        + role_c1   * ROLE_C1      * COMM
        + role_c2   * ROLE_C2      * COMM
        + flex_c    * FLEX_C       * COMM
        + career_c1 * CAREER_C1    * COMM
        + career_c2 * CAREER_C2    * COMM
        + loc_c1    * LOCATION_C1 * COMM
        + loc_c2    * LOCATION_C2 * COMM
        + salary_c  * SALARY_C     * COMM

        + role_p    * ROLE_P       * PRIM
        + flex_p    * FLEX_P       * PRIM
        + career_p1 * CAREER_P1    * PRIM
        + career_p2 * CAREER_P2    * PRIM
        + loc_p1    * LOCATION_P1 * PRIM
        + loc_p2    * LOCATION_P2 * PRIM
        + salary_p  * SALARY_P     * PRIM

        + role_i1   * ROLE_I1      * IND
        + role_i2   * ROLE_I2      * IND
        + flex_i    * FLEX_I       * IND
        + career_i  * CAREER_I     * IND
        + loc_i     * LOCATION_I   * IND
```

```
        + salary_i  * SALARY_I    * IND

        + role_g    * ROLE_G      * GOV
        + flex_g    * FLEX_G      * GOV
        + career_g  * CAREER_G    * GOV
        + loc_g     * LOCATION_G  * GOV
        + salary_g  * SALARY_G    * GOV

        + role_n    * ROLE_N      * NONP
        + flex_n    * FLEX_N      * NONP
        + career_n  * CAREER_N    * NONP
        + loc_n1    * LOCATION_N1 * NONP
        + loc_n2    * LOCATION_N2 * NONP
        + salary_n  * SALARY_N    * NONP
$
```

Appendix 5.1.2. Labelled design

```
design

;alts = H, C, P, I, G, N

;rows = 18

;con
;eff = 13*(mnl,d) + 2*(mnl,a)
;block = 6

;cond:
if (H.ROLE_H = 0, H.CAREER_H <> 2),
if (C.ROLE_C = 0, C.CAREER_C <> 2)

;model:

U(H) = role_h.dummy[0|0]   * ROLE_H[2,1,0]
     + flex_h              * FLEX_H[0,1]
     + career_h.dummy[0|0] * CAREER_H[2,1,0]
     + loc_h.dummy[0]      * LOCATION_H[1,0]
     + salary_h            * SALARY_H[60,100,140,180] /

U(C) = asc_c
     + role_c.dummy[0|0]   * ROLE_C[2,1,0]
     + flex_c              * FLEX_C[0,1]
     + career_c.dummy[0|0] * CAREER_C[2,1,0]
     + loc_c.dummy[0|0]    * LOCATION_C[2,1,0]
     + salary_c            * SALARY_C[60,100,140,180] /

U(P) = asc_p
     + role_p.dummy[0]     * ROLE_P[1,0]
     + flex_p              * FLEX_P[0,1]
     + career_p.dummy[0|0] * CAREER_P[2,1,0]
     + loc_p.dummy[0|0]    * LOCATION_P[2,1,0]
     + salary_p            * SALARY_P[60,100,140,180] /

U(I) = asc_i
     + role_i.dummy[0|0]   * ROLE_I[2,1,0]
     + flex_i              * FLEX_I[0,1]
     + career_i.dummy[0]   * CAREER_I[1,0]
     + loc_i.dummy[0]      * LOCATION_I[1,0]
     + salary_i            * SALARY_I[100,140,180,220] /

U(G) = asc_g
     + role_g.dummy[0]     * ROLE_G[1,0]
     + flex_g              * FLEX_G[0,1]
     + career_g.dummy[0]   * CAREER_G[1,0]
     + loc_g.dummy[0]      * LOCATION_G[1,0]
     + salary_g            * SALARY_G[60,100,140,180] /

U(N) = asc_n
     + role_n.dummy[0]     * ROLE_N[1,0]
     + flex_n              * FLEX_N[0,1]
     + career_n.dummy[0]   * CAREER_N[1,0]
     + loc_n.dummy[0|0]    * LOCATION_N[2,1,0]
     + salary_n            * SALARY_N[60,100,140,180]

$
```

Appendix 5.2. Data Analysis coding

Appendix 5.2.1. FCSD Nlogit coding

```
Nlogit
;lhs = cho, cset, alts
;choices = a,b,c,d,e,f
;checkdata
;Table=table1
;Export output
;export=both
;model:
U(a) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P

     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
     + lo_1t     * LO_I1
     + sa_t      * SA_I

     + rl_g1t    * RL_G1
     + fl_t      * FL_G
     + cr_1t     * CR_G1
     + lo_1t     * LO_G1
     + sa_t      * SA_G

     + rl_n1t    * RL_N1
     + fl_t      * FL_N
     + cr_1t     * CR_N1
     + lo_1t     * LO_N1  + lo_2t   * LO_N2
     + sa_t      * SA_N
/
U(b) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
```

```
     + sa_t       * SA_C

     + rl_p1     * RL_P1
     + fl_t       * FL_P
     + cr_1t      * CR_P1  + cr_2t   * CR_P2
     + lo_1t      * LO_P1  + lo_2t   * LO_P2
     + sa_t       * SA_P

     + rl_i1t     * RL_I1  + rl_i2t  * RL_I2
     + fl_t       * FL_I
     + cr_1t      * CR_I1
     + lo_1t      * LO_I1
     + sa_t       * SA_I

     + rl_g1t     * RL_G1
     + fl_t       * FL_G
     + cr_1t      * CR_G1
     + lo_1t      * LO_G1
     + sa_t       * SA_G

     + rl_n1t     * RL_N1
     + fl_t       * FL_N
     + cr_1t      * CR_N1
     + lo_1t      * LO_N1  + lo_2t   * LO_N2
     + sa_t       * SA_N
/
U(c) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t     * RL_H1  + rl_h2t  * RL_H2
     + fl_t       * FL_H
     + cr_1t      * CR_H1  + cr_2t   * CR_H2
     + lo_1t      * LO_H1
     + sa_t       * SA_H

     + rl_c1t     * RL_C1  + rl_c2t  * RL_C2
     + fl_t       * FL_C
     + cr_1t      * CR_C1  + cr_2t   * CR_C2
     + lo_1t      * LO_C1  + lo_2t   * LO_C2
     + sa_t       * SA_C

     + rl_p1     * RL_P1
     + fl_t       * FL_P
     + cr_1t      * CR_P1  + cr_2t   * CR_P2
     + lo_1t      * LO_P1  + lo_2t   * LO_P2
     + sa_t       * SA_P

     + rl_i1t     * RL_I1  + rl_i2t  * RL_I2
     + fl_t       * FL_I
     + cr_1t      * CR_I1
     + lo_1t      * LO_I1
     + sa_t       * SA_I

     + rl_g1t     * RL_G1
     + fl_t       * FL_G
     + cr_1t      * CR_G1
     + lo_1t      * LO_G1
     + sa_t       * SA_G

     + rl_n1t     * RL_N1
     + fl_t       * FL_N
     + cr_1t      * CR_N1
     + lo_1t      * LO_N1  + lo_2t   * LO_N2
```

```
     + sa_t      * SA_N
/
U(d) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P

     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
     + lo_1t     * LO_I1
     + sa_t      * SA_I

     + rl_g1t    * RL_G1
     + fl_t      * FL_G
     + cr_1t     * CR_G1
     + lo_1t     * LO_G1
     + sa_t      * SA_G

     + rl_n1t    * RL_N1
     + fl_t      * FL_N
     + cr_1t     * CR_N1
     + lo_1t     * LO_N1  + lo_2t   * LO_N2
     + sa_t      * SA_N
/
U(e) =comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P

     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
```

```
     + lo_1t      * LO_I1
     + sa_t       * SA_I

     + rl_g1t     * RL_G1
     + fl_t       * FL_G
     + cr_1t      * CR_G1
     + lo_1t      * LO_G1
     + sa_t       * SA_G

     + rl_n1t     * RL_N1
     + fl_t       * FL_N
     + cr_1t      * CR_N1
     + lo_1t      * LO_N1  + lo_2t   * LO_N2
     + sa_t       * SA_N
/
U(f) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t     * RL_H1  + rl_h2t  * RL_H2
     + fl_t       * FL_H
     + cr_1t      * CR_H1  + cr_2t   * CR_H2
     + lo_1t      * LO_H1
     + sa_t       * SA_H

     + rl_c1t     * RL_C1  + rl_c2t  * RL_C2
     + fl_t       * FL_C
     + cr_1t      * CR_C1  + cr_2t   * CR_C2
     + lo_1t      * LO_C1  + lo_2t   * LO_C2
     + sa_t       * SA_C

     + rl_p1     * RL_P1
     + fl_t       * FL_P
     + cr_1t      * CR_P1  + cr_2t   * CR_P2
     + lo_1t      * LO_P1  + lo_2t   * LO_P2
     + sa_t       * SA_P

     + rl_i1t     * RL_I1  + rl_i2t  * RL_I2
     + fl_t       * FL_I
     + cr_1t      * CR_I1
     + lo_1t      * LO_I1
     + sa_t       * SA_I

     + rl_g1t     * RL_G1
     + fl_t       * FL_G
     + cr_1t      * CR_G1
     + lo_1t      * LO_G1
     + sa_t       * SA_G

     + rl_n1t     * RL_N1
     + fl_t       * FL_N
     + cr_1t      * CR_N1
     + lo_1t      * LO_N1  + lo_2t   * LO_N2
     + sa_t       * SA_N
$
```

Appendix 5.2.2. PCSD coding

```
Nlogit
;lhs = cho, cset,alts
;choices = a,b,c
;model:
U(a) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P

     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
     + lo_1t     * LO_I1
     + sa_t      * SA_I

     + rl_g1t    * RL_G1
     + fl_t      * FL_G
     + cr_1t     * CR_G1
     + lo_1t     * LO_G1
     + sa_t      * SA_G

     + rl_n1t    * RL_N1
     + fl_t      * FL_N
     + cr_1t     * CR_N1
     + lo_1t     * LO_N1  + lo_2t   * LO_N2
     + sa_t      * SA_N
/
U(b) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P
```

```
     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
     + lo_1t     * LO_I1
     + sa_t      * SA_I

     + rl_g1t    * RL_G1
     + fl_t      * FL_G
     + cr_1t     * CR_G1
     + lo_1t     * LO_G1
     + sa_t      * SA_G

     + rl_n1t    * RL_N1
     + fl_t      * FL_N
     + cr_1t     * CR_N1
     + lo_1t     * LO_N1  + lo_2t   * LO_N2
     + sa_t      * SA_N
/
U(c) = comt*COM + prit*PRI + indt*IND + govt*GOV + nont*NON
     + rl_h1t    * RL_H1  + rl_h2t  * RL_H2
     + fl_t      * FL_H
     + cr_1t     * CR_H1  + cr_2t   * CR_H2
     + lo_1t     * LO_H1
     + sa_t      * SA_H

     + rl_c1t    * RL_C1  + rl_c2t  * RL_C2
     + fl_t      * FL_C
     + cr_1t     * CR_C1  + cr_2t   * CR_C2
     + lo_1t     * LO_C1  + lo_2t   * LO_C2
     + sa_t      * SA_C

     + rl_p1    * RL_P1
     + fl_t      * FL_P
     + cr_1t     * CR_P1  + cr_2t   * CR_P2
     + lo_1t     * LO_P1  + lo_2t   * LO_P2
     + sa_t      * SA_P

     + rl_i1t    * RL_I1  + rl_i2t  * RL_I2
     + fl_t      * FL_I
     + cr_1t     * CR_I1
     + lo_1t     * LO_I1
     + sa_t      * SA_I

     + rl_g1t    * RL_G1
     + fl_t      * FL_G
     + cr_1t     * CR_G1
     + lo_1t     * LO_G1
     + sa_t      * SA_G

     + rl_n1t    * RL_N1
     + fl_t      * FL_N
     + cr_1t     * CR_N1
     + lo_1t     * LO_N1  + lo_2t   * LO_N2
     + sa_t      * SA_N
$
```

Appendix 5.3. Comparison between the whole sample and included sample who completed both designs

Table A.5.1. Descriptive statistics of the included and whole samples

	Included sample		Whole sample	
	%/Mean	n =790	%/Mean	n =834
Female	63.76	654	63.76	654
Age (years)		667		667
<40	57.42	383	57.42	383
40-60	29.84	199	29.84	199
>60	12.74	85	12.74	85
Annual income (Australian dollar)	$85,474	664	$ 85,162	696
Device used		761		824
Mobile phone	21.55	164	24.27	200
Tablet	4.33	33	4.73	39
Desktop	74.11	564	71	585
Total time (DCE section only) (minutes)	4.59	783	4.43	816
Employment status		790		824
Working	91	715	91	747
Not working	7	53	7	54
Retired	3	22	2.79	23

Appendix 5.4. Using Swait-Louviere test to examine the impact of different designs on parameter estimates

Firstly, assuming the CL model is the true model of the datasets, the Swait-Louviere test (Louviere et al., 2000b; Swait & Louviere, 1993) was used to test if all parameters are statistically equal across both datasets (i.e. a full preference homogeneity test) while adjusting for scaling effect. In this test, the LR test statistic $-2(LL_p – (LL_{FC} + LL_{Pc})$ is asymptotically chi-squared distributed with K-1 degrees of freedom where K is the number of attributes constrained to have equal parameters across two data sources. LL_p id the log likelihood of a pooled CL model including all observations but allowing different scale between two data sources (i.e. the "nested logit trick" model[15]). LL_{FC} and LL_{PC} are the log likelihood values from two CL separate models applied to the FCSD and PCSD datasets (Louviere et al., 2000b; Swait & Louviere, 1993). A rejection of the hypothesis indicates that the two datasets produce statistically different preference parameters up to scale. If a full preference homogeneity test was rejected, a partial preference homogeneity was tested in which a subset of parameters are hypothesised to be equal across two data sources (Louviere et al., 2000b). To do so, we allowed a set of parameters for each attributes to vary by the data source once at a time. For example, we assumed the two datasets to capture different unobserved factors by allowing dummy variables of labelled effect to varying by data sources. We then allowed parameters of the *ROLE* attributes different due to data sources etc. The Swait-Lourviere test was used to assess the partial preference homogeneity in a similar manner as in the full preference homogeneity test.

[15] The nested logit trick is a method that utilises a nested logit model with two levels, two branches of alternatives to accomplish the estimation required to pool FCSD and PCSD data. Each branch of the nested logit model contains alternatives from each dataset whereby the constant variance (i.e. scale) assumption must hold within branches but scale factors between branches can differ Hensher, D. A., Rose, J. M., & Greene, W. H. (2015b). Combining sources of data. In *Applied choice analysis* (2nd edition. ed.). Cambridge : Cambridge University Press. .

Secondly, as mentioned previously, the CL model may be undesirable in our application where the presence or absence of an alternative may change the probability of choosing another alternative in the choice sets, the most general form of the MIXL model in WTP-space were estimated.

Table A. presents the results of separate CL models for each design type and the results from the pooled, scaled CL model. All statistically significant parameter estimates from both designs have the same sign

Table A. show the results of the Swait-Louviere parameter equality tests. The first test was undertaken on the pooled model with preference homogeneity across all variables. First, we assumed the unobserved factors captured by the labelled effects to be similar between two data sources by specifying the parameter estimates of the dummy variables for labelled effects being the same across both data sets. The chi-square statistic for the test was 59.83. As the critical chi-squared value is 36.19 based on 19 degrees of freedom and the significance level $\alpha = 0.01$, this test statistic rejects the hypothesis of preference homogeneity across all variables. A test statistic of 35.63 still rejects the hypothesis of equal parameters given the critical chi-squared value of 29.14 based on 14 degrees of freedom and $\alpha = 0.01$. This means that the FCSD and PCSD data do not produce preference homogeneity up to scale across attributes, even accounting for unobserved factors.

Following the example in Louviere and colleagues (Louviere et al., 2000b), we tested the partial preference homogeneity. Using graphical methods (Appendix 3, Figure 1), the differences in the variables comprising the ROLE attributes may cause the rejection of the full preference homogeneity hypothesis. Another pooled model in which not all dummy variables for labelled effects and the ROLE attribute were constrained to be equivalent in the FCSD and PCSD joint model resulted in a chi-squared statistic of 10.97. This means that the hypothesis of parameter equality across attributes except for ROLE and labelled effects were not rejected (critical value of 15.09 given five degrees of freedom and $\alpha = 0.01$). In this case, it seems that the preference homogeneity hypothesis does not hold across all taste parameters (i.e. attributes) but partial preference homogeneity does apply on attributes when accounting for the preference heterogeneity in the label effects and *ROLE* attributes.

reports the results from two separate MIXL models accounting for more flexible substitution patterns across alternatives in two datasets. The t-test of equality shows that the two data sources produce different WTPs estimates for attributes whose coefficients are statistically significant in both models. Overall, these results suggest that the difference in design types (i.e. the number of alternatives) influences taste estimates to some extent.

Table A.5.2. CL results for separate data sets and pooled data

Attributes	Alternatives	FCSD Coefficient (SE)	PCSD Coefficient (SE)	Pooled, scaled data Coefficient (SE)
Community pharmacy constant	Community pharmacy	Ref	Ref	Ref
Hospital pharmacy constant	Hospital pharmacy	0.11 (0.14)	0.53 ** (0.19)	0.22 * (0.12)
Primary Care Setting constant	Primary Care Setting	0.34 ** (0.13)	0.72 *** (0.17)	0.51 *** (0.10)
Pharmaceutical Industry constant	Pharmaceutical Industry	-0.94 *** (0.16)	-0.50 ** (0.19)	-0.66 *** (0.12)
Government/Academia constant	Government/Academia	0.09 (0.13)	0.32 * (0.17)	0.17 (0.11)
Non-pharmacy related sector constant	Non-pharmacy related sector	-0.09 (0.14)	0.47 ** (0.18)	0.12 (0.11)
Dispensing/distribution role	Hospital pharmacy	Ref	Ref	Ref
Clinical practice role	Hospital pharmacy	0.08 (0.16)	0.10 (0.16)	0.04 (0.11)
Education/Research role	Hospital pharmacy	0.19 (0.13)	0.31 ** (0.14)	0.23 ** (0.09)
Dispensing role	Community pharmacy	Ref	Ref	Ref
Combination of dispensing and professional services role	Community pharmacy	0.39 ** (0.17)	0.11 (0.19)	0.28 ** (0.12)
Professional services role	Community pharmacy	0.31 ** (0.15)	0.04 (0.23)	0.27 ** (0.12)
General practice role	Primary Care Setting	Ref	Ref	Ref
Aged care facility role	Primary Care Setting	-0.01 (0.12)	-0.56 *** (0.11)	-0.28 *** (0.08)
Sales or marketing role	Pharmaceutical Industry	Ref	Ref	Ref
Medical or Regulatory Affairs role	Pharmaceutical Industry	0.65 *** (0.14)	0.43 ** (0.18)	0.52 *** (0.10)
Research and development role	Pharmaceutical Industry	0.78 *** (0.15)	0.68 *** (0.15)	0.57 *** (0.09)

Table A. 5.2. CL results for separate data sets and pooled data, Continued

Attributes	Alternatives	FCSD Coefficient (SE)	PCSD Coefficient (SE)	Pooled, scaled data Coefficient (SE)
Policy related role	Government/Academia	Ref	Ref	Ref
Research or teaching role	Government/Academia	-0.34 **	-0.05	-0.20 **
		(0.13)	(0.12)	(0.08)
Health-related role	Non-pharmacy related sector	Ref	Ref	Ref
Non health related role	Non-pharmacy related sector	-0.08	-0.72 ***	-0.35 ***
		(0.14)	(0.14)	(0.09)
No flexible work schedule	All sectors	Ref	Ref	Ref
Having flexible work schedule	All sectors	0.20 ***	0.21 ***	0.20 ***
		(0.05)	(0.06)	(0.04)
No opportunities	All sectors	Ref	Ref	Ref
Promotion and specialization opportunities	All sectors	0.43 ***	0.29 ***	0.38 ***
		(0.06)	(0.06)	(0.04)
Specialization opportunities only	Hospital pharmacy/Community	0.15 *	0.07	0.17 **
	pharmacy/Primary care settings	(0.09)	(0.10)	(0.06)
Urban location	All sectors	Ref	Ref	Ref
Rural location	All sectors	-0.56 ***	-0.84 ***	-0.67 ***
		(0.06)	(0.07)	(0.04)
Remote location	All sectors	-0.87 ***	-0.91 ***	-0.91 ***
		(0.08)	(0.09)	(0.06)
Annual salary ($0,000)		0.01 ***	0.01 ***	0.01 ***
		(0.00)	(0.00)	(0.00)
PC-to_FC IV value				0.96 ***
				(0.03)
Respondents*		790	790	790
Observations		2370	3160	5530
Log likelihood		-3903	-2847	-6780

Notes: *Models were run on the same sample of respondents who fully completed two choice question sets of different design types

Table A.5.3: Swait-Louviere testing of parameter equality

Models	Log likelihood	K	Chi-square value	Degree of freedom (β -1)	Critical value (95%)	Result
FCSD model	-3903	20				
PCSD model	-2847	20				
Joint model (FC + PC pooled)	-6780	21	59.83	19	36.19	Reject
Joint model (FC + PC pooled), ASCs variables by data source	-6768	26	35.63	14	29.14	Reject
Joint model (FC + PC pooled), ASCs & ROLE variables by data source	-6756	35	10.97	5	15.09	Accept

Notes:

1. Hypothesis: $\beta = \beta f = \beta p$; 2. Likelihood ratio test: $-2[L\mu - (L1 + L2)]$; 3. K: number of parameters, β: number of common coefficients; 4. ASCs: Labelled effect

5. FCSD: Full choice set data ; 6. PCSD: Partial choice set data

Table A.5.4: WTPs resulted from the WTP-space models

Attributes	Alternatives	FCSD	PCSD	Difference in MWTP †
Dispensing/distribution role	Hospital pharmacy	Ref	Ref	
Clinical practice role	Hospital pharmacy	9.88 (-15.51 ; 35.26)	6.72 (-26.48 ; 39.92)	3.16 ***
Education/Research role	Hospital pharmacy	26.53 ** (5.36 ; 47.70)	7.97 (-11.55 ; 27.49)	18.56 ***
Dispensing role	Community pharmacy	Ref	Ref	
Combination of dispensing and professional services	Community pharmacy	-5.13 (-34.78 ; 24.51)	-5.37 (-37.21 ; 26.47)	.24
Professional services role	Community pharmacy	-8.49 (-43.50 ; 26.52)	-30.45 (-83.76 ; 22.87)	21.96 ***
General practice role	Primary Care Setting	Ref	Ref	
Aged care facility role	Primary Care Setting	-3.95 (-24.41 ; 16.51)	-32.51 *** (-51.16 ; -13.86)	28.56 ***
Sales or marketing role	Pharmaceutical Industry	Ref	Ref	
Medical or Regulatory Affairs role	Pharmaceutical Industry	29.51 * (-2.05 ; 61.08)	28.34 (-6.74 ; 63.42)	1.17
Research and development role	Pharmaceutical Industry	45.98 ** (13.87 ; 78.09)	41.09 ** (8.45 ; 73.72)	4.89 ***
Policy related role	Government/Academia	Ref	Ref	
Research or teaching role	Government/Academia	-30.80 ** (-54.55 ; -7.06)	-6.77 (-29.19 ; 15.65)	-24.03 ***
Health-related role	Non-pharmacy related sector	Ref	Ref	
Non health related role	Non-pharmacy related sector	-15.58 (-47.42 ; 16.26)	-44.49 *** (-67.59 ; -21.39)	28.91 ***
No flexible work schedule	All sectors	Ref	Ref	
Having flexible work schedule	All sectors	14.48 ** (5.85 ; 23.11)	19.51 *** (9.24 ; 29.79)	-5.04 ***
No opportunities	All sectors	Ref	Ref	
Promotion and specialization opportunities•	All sectors	32.89 *** (23.04 ; 42.74)	37.75 *** (27.78 ; 47.73)	-4.86 ***
Specialization opportunities only	All sectors	9.01 (-5.13 ; 23.16)	19.84 ** (2.43 ; 37.25)	-10.83 ***
Urban location	All sectors	Ref	Ref	
Rural location	All sectors	-45.39 *** (-56.68 ; -34.10)	-58.01 *** (-69.77 ; -46.24)	12.62 ***
Remote location	All sectors	-79.65 *** (-101.74 ; -57.56)	-94.86 *** (-115.59 ; -74.13)	15.22 ***
Model statistics				
logL		-3703	-2761	
Observations		2370	3160	
Respondents		790	790	

Notes:
1. *p<0.1; **p<0.05;***p<0.0001
2. 95% confidence interval in brackets
3. WTP values in $1000

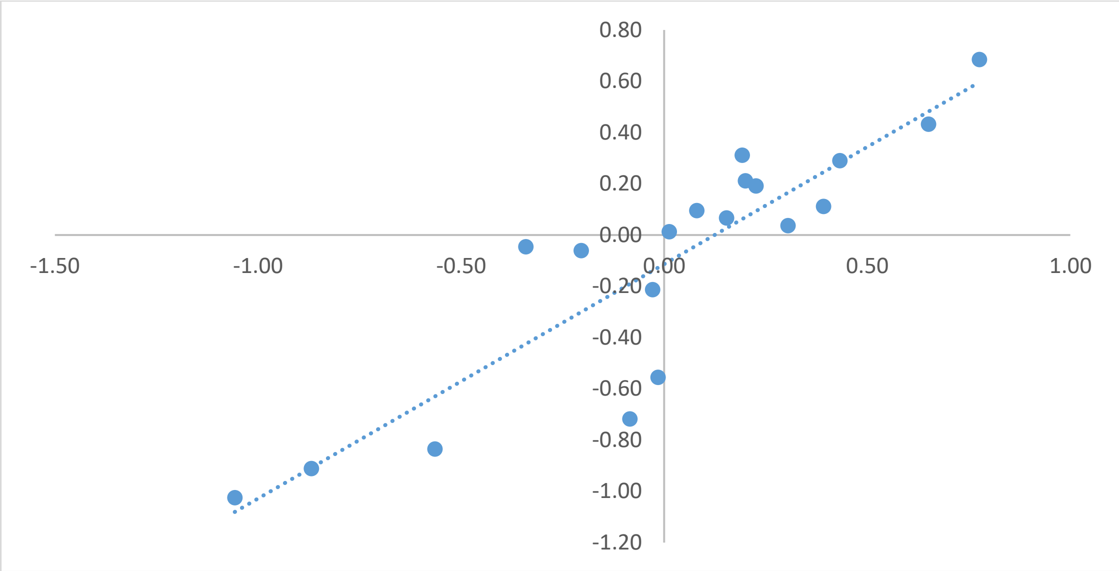

Figure A5. 1: Full choice set vs Partial choice set coefficients

Table A.5.5: Swait-Louviere test for full and partial preference homogeneity between two data sources

Models	Log likelihood	K	Chi-square value	Degree of freedom (β -1)	Critical value (95%)	Result
FC model	-3903	20				
PC model	-2847	20				
Joint model (FC + PC pooled)	-6780	21	59.83	19	36.19	Reject
Joint model (FC + PC pooled), ASCs variables by data source	-6768	26	35.63	14	29.14	Reject
Joint model (FC + PC pooled), ROLE variables by data source	-6761	30	21.42	10	23.20	Reject
Joint model (FC + PC pooled), FLEXIBILITY variables by data source	-6780	22	59.77	18	34.80	Reject
Joint model (FC + PC pooled), CAREER PROGRESSION variables by data source	-6778	23	55.81	17	33.40	Reject
Joint model (FC + PC pooled), LOCATION variables by data source	-6774	23	48.72	17	33.40	Reject
Joint model (FC + PC pooled), SALARY variables by data source	-6779	22	58.13	18	34.80	Reject
Joint model (FC + PC pooled), ASCs & LOCATION variables by data source	-6763	28	26.94	12	26.22	Reject
Joint model (FC + PC pooled), ASCs & FLEXIBILITY variables by data source	-6768	27	35.63	13	27.69	Reject
Joint model (FC + PC pooled), ASCs & CAREER PROGRESSION variables by data source	-6767	28	33.65	12	26.22	Reject
Joint model (FC + PC pooled), ASCs & SALARY variables by data source	-6766	27	31.24	13	27.69	Reject
Joint model (FC + PC pooled), ASCs & ROLE variables by data source	-6756	35	10.97	5	15.09	Accept
Joint model (FC + PC pooled), ASCs & ROLE &LOCATION&SALARY variables by data source	-6751	37	2.80	3	11.35	Accept
Joint model (FC + PC pooled), ASCs & ROLE &LOCATION variables by data source	-6750	38	0.93	2	9.21	Accept

Notes:

1. Hypothesis: β= βf= βp; 2. Likelihood ratio test: -2[Lμ - (L1 + L2)]; 3. ASCs: Labelled effect

4. FC: Full choice set data; 5. PC: Partial choice set data; 6. K: number of parameters, β: number of common coefficients

Appendix 5.5. MNL in WTP space model

Table A. shows the WTP space MNL model results for both FCSD and PCSD. The statistically significant parameters estimates have the same sign across the two design types and the SA coefficients are almost identical across both designs. Both FCSD and PCSD produce the same pattern of WTP values across attribute levels and the LO and FL coefficients are quite similar. All constants are larger while the RL coefficients are mostly smaller in the PCSD (Figure A5. 2). Interestingly, the PCSD has more (at 5%) statistically significant ASCs (4 out 5 ASCs) than the FCSD (2 out of 5 ASCs).

The relative importance of each attribute is very similar across the designs, in which the order of preference appears to be (from most preferred to least preferred): salary, job type, role, location, career progression and flexible work schedule (Figure A5. 2).

Using the confidence interval for the difference between two means, we show the FCSD and PCSD produced different WTP values for CR1 and LO1 which are statistically significant in both FCSD and PCSD results (i.e. the confidence intervals do not include "0"). The FCSD and PCSD also produced different WTP values for NON, RL_P1, RL_G1 and CR2 although these attribute levels are only statistically significant in one of the designs. The remaining 14 attribute levels have statistically similar WTP values from both designs. These results suggest both FCSD and PCSD may produce significantly indifferent preference estimates.

Table A.5.6: WTP space MNL model for different designs

Parameter	FCSD		PCSD		95% CI for the Difference between two means
	MWTP (SE)	CI	MWTP (SE)		
COM	Ref	Ref	Ref	Ref	Ref
HOS	8.59 (11.56)	(-14.06 ; 31.24)	38.97 ** (14.70)	(10.15 ; 67.79)	(-6,67)
PRI	27.45 ** (10.42)	(7.03 ; 47.87)	54.37 *** (12.89)	(29.11 ; 79.64)	(-6,59)
IND	-73.72 *** (11.84)	(-96.92 ; -50.51)	-36.58 ** (15.00)	(-65.98 ; -7.18)	(0,75)
GOV	8.13 (10.71)	(-12.86 ; 29.12)	21.29 (13.29)	(-4.75 ; 47.33)	(-20,47)
NON	-5.37 (11.27)	(-27.45 ; 16.72)	32.55 ** (13.82)	(5.47 ; 59.63)	**(3,73)**
RL_H0	Ref	Ref	Ref	Ref	Ref
RL_H1	6.44 (12.60)	(-18.24 ; 31.13)	11.09 (12.68)	(-13.77 ; 35.95)	(-30,40)
RL_H2	15.35 (10.51)	(-5.26 ; 35.96)	23.27 ** (11.16)	(1.40 ; 45.14)	(-22,38)
RL_C0	Ref	Ref	Ref	Ref	Ref
RL_C1	31.29 ** (13.95)	(3.94 ; 58.63)	9.45 (14.66)	(-19.29 ; 38.18)	(-62,18)
RL_C2	24.26 * (12.38)	(-0.01 ; 48.52)	3.62 (18.21)	(-32.08 ; 39.32)	(-64,23)
RL_P0	Ref	Ref	Ref	Ref	Ref
RL_P1	-1.18 (9.63)	(-20.06 ; 17.71)	-41.08 *** (9.12)	(-58.94 ; -23.21)	**(-66,-14)**
RL_I0	Ref	Ref	Ref	Ref	Ref

RL_I1	51.44 *** (11.86)	(28.19 ; 74.69)	27.54 * (14.10)	(-0.10 ; 55.19)	(-60,12)
RL_I2	61.45 *** (11.66)	(38.59 ; 84.31)	49.55 *** (11.94)	(26.16 ; 72.95)	(-45,21)
RL_G0	Ref	Ref	Ref	Ref	Ref
RL_G1	-26.99 ** (9.87)	(-46.34 ; -7.64)	1.65 (9.20)	(-16.39 ; 19.68)	**(2,55)**
RL_N0	Ref	Ref	Ref	Ref	Ref
RL_N1	-6.71 (10.71)	(-27.70 ; 14.29)	-48.72 *** (11.30)	(-70.87 ; -26.57)	**(-73,-11)**
NO-FL	Ref	Ref	Ref	Ref	Ref
FL	15.85 *** (4.25)	(7.52 ; 24.17)	15.94 *** (4.68)	(6.77 ; 25.11)	(-12,12)
CR0	Ref	Ref	Ref	Ref	Ref
CR1	34.27 *** (4.99)	(24.48 ; 44.06)	18.14 *** (4.99)	(8.36 ; 27.91)	**(-30,-2)**
CR2	12.13 * (7.13)	(-1.85 ; 26.11)	5.00 (8.19)	(-11.04 ; 21.05)	(-28,14)
LO0	Ref	Ref	Ref	Ref	Ref
LO1	-44.68 *** (5.36)	(-55.19 ; -34.17)	-65.08 *** (5.22)	(-75.30 ; -54.86)	**(-35,-6)**
LO2	-68.81 *** (8.41)	(-85.29 ; -52.33)	-73.01 *** (6.63)	(-86.01 ; -60.02)	(-25,17)
Scale	0.01 *** (0.00)		0.01 *** (0.00)		
n	790		790		
Obs	2370		3160		
LL	-3903		-2843		

Notes:

1. *p<0.1; **p<0.05;***p<0.0001

2. 95% confidence interval of WTP distributions in brackets
3. WTP values in $1000
4. † in preference space

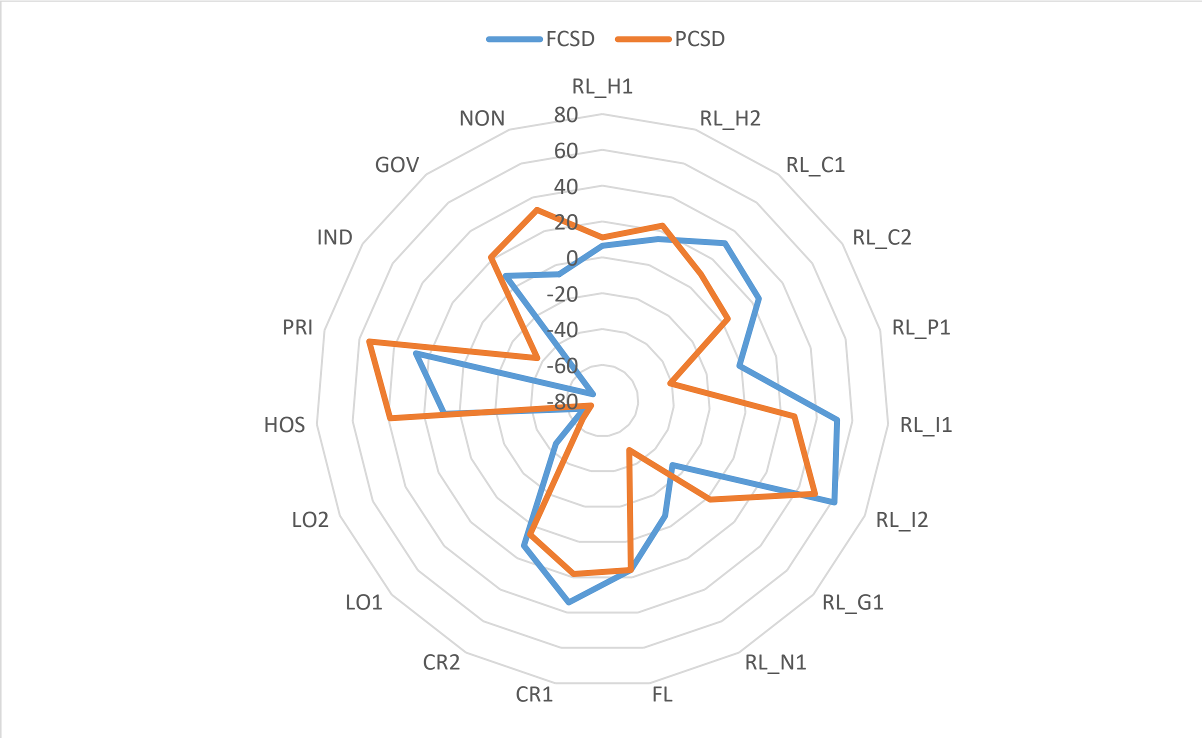

Figure A5. 3: Comparison of WTP values across attributes between FCSD and PCSD from WTP space MNL model

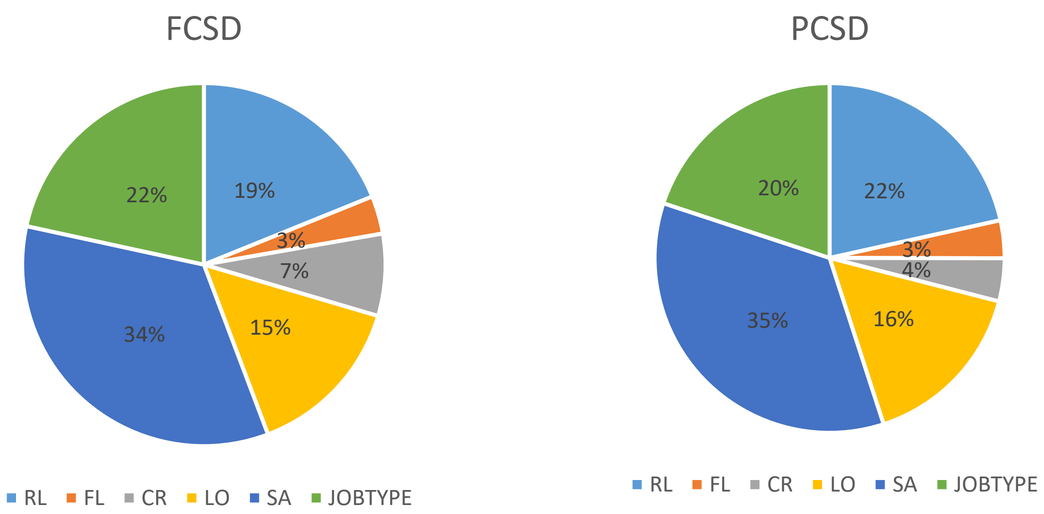

Figure A5. 4 Relative importance of attribute levels from FCSD and PCSD from WTP space MNL model

The FCSD produced smaller standard errors of ASCs than the PCSD while both designs produce similar standard errors for attribute levels. While we controlled for the alternative order, this may be due to the nature of the FCSD presenting all alternatives, of which some are more dominant, thus reducing the error variance. On the other hand, the PCSD presents a different subset of alternatives, as such reducing the probability of presenting dominant alternatives, and increasing the standard error of ASCs.

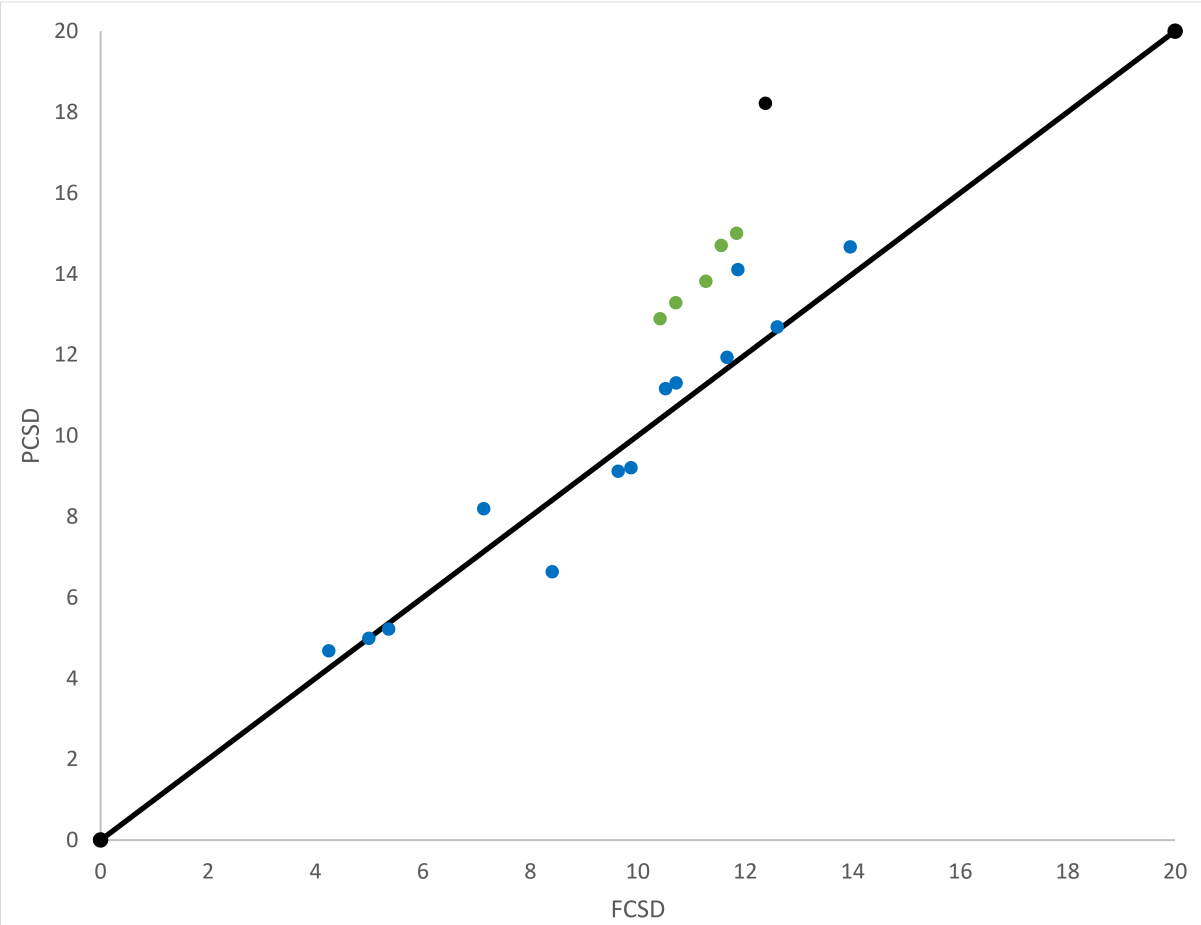

Figure A5. 5 Standard errors resulted from WTL space MNL model from FCSD and PCSD (Green =ASCs, black = RL_C2, blue = other attribute levels)

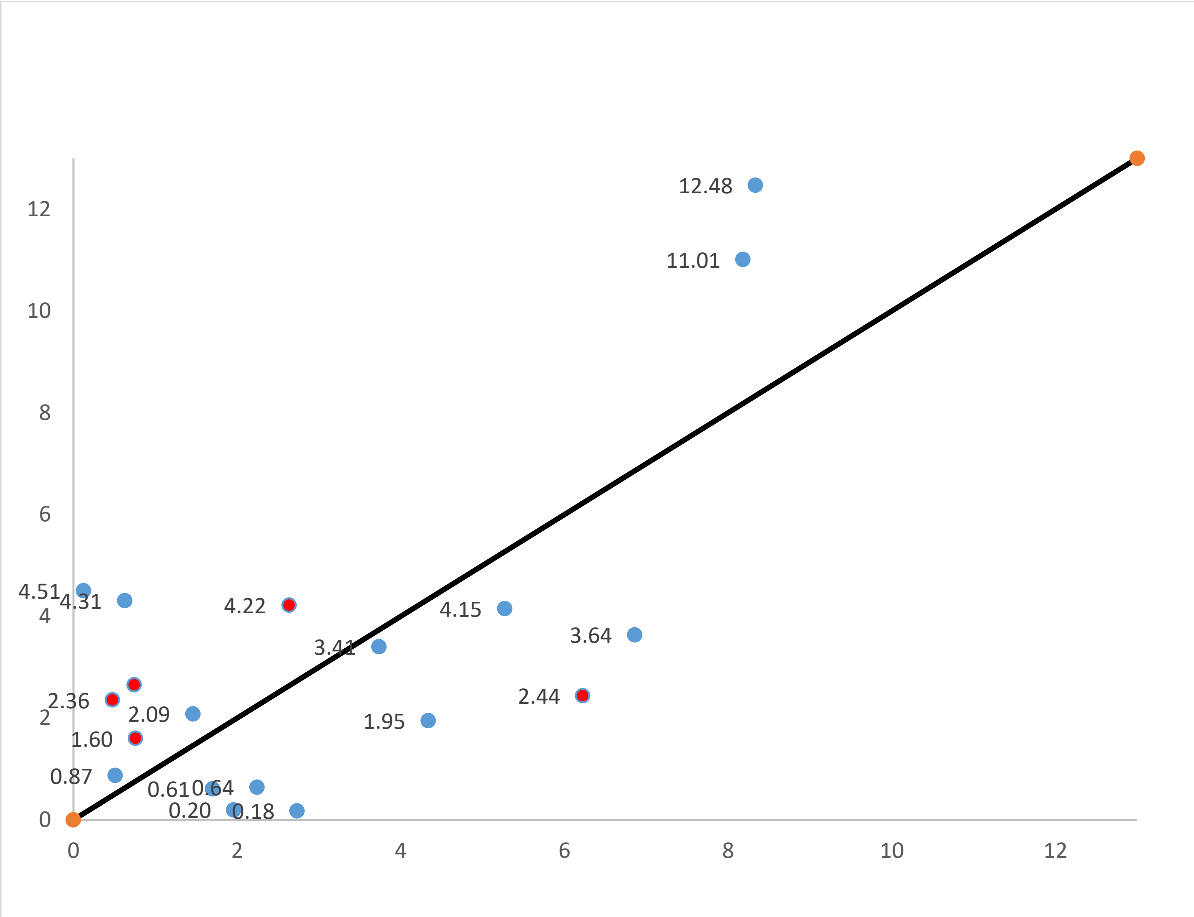

Figure A5. 6 Observed t-ratio from WTP space MNL model (Red = ASCs, blue = non-random attribute levels)

Appendix 5.6. Models including alternative order

Table A. reports the results of CL models in preference space which control for alternative order (i.e. position of alternatives in choice tasks). We do not observe significant effects of alternative orders.

Table A.5.7: Results of CL models in preference space including alternative order

Attributes	Alternatives	FCSD β (SE)	PCSD β (SE)
Community pharmacy constant	Community pharmacy	Ref	Ref
Hospital pharmacy constant	Hospital pharmacy	0.45 ** (0.19)	0.71 ** (0.28)
Primary Care Setting constant	Primary Care Setting	0.33 * (0.18)	0.85 *** (0.24)
Pharmaceutical Industry constant	Pharmaceutical Industry	-0.45 ** (0.22)	-0.28 (0.29)
Government/Academia constant	Government/Academia	0.21 (0.18)	0.58 ** (0.25)
Non-pharmacy related sector constant	Non-pharmacy related sector	0.20 (0.19)	0.75 ** (0.26)
Dispensing/distribution role	Hospital pharmacy	Ref	Ref
Clinical practice role	Hospital pharmacy	-0.36 (0.22)	0.30 (0.24)
Education/Research role	Hospital pharmacy	0.05 (0.17)	0.55 ** (0.21)
Dispensing role	Community pharmacy	Ref	Ref
Combination of dispensing and professional services role	Community pharmacy	0.27 (0.23)	0.16 (0.27)
Professional services role	Community pharmacy	0.32 (0.21)	0.33 (0.35)
General practice role	Primary Care Setting	Ref	Ref
Aged care facility role	Primary Care Setting	0.23 (0.16)	-0.45 ** (0.17)
Sales or marketing role	Pharmaceutical Industry	Ref	Ref
Medical or Regulatory Affairs role	Pharmaceutical Industry	0.34 * (0.20)	0.59 ** (0.26)
Research and development role	Pharmaceutical Industry	0.50 ** (0.20)	0.69 ** (0.24)
Policy related role	Government/Academia	Ref	Ref
Research or teaching role	Government/Academia	-0.39 ** (0.17)	0.04 (0.19)
Health-related role	Non-pharmacy related sector	Ref	Ref
Non health related role	Non-pharmacy related sector	-0.01 (0.17)	-0.63 ** (0.21)
No flexible work schedule	All sectors	Ref	Ref
Having flexible work schedule	All sectors	0.07 (0.07)	0.31 *** (0.09)
No opportunities	All sectors	Ref	Ref
Promotion and specialization opportunities	All sectors	0.43 *** (0.08)	0.22 ** (0.09)
Specialization opportunities only	Hospital pharmacy/Community	0.16 (0.12)	0.01 (0.15)

	pharmacy/Primary care settings		
Urban location	All sectors	Ref	Ref
Rural location	All sectors	-0.46 ***	-0.95 ***
		(0.08)	(0.11)
Remote location	All sectors	-0.68 ***	-1.07 ***
		(0.11)	(0.13)
Annual salary ($0,000)		0.01 ***	0.01 ***
		(0.00)	(0.00)
2nd ALT		0.02	-0.14
		(0.10)	(0.10)
3rd ALT		0.10	-0.17 *
		(0.10)	(0.09)
4th ALT		0.13	
		(0.10)	
5th ALT		0.09	
		(0.10)	
6th ALT		0.03	
		(0.10)	
Respondents*		414	414
Observations		1242	1656
Log likelihood		-2097	-1441

Notes: p<0.1; **p<0.05;***p<0.0001

Appendix 6. Job Satisfaction and Involvement in Clinical Activities among Australian Pharmacists – An application of Herzberg' Two Factor Theory

Table A6.1 Comparison between the included and excluded samples in data analysis

	Excluded sample			Included sample			Difference
Explanatory variables	Obs	Mean	Std. Dev.	Obs	Mean	Std. Dev.	
Overall job satisfaction (1 to 5)	95	3.04	1.15	392	3.33	1.13	-0.29 **
Dispensing role	267	0.22	0.41	392	0.20	0.40	0.02
Clinical practice role	267	0.21	0.41	392	0.30	0.46	-0.09 **
Int. Clinical practice in COM	270	0.02	0.15	392	0.03	0.16	0.00
Education/Research role in HOS	267	0.01	0.12	392	0.03	0.17	-0.02
Combination of dispensing and professional services role in COM	267	0.56	0.50	392	0.47	0.50	0.09 **
Community pharmacy	270	0.74	0.44	392	0.66	0.47	0.08 **
Female	45	0.69	0.47	392	0.62	0.49	0.07
Married	63	0.73	0.45	392	0.73	0.44	0.00
Having kids less than 5ys	63	0.14	0.35	392	0.18	0.38	-0.04
<40 years	55	0.38	0.49	392	0.63	0.48	-0.25 ***
40-60 years	55	0.44	0.50	392	0.28	0.45	0.16 **
>60 years	55	0.18	0.39	392	0.09	0.29	0.09 *
Years employed in the current job	99	10.37	11.31	392	7.64	7.82	2.73 **
Hours worked	95	28.18	13.54	392	34.73	9.29	-6.55 ***
Having pharmacy higher education	54	0.39	0.49	392	0.40	0.49	-0.01
Having non-pharmacy higher education	54	0.39	0.49	392	0.35	0.48	0.04
Having good health	51	0.78	0.42	392	0.84	0.37	-0.05
Preference mismatch in sector	270	0.02	0.15	392	0.04	0.19	-0.01
Preference mismatch in Flexibility	106	0.15	0.36	392	0.08	0.27	0.07 *
Preference mismatch in other attributes	199	0.90	0.29	392	0.57	0.50	0.33 ***
Having flexible work schedule	254	0.31	0.46	392	0.33	0.47	-0.02
Promotion and specialization opportunities	249	0.18	0.38	392	0.19	0.39	-0.01
Specialization opportunities only	249	0.20	0.40	392	0.30	0.46	-0.10 **
Rural location	237	0.25	0.43	392	0.26	0.44	-0.01
Remote location	237	0.04	0.19	392	0.02	0.14	0.02
Annual salary ($0,000) †	196	78.37	33.40	392	83.20	33.37	-4.83 *
Having second employment	89	0.26	0.44	392	0.23	0.42	0.02

Table A6.2: OLS with interaction terms

Dependent variable: Job satisfaction	Model 1	
Explanatory variables	Coeff.	S.E.
Intrinsic factors		
Role (Dispensing as reference)		
Clinical practice role	-0.33	0.52
Int. Clinical practice in COM	1.05 **	0.45
Education/Research role in HOS	-0.66 *	0.38
Combination of dispensing and professional services role in COM	0.22	0.32
Community pharmacy	-0.93 **	0.33
Female	0.31 **	0.10
Married	0.06	0.11
Having kids less than 5ys	-0.01	0.08
40-60 years	0.20	0.12
>60 years	0.62 **	0.20
Years employed in the current job	-0.01	0.01
Hours worked	-0.01 *	0.01
Having pharmacy higher education	-0.11	0.10
Having non-pharmacy higher education	-0.03	0.10
Having good health	0.23 *	0.13
Preference mismatch in sector	-0.62 **	0.25
Preference mismatch in Flexibility	-0.39 **	0.17
Preference mismatch in location, flexibility, career opportunities	-0.08	0.11
Having flexible work schedule	0.16	0.23
Promotion and specialization opportunities	0.39	0.34
Specialization opportunities only	0.57 *	0.32
Rural location	-0.15	0.23
Remote location	-0.05	0.55
Annual salary ($0,000) †	0.01 **	0.00
Having second employment	0.10	0.12
Interaction terms		
Int. Clinical practice & Flexibility	0.13	0.32
Int. Clinical practice & promotion/specialisation	0.41	0.38
Int. Clinical practice & Specialisation opportunities	0.38	0.43
Int. Clinical practice & Rural	0.32	0.34
Int. Clinical practice & Remote	0.59	0.71
Int. Clinical practice & salary	0.34	0.26
Int. Combination role & Flexibility	-0.03	0.38
Int. Combination role & promotion/specialisation	0.64 *	0.37
Int. Combination role & Specialisation opportunities	0.00	0.00
Int. Combination role & Rural	0.51 *	0.27
Int. Combination role & Remote	-0.58	1.08
Int. Combination role & salary	0.00	0.00
Constant	3.06 ***	0.47
Sample	392	
Adj. R squared	0.39	

Table A. 6.3: OLS versus ordered probit models

Intrinsic factor of interest	OLS Coeff.	S.E.	Ordered probit	
Dispensing role (Ref)				
Clinical practice role	-0.37	0.25	0.32	-1.34
COM	-0.88 **	0.27	0.34 **	-2.98
Int. Clinical practice in COM	0.99 **	0.40	0.51 **	2.5
Control variables				
Female	0.28 **	0.10	0.13 **	2.44
Married	0.04	0.11	0.14	0.38
Having kids less than 5ys	-0.02	0.09	0.10	-0.12
40-60 years	0.17	0.12	0.15	1.33
>60 years	0.65 **	0.20	0.24 **	3.06
Having pharmacy higher education	-0.13	0.10	0.13	-1.14
Having non-pharmacy higher education	-0.03	0.10	0.12	-0.07
Having good health	0.23 *	0.13	0.16 *	1.95
Years employed in the current job	0.00	0.01	0.01	-0.43
Hours worked	-0.01	0.01	0.01	-1.33
Having second employment	0.10	0.11	0.14	0.67
Other intrinsic factors				
Education/Research role in HOS	-0.72 **	0.36	0.45 *	-1.96
Dispensing and professional services in COM	0.20	0.13	0.16	1.46
Promotion and specialization opportunities	0.49 ***	0.13	0.13 ***	3.95
Specialization opportunities only	0.96 ***	0.13	0.16 **	3.47
Extrinsic factors				
Having flexible work schedule	0.41 ***	0.11	0.17 ***	7.55
Rural	0.18 *	0.11	0.13 *	1.82
Remote	0.13	0.33	0.41	0.72
Annual salary ($0,000) †	0.00 *	0.00	0.00 *	1.75
Mismatch between actual and minimum acceptable levels				
Mismatch in sector	-0.67 **	0.25	0.32 **	-2.5
Mismatch in intrinsic factors	0.01	0.14	0.17	0.39
Mismatch in flexibility	-0.38 **	0.17	0.21 **	-1.98
Mismatch in geographic location	0.33	0.38	0.14 *	-1.68
Mismatch in salary	-0.18	0.11	0.00 ***	
Constant	3.07 ***	0.36		
Threshold 1			0.46 ***	
Threshold 2			0.45 ***	
Threshold 3			0.45 ***	
Threshold 4			0.46 ***	
Sample	392		392	
Log likelihood			-459.79	
Model χ2			209.16	
Adj R-squared	0.37			