A Study on Attitudes towards Postgraduate Education in the UK

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A thesis submitted in partial fulfilment of the requirements of the University of Greenwich for the Degree of Doctor of Philosophy.

June 2018.

Declaration

I certify that the work contained in this thesis, or any part of it, has not been accepted in substance for any previous degree awarded to me, and is not concurrently being submitted for any degree other than that of Doctor of Philosophy being studied at the University of Greenwich. I also declare that this work is the result of my own investigations, except where otherwise identified by references and that the contents are not the outcome of any form of research misconduct.

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Acknowledgements

This thesis would not have been possible without the immense guidance and encouragement of several individuals who share with me whatever credit attributed to this research. The patient advice, insight and exacting standards of my supervisors – Dr Gabriella Cagliesi, Dr Denise Hawkes and Prof Bruce Cronin– have been especially pertinent, and without their guidance, this thesis would have been lacking in rigour and direction.

My gratitude is also extended to the Department for International Business and Economics and the Faculty of Business at the University of Greenwich for establishing an avenue for MPhil/PhD students to share and discuss ideas, which stimulates research progress across the board. Especial commendations are due to the Faculty of Business' MPhil/PhD Seminar series, as well as the Work and Employability Research Unit (WERU) of the department. Additional thanks are due to Dr Guido Conaldi and the Centre for Business Network Analysis (CBNA).

Further credit is due to the staff at both the University of Greenwich Maritime Campus and Avery Hill Campus Libraries, the University College London- Institute of Education (UCL-IoE) Library, and the British Library for providing a second home for my research endeavours. Additional thanks are due to Ms. Vera Eterovic of the British Library, Dr Emma Fitzsimons of the UCL-IoE, Dr Wessel Vermeulen of Newcastle University and Dr Liam Delaney of University College Dublin for their insight and support.

For their emotional and financial support, particular thanks are due to my family. For their encouragement, and friendship, my final thanks is to my good friends, Pajtim, Sujoy, Oyindamola and Moses; and most of all, my girlfriend, Atinuke.

All errors, omissions and mistakes remain my own.

Abstract

Supply side economic policies designed to encourage participation in postgraduate education have the ultimate goal to improve productivity of the workforce. For such policies to deliver the expected impact, they should be designed taking into consideration individual perceptions of "self" in relation to educational experiences and credit market imperfections. In his 2014 UK Autumn statement, the Chancellor of the Exchequer announced the provision of postgraduate loans of £10,000 each to benefit 40,000 students from the 2016/17 academic session and onwards. Targeted at prospective students below the age of 30, this policy aims at developing a higher-skilled workforce by providing access to students especially from low-income backgrounds. Thus, through this initiative, the government hopes to improve the public return on higher education through offering the prospects for a higher private return to higher education.

This research explores the effects of this policy on two types of individuals who it is expected to impact: the final-year undergraduate student considering her path towards employment, and the graduate who considers returning to higher education. This comparison is made in two scenarios considering intertemporal choice with exponential discounting as well as hyperbolic discounting. Thus, a model characterising optimal stopping times for both individuals is derived. This will allow for more government consideration of the social and economic constraints that influence transitions within higher education and may direct future research on understanding student progression within higher education.

The methodology adopted allows for inferences to be derived regarding how the nature of individual behaviour changes given the effects of individual identity and financial constraints. It further proposes an exposé on how fundamentally disparate theoretical assumptions can shape our understanding of the opportunity costs of transitions to taught postgraduate degrees. The results explored in this document depict some implications on public policy which span from the rationale behind funding PGT degrees to the effect of socio-economic disparities on the UK's widening participation agenda.

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Chapter 1: Introduction

1.1 Introduction

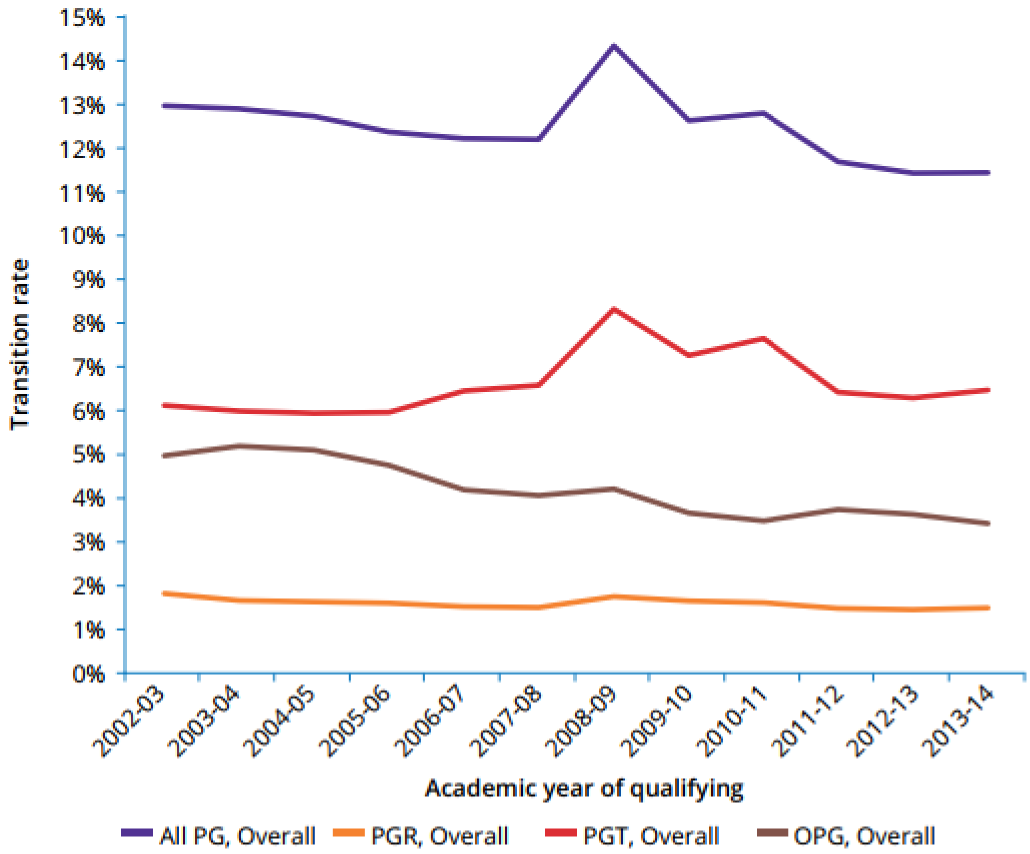
Choosing a path towards personal and professional development after completing an undergraduate degree could, for some individuals, represent a difficult and daunting decision. Fundamentally, a graduate could choose across 3 main options: the first option is to enter the job market immediately and not to pursue postgraduate studies (PGS) or to return to PGS at a later date; the second option is to transit immediately into PGS and to postpone entering into the job market for a later date; the third option is to do both, managing a part time job and a part time PG degree. Moreover, within the choice of PGS, several options are also possible. According to the latest report of the Higher Education Agency (HEA, 2016) in the UK, 60% of those graduates who choose an immediate transit[1] or a delayed return[2] into PGS, have ventured into various Taught Postgraduate (PGT) programmes, while the remaining 40% have proceeded into Postgraduate Research (PGR) programmes and other[3] postgraduate programmes.

The decision to enter into various paths of PGS has followed a long-term upward trend but more recently, these trends[4] have shown a noticeable decline in the number of students registering into PG courses during the first year after graduation from undergraduate studies: from 13% in 2002/2003 academic session to 11.3% in the 2013/2014 academic session (Higher Education Funding Council for England, HEFCE, 2016). The latest 2016 HEFCE report also – as indicated in Figure 1.1- show that the increase in registrations to PGT programmes has fallen from a peak of 8.3% increase in the 2008/2009 academic session to 6.5% in the

[1] This is defined as commencing postgraduate study on the most recent academic session following an individual's graduation from undergraduate study.
[2] This considers a time period between 1 – 3 years after graduating from undergraduate study.
[3] Other postgraduate programmes include: Postgraduate Certificate in Education (PGCE), Postgraduate Diploma (PGDip) and Legal Practice Course (LPC) (Prospects, 2016)
[4] These trends cover a time-period between 2002/2003 – 2013/2014 academic session.

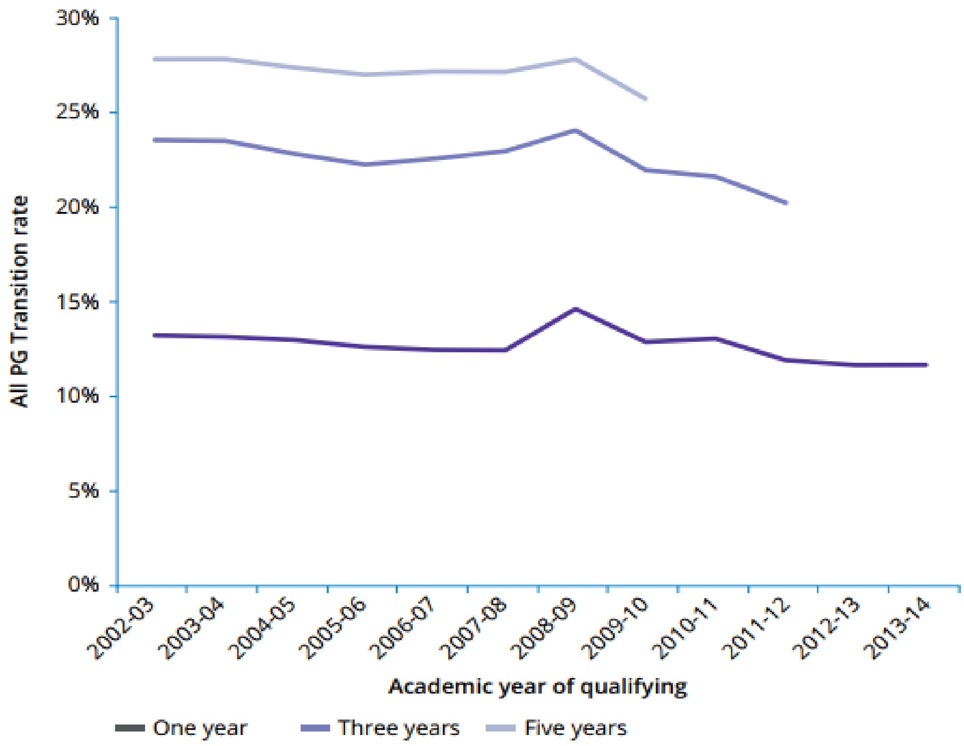
2013/2014 session. Thus, albeit maintaining a constant growth trend of 1.5% each session, the increase in numbers is progressively declining.

Figure 1.1: One-year Transition rates into PG studies. (Source: HEFCE)



Observing the trends between different years of transition as illustrated in Figure 1.2, HEFCE (2016) noted that students on completion of undergraduate studies were more likely to transition to PGS immediately after graduation in comparison with any other time in the future. Furthermore, students are more likely to transition within one or two years after graduating from UG studies as opposed to three or four years afterwards. This is expressed in the wider gap between the lines indicating one-year transition rates and three-year transition rates, in comparison to the lines indicating three-year and five-year transition rates. Transition rates overall have shown a remarkable decline in recent years in comparison with rates in the 2002/03 academic session which has been a cause of concern for government decision-makers.

Figure 1.2: Student Transition rates to PG courses. (Source: HEFCE)



The two key determinants that, among other factors, have affected recent trends' behaviour into PG study, are recognized as being the sudden increase in 2012 of the undergraduate tuition fees from £3,000 to £9,000 (Mellors-Bourne *et al*. 2014) and the ending effects of the 2008-2009 financial crisis which had prompted individuals to bring forward their intentions to study for a PG course (HEFCE, 2016). As HESA (2017) figures indicate, there was an 11% increase in admission rates between 2007/08 and 2008/09 academic sessions. This was further improved by an extra 9% increase in the following academic session. Since then, there has been a decline in student enrolment numbers.

To counteract the declining trends and to encourage and widen participation into PGS, the UK Government announced in 2014 and then introduced in 2015 a provision of an income-contingent loan of £10,000 for full-time postgraduate students enrolling on PGT programmes (Masters) starting from the academic year of 2016/2017 (HM Treasury, 2014). It was expected that the policy would benefit 40,000 students with the potential of introducing 10,000 more into PGT education (BBC, 2014).

This thesis seeks to explain factors that influence the individual educational decision-making process into PGS, and to extricate the effects of external incentives coming from government policies from the effects of internal motivators related to individual preferences. We introduce the construct of individual's identity to understand to what extent this factor – and not just economic incentives - influences an agent's decision to make a transition into PG education and if so, when. The individual preference analysis is thus enriched by the presence of the role of an "educational identity" which is gained by earning a PG degree. In this approach we follow Akerlof and Kranton, (2000) who recognize the identity as the missing element in economic analysis that would help to explain why people--facing the same economic circumstances--would make different choices.

From a theoretical perspective, the study will explore the effects of personal characteristics (and cognitive biases such as hyperbolic discounting) and the presence of financial constraints/enablers on two important dimensions of the educational decision-making process: the choice of whether to pursue or not to pursue PGS, and the choice of when to transit into PGS when the option to proceed into PGS is the individual's decision. Moreover, the empirical perspective, provides more context regarding drivers, motivating factors as well as individual characteristics that play a role in individuals' decisions about the timing to proceed into PG education.

In this chapter, to motivate and to justify the relevance of this research, we contexualise it by providing the reader with the historical developments of postgraduate education policy and of educational trends in the UK. We then formulate a series of questions that express the key aims and objectives of the research and we identify the main contributions achieved in this thesis. Furthermore, this chapter will conclude with an explanation of the organisation of the thesis. Limitations of the study, possible suggestions and future research plans will be discussed at the concluding section of the thesis.

1.2 Motivations and Relevance of the research

The need to understand the factors behind the decision-making processes into PG education has only been addressed in the education literature and it is gaining increasing mainstream appeal within the social sciences. Despite this growing interest, the literature in relation to how individuals transition into Taught Postgraduate (PGT) programmes remains scant.

This research seeks to fill the theoretical and empirical gaps in the current literature by exploring alternative educational decision-making processes under different government intervention schemes in PGT studies, as well as the factors that facilitate or hinder progression into PGT study. Before doing so, I review recent changes in UK PG education policy and the characteristics of the transition from undergraduate to PGT education.

1.2.1 Government's interest in PGS. Government's reports on recent developments in the UK Postgraduate education policy[5]

A major theme that runs through recent UK government policies affecting PGT study and the PG education at large is the need to improve widening participation through facilitating access to education through various means including curricular activities, academic engagement, and financial support amongst others. The earliest example of such policy recommendation comes from the Robbins report (1963). In it, Lionel Robbins provides reasons for an increase in transitions into postgraduate education as:

> "First is the need for more teachers in the rapidly expanding system of higher education. Second, the scientific and technological revolution that we are living through, the pace of social change and the complexity of modern social and economic organisation all demand an increasing number of persons capable of understanding, developing and applying modem techniques in science and applied science and in the social sciences. Thirdly, apart from specific needs for growing numbers of highly trained persons, there is a natural

[5] This section is discussed as pertains to the effects of such policies on the transitions of students into PGT degree programmes. Thus, policies such as the introduction of the Research Excellence Framework (REF) and the Teaching Excellence Framework (TEF) will not be discussed in this section; but may be alluded to.

> presumption that the demand for postgraduate study will increase. As we have said earlier, every increase of educational opportunity at one level leads almost at once to a demand for more opportunity at a higher level. Experience shows that the appetite grows by what it feeds on. On the principles we have already stated, the demand should be met." (Robbins, 1963; pp 100 – 01)

Robbins' primary policy recommendation was an increase in home students aiming to study at postgraduate level by 10% between 1963 and 1980. Therefore, he suggested an increase in the number of universities in existence at the time the paper was published under the assumption that such supply will meet the increasing demand for PG degree qualifications (Burgess et al, 1998). Concerning the influence it had on the structure of the UK government policy on PG education, the Robbins report was important for two main reasons. Firstly, it highlighted the relevance of postgraduate education as the key route towards improving both the intellectual rigour of the academic environment as well as developing key skills relevant for a dynamic labour market. Secondly, it modified the blueprint on the structure of the PG environment from one where academic performance is largely primed on the master's dissertation or the doctoral thesis, to a structure where academic performance is dependent on a mix of the dissertation or thesis and performance in academic learning through examinations and coursework.

In the 30 years following the Robbins report, there was little[6] mention of structural reform suggested in various white and green papers until the Harris[7] Report (1996) and the Dearing[8] Report (1997). The Harris report focused principally on two key areas: funding tuition and academic standards of teaching and learning. Regarding funding tuition fees for postgraduates, the Harris report suggested that the public provide funds to aid postgraduate students- especially PGR students- as well as consider the needs of both PGT and part time

[6] Although the need to advance participation in PG education was mentioned –in line with the Robbins report in various white papers and reports. An example of this is the Swinnerton-Dyer (1982) report on postgraduate education.
[7] Prof. Martin Harris who was the vice-chancellor at the University of Manchester at the time of publication chaired the Harris report. It was done by consent of the HEFCE, the Standing Conference of Principals (SCOP) and the Committee of Vice-Chancellors and Principals (CVCP).
[8] Lord Dearing chaired the Dearing report on behalf of the UK government.

students in policy-making endeavours. Addressing the standards of teaching and learning, the Harris report stated unease concerning the lack of coherence in what students were taught across various universities in the country. It mentioned that a likely repercussion of such incoherence in teaching structure could lead to a conflation between student expectations and the quality of the courses provided. To these concerns, it recommended a code of practice for PGR and a restructuring of available information on PG training to identify the characteristics of each degree programme. A criticism of the report at the time of its release was the emphasis it made on HEFCE to not fund PGR students who worked in university departments graded two and below by the Research Assessment Exercise (RAE). Such policy recommendation was argued by critics to be elitist, as predominantly Russell Group universities will gain a significant chunk of funding dispersed by the HEFCE for research endeavours (Rogan, 1998).

The Dearing report (1997) was commissioned following a major concern that the existing loans and grants facility was insufficient to serve as an incentive for individuals to transition into HE (Barr and Crawford, 1998). In general, the report's primary aim was to provide advice on how more money can be channelled into the HE sector. As a solution, it recommended that students contribute to the cost of their education following a means-tested[9] approach. Although the government did not follow the means-tested approach identified in the Dearing report, it introduced an income-contingent student loan infrastructure of £1000 which was to be applied to all prospective home and EU students that commenced in 1998 (Wyness, 2010; Greenaway and Hayes, 2003). Concerning PG education recommendations, the Dearing Report largely incorporated the recommendations from the Harris report. That withstanding, it advocated for a coherent structure of award definitions, the need for the external examiners, the need to influence teaching quality through research, and a national qualifications framework for all PG degrees (Burgess et al, 1998).

[9] The procedure for such approach was to identify the socio-economic background of prospective students and provide exemption from tuition fee payment for the most disadvantaged and a payment of tuition fees be made by students from better advantaged backgrounds.

Most recently, the Browne report (2010) was commissioned by the Labour Government with the mission to provide insight into funding and student finance in the HE sector. Amongst its key results was the proposal for the removal of the undergraduate tuition fee cap of £3,290 per annum. Regarding postgraduate funding, it recommended that tuition fees for undergraduate study be studied to observe its effect on transitions into PG education. This insufficient information was criticised with some noting that postgraduate funding made up one page of the 63-page document (Independent, 2012). Given the uncertainty in how postgraduate education should be funded, a series of reports and white papers have been presented, providing policy recommendations on widening participation and the changing demography of postgraduate education. The Sutton Trust (2010) for instance, found that 30% of university students who were prior educated in private schools as opposed to 23% of students who had prior attended state schools. In a report for the Higher Education Committee (HEC, 2012), Alan Milburn (2012)[10] expressed his concern about growing inaccessibility to PG education stating "*… postgraduate education is in danger of becoming a social mobility time bomb*". Furthermore, the Department for Business, Innovation and Skills (BIS, 2013) found that 50% of all PG students were from outside the EU and the proportion of home and EU students as a proportion of the PG student population was on a decline. Following the concerns from these reports and more,[11] the UK government announced in its 2014 Autumn Statement that:

> "[The] Autumn Statement 2014 therefore introduces a new offer of income contingent loans for those under 30 years old wishing to undertake a postgraduate taught masters in any subject. These loans, of up to £10,000, are planned to be available from[12] 2016- 17 and will be repaid concurrently with undergraduate loans. The loans are designed so that, on average, individuals will repay in full, in recognition of the high private return to individuals, but they will beat commercial rates." (HM Treasury, 2014).

On hearing this announcement, organisations such as the Sutton Trust, University Alliance and the Million+ welcomed the proposals. However, there were concerns about the added

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[10] At the time of this remark, Alan Milburn was the UK Government advisor on social mobility.

[11] Some other reports on this issue include: Wakeling and Hampsen-Thompson (2013) "Transition to higher degrees across the UK: An analysis of national, international and individual"; Social Mobility & Child Poverty Commission (2013) "Higher Education: the Fair Access Challenge"; and Milburn (2012).

[12] The commencement of the tuition fee loans coincides with the academic session following the graduation of undergraduate students imposed with the latest change in undergraduate tuition fees.

burden[13] such a loan could impose on individuals ambitious to study for a PGT degree (IFS, 2014). Also announced in the autumn statement was an allocation of £50 million to the HEFCE, which was to be distributed to 10,000 students at a rate of £10,000 each during the 2015-16 academic session (HM Treasury, 2014). In a recent study of the efficacy of this experiment, Smith (2015) found that the provision of adequate advice on funding was helpful toward breaking the barrier to entry most individuals from disadvantaged socio-economic backgrounds face. Although these recent changes have been well received, concerns on whether it solves the problem of widening participation remain legitimate. This thesis seeks to provide insight into whether the potential benefit of a PGT education is worth the cost of tuition and maintenance fees.

1.2.2 Some interesting trends related to UK Government Policies.

Government interventions can affect educational choices and trends but, in turn, they can also be inspired by ongoing trends, used to design ad hoc policies. We review some significant trends here that have characterised PGS development. Since 1979, there has been a sustained growth in the number of students admitted to study for PG degrees at HEIs across the UK (Burgess, 1997; Universities UK, 2008). In particular, admission rates into various PGT programmes has increased remarkably over the last 15 years (Morgan, 2014). Recent statistics from HESA (2017) indicate a 13.3% increase in the number of students enrolling into PGT degrees between 2006/07 and 2015/16 academic sessions.

The Universities UK (2008) report on '*Taught postgraduate students: market trends and* opportunities' explores enrolment trends based on the 2001/02, 2005/06 and 2006/07 academic sessions. Over the time-period that was covered, overall enrolment increased by 21%, with most students being part-time. Due to increases in non-EU student recruitment, the number of full-time students has increased by 36% throughout the period studied in the report. Other trends noticed included the growth in female PGT students, a high

[13] The IFS (2014) mentioned that the introduction of the student loan for access to PGT will lead to a cumulative tax contribution of PG graduates of 50% of their income (i.e. 9% on PG student loan, 9% on UG student loan. 20% income tax and 12% National Insurance (NI) contribution.

concentration of PGT students studying Masters Degrees (65%) and the increasing dichotomy[14] between part-time (PT) and full-time (FT) students.

Wakeling and Hampden-Thompson (2013) study[15] explored the transition trends from UG to PG programmes. Using students from all UK HEIs that graduated within the 2009/10 and 2010/11 academic session, they observed that students who had First Class Honours were more likely to transition to a higher degree. In addition, a majority of graduates who proceeded to a higher degree chose to pursue a PGT programme.

Exploring the career prospects for PGT students, the Higher Education Career Service Unit (HESCU, 2014), studied the employment outcomes of various PGT students. In their conclusions, they noted that the students most motivated to study PGT programmes were more likely to have attended 'high entry tariff' universities. They also found that most employers do not express a strict preference for a PGT degree during recruitment.

Mellors-Bourne et al (2016), studied HESA data of students who graduated from 2002/03 - 2012/13 session using HEFCE multi-level model[16] to explain PG transitions. In contrast[17] to HESCU (2014), Mellors-Bourne et al (2016) find that the institutions with the highest rates of transitions to PGT and other PG courses are characteristically specialist universities which focus on specific disciplines. They also found that students were more likely to transition within three years after graduating from undergraduate studies. To complement Mellors-Bourne et al (2016), HEFCE (2016) indicate that students were more likely to transition to PGT as soon as they graduate from undergraduate studies.

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[14] FT students tended to be young people from 21 – 25, while PT students were more likely to be older in age.
[15] Morgan (2015) describes the study as "the first comprehensive research undertaken examining PG growth within the UK."
[16] Multi-level models are used in longitudinal studies to observe individual responses, which have the possibility of being correlated with each other over time. Thus, it recognises the presence of structures in longitudinal data that are hierarchical.
[17] Mellors-Bourne et al (2016) find instead that, students from high entry tariff universities were more likely to proceed directly to PGR degrees.

As mentioned earlier on, HEFCE (2016) also showed a decline in the number of students registering to study for a postgraduate (PG) course from 13% in 2002/2003 academic session to 11.3% in the 2013/2014 academic session (HEFCE, 2016). Some interesting demographic information show that, a significant proportion of men, BME graduates and individuals from areas with a high young participation rate in HE, transitioned immediately into PGT study in comparison to women, white graduates and individuals from areas with a low young participation rate respectively.

1.3 Objectives and aims of the research

The recent trends in PGS discussed above and the increasing interest of the government in widening participation have motivated this research. From a broad perspective, the primary purpose of this research is to explore the role played by socio-economic factors (constraints and enablers) and of individual characteristics and preferences on determining educational choices in relation to PGS. The suitable reference framework is therefore an interdisciplinary approach that provides insight from several academic disciplines such as: economics[18], psychology, sociology and education. Theories from these disciplines are used to answer a range of core research questions and to provide a context within which this research is conducted. This theoretical framework will then be used to achieve the objective to empirically evaluate the effects of government interventions and human capital projections via potential wage increases on widening participation in PGS.

1.3.1 Research Questions

This study offers a theoretical model to explore educational decision-making processes into PGS. It seeks to answer the following core theoretical questions:

[18] The main branches of economics explored in this research are: conventional economics, behavioural economics and economics of education.

- Question 1: To what extent would different assumptions on individual rationality in decision-making and on discounting preference influence the choice of and timing into PGT?
- Question 2: To what extent does educational gratification (in the form of identity utility) play a role in decision-making processes- in the context of education transitions?
- Question 3: Which decision-making process yields the more utility?
- Question 4: To what extent would human capital gains (wage premia), and a cost of borrowing and government policies on undergraduate fees influence an individual's decision to proceed to PGT education?

The study also tries to answer from an empirical point, the following research question:

- Question 5: What are the factors that would affect the timing of the decision to enter into PG study?

To endeavour to answer these questions, we firstly explore literature from various disciplines including economics, sociology, psychology and education. This is followed by developing a theory on optimal stopping time which is simulated through a series of scenarios such as: a baseline scenario, sensitivity analyses, and alternate simulations including the effects of government intervention and human capital theory. These models are further explored under both exponential and hyperbolic discounting processes. These competing models will be then used to identify and compare optimal choices across three types of options: the option of never to proceed to PGT education; the option of choosing an immediate transition into PGT education; and the option of postponing to an optimal time the entry into PGT after spending some years in full-time work. The optimal choice will be simulated under alternative scenarios of human capital gains and of different costs of borrowing.

1.3.2 Research contributions

This research offers some important theoretical as well as empirical contributions. The first theoretical contribution is the derivation of an intertemporal choice model that uses a unified interdisciplinary approach across several fields. This approach combines various theoretical arguments made from the fields of economics, psychology, sociology and education on why an individual may consider a PGT as a route towards her personal, social and economic development. Thus approach enriches the view of educational choice much beyond the standard human capital theory. Indeed, the model includes the role of personal identity, where personal identity is a construct combining various conceptual elements related to the social and personal sphere, and the role of financial constraints and enablers and government policies.

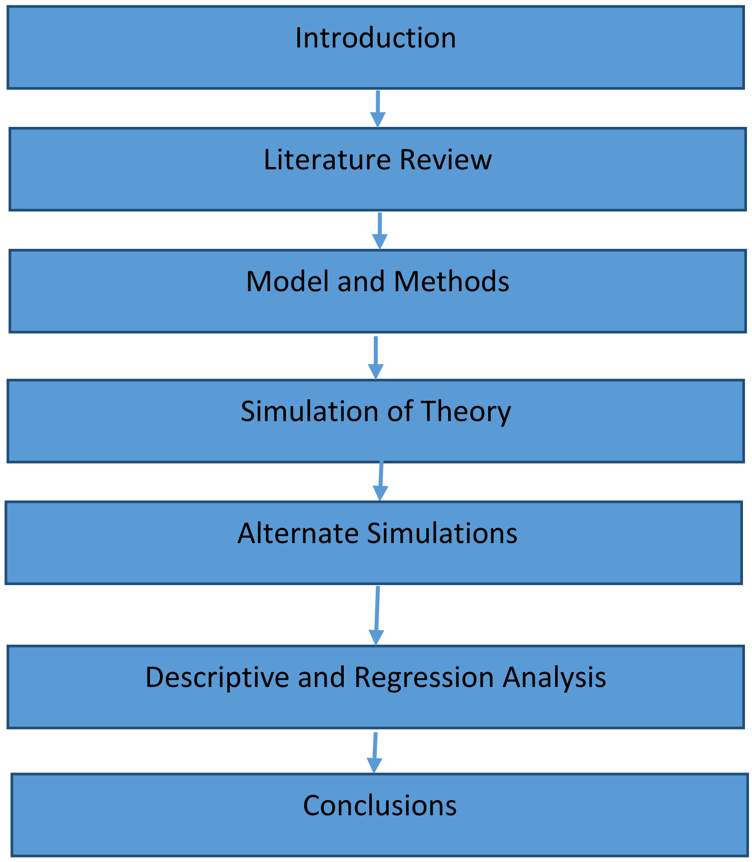
The second theoretical contribution is the use of competing educational decision-making mechanisms that lead to the optimal educational choice in relation to PGS. Fundamentally, we assume that students can either be fully rational (in the sense of a "homo economicus" agent) or affected by behavioural biases. We derive optimal solutions for both cases under various scenarios and under different time discounting preferences and we compare the solutions. To this, we have three key findings. Firstly, we observe that when all things are considered equal- without any consideration for financial constraints and identity effects- only an individual who does not have a fear of debt would consider a transition into PG study All other types of agents would postpone their decision of transiting into PGT with the individual with a bounded rational behaviour transitioning later than the person who behaves in a purely rational manner. Secondly, the optimal stopping time does not change when a different behaviour of borrowing is assumed. This implies that what changes is the level of utility due to a lower availability of resources. Finally, a reduction in the UG fees (or in the constraint of the UG debt repayment) affects the optimal stopping time solution for both exponential and hyperbolic preferences reducing the time the agent wants to wait to move into PG.

The third contribution is an empirical one, which applies the theoretical model to estimate, using ordered logit, the socio-economic enablers that influence the transition into PGS. This is conducted using a pooled sample of Masters' students at the University of Greenwich surveyed in 3 different consecutive years. We find that the effects of financial constraints and individual identity has an impact on the likelihood of an individual to proceed into PGS. We observe that people who possessed the agreeableness character and were beneficiaries of the Fast Forward fund tended to proceed earlier into PG. Also, we observed that as expected incomes for people of Black and Minority ethnic groups (BME) increase, they are more likely to proceed into PG earlier in comparison with those who are not of BME heritage. On the other hand, age group has an impact on an individual proceeding into PG as the older a respondent was, the less likely it was for her to have proceeded into PGT immediately after UG.

1.4 Organisation of the Thesis

The structure of this thesis is shown in Figure 1.3 below. In all, there consist of seven chapters which explore the aim of this thesis through exploring related literature, deriving a theory, simulating the model and corroborating findings from the theory with empirical findings. The findings and observations are summarised in the conclusion section.

Figure 1.3: Thesis structure



The next chapter explores related literature and theoretical background in relation to transitions from undergraduate studies to Taught Postgraduate programmes. On the one hand, there is an emphasis on the empirical evidence of trends in transitions into PGT education. This is done in consideration of other transition patterns within higher education, with the purpose of deriving motives to explain the phenomenon of transitions into PGT education. On the other hand, there is a theoretical emphasis to explain the empirical evidence using some basis from a developed understanding of theory. The core concepts explored here include rational choice theory, bounded rationality, and time discounting processes. Besides these concepts, some supporting theory include analytical hierarchical process and various models on educational transitions within the education literature.

Following the literature review and theoretical background, chapter 3 focuses on the deriving a theoretical model and explaining the method of analysis. The first part- the theoretical model- explains how the concepts discussed in chapter 2 are used to create a theoretical model of educational decision-making of educational transitions. This model is created considering the various pathways to PGT education as highlighted in chapter 1; but also considering the theoretical concepts discussed in chapter 2. The aim of this subsection is to explain how the individual's decision-making process is coordinated given various strictures on the emphasis of utility maximisation as a core objective in the individual's decision-making process. The second part seeks to discuss the ways the model will be used. In other words, it will explain the various scenarios the individual will be placed in with the purpose of understanding the point where it will be most optimal to transition into PGT education. These scenarios are derived based on how the individual's preference for transition into PGT is interpreted at Year 0 (year the individual graduates from undergraduate studies).

Given a clear derivation of the model and an explanation, chapters 4 and 5 focus on deriving the results using the model in various scenarios. In chapter 4, a baseline[19] scenario is created to explore the primary assumptions expressed in the formulation of the model. Besides this baseline scenario, there are sensitivity analyses that explore the effect of borrowing less and that of a situation of paying PGT loans in a fixed quota structure. In chapter 5, alternate scenarios are considered where we explore how government policies on reduction in UG fees, an increase in interest rates and the impact of human capital theory can affect an individual's decision to make a transition into PG study.

To further test the veracity of the results found through simulating the model, chapter 6 provides an empirical perspective to accompany the theoretical analyses. This will analyse results from a pooled survey of Master's students at the University of Greenwich conducted through a period of 3 academic sessions. We do this using an ordered logit regression analysis that explores the effects of financial constraints (receiving funds through the Fast Forward

[19] Where the individual is indifferent between proceeding into PGT studies and moving into full-time work at Year 0

scheme and the amount of tuition fee paid for UG studies) and identity differences (gender, age group, agreeableness trait) impact on the length of time between an individual's graduation from UG and commencement of PG studies. Furthermore, we discuss how macroeconomic factors such as GDP and youth unemployment affect waiting time to proceed into PG studies.

Chapter 7 concludes the thesis. This chapter contemplate on the overall findings, delves into the limitations of the results and proposes the next phase of the research. Furthermore, there will be an explanation of the further work expected in the future and ideas on how that can be achieved.

Chapter 2: Literature Review

2.1. Introduction

Recent changes in the UK undergraduate tuition fee structure has garnered concerns about the risks of such decision on students' willingness to proceed towards a PGT degree following graduation from undergraduate study (Whitty and Mullan, 2014). Furthermore, there has been a sustained increase in enrolment for PGT courses in recent years. The reasons for this surge in student enrolment to PGT programmes is attributed to many factors. A key factor is changes in government policy currently aimed at making UK HEIs attractions for scholarly endeavour (DfES, 2003). Other factors that explain increase in numbers of PGS students are: career advancement (Park and Kulej, 2009; Stuart et al, 2008), overcoming credential inflation (Wakeling, 2005) and higher potential lifetime earnings (Machin and Murphy, 2010).

For this reason, the UK Government announced in its 2014 Autumn statement that a provision of £10,000 would be made for Masters' students commencing in the 2016/17 academic session. In the next year, it announced a similar plan for postgraduate research degree access. This announcement was received with a degree of relief, but also a modest level of consternation from HEIs, student bodies and HE membership organisations. This level of concern may be surprising as evidence shows that a student with a postgraduate degree will earn approximately £200000 more than a fellow student with only an undergraduate degree over her entire working career (Milburn, 2012). To our knowledge, our evaluation of the effects of the £10,000 policy on PGT decisions has not been carried out as yet, as the policy has only taken effect in the 2016/17 academic session. One of the contributions of the research is to quantify the effect of government intervention of widening participation into PGT by using a sample of of three waves of surveyed Masters' students at the University of Greenwich. However, estimating the likelihood that an individual will transition to the PGT degree programme following undergraduate studies is currently non-existent, as the policy has only taken effect in the 2016/17 academic session.

In this chapter, we will review an extensive body of theoretical and empirical contributions to explain educational choices into PGS, particularly into Postgraduate taught degrees (PGTs). The theoretical contribution comes from a plethora of decision-making theories ranging from socio-economic to educational perspectives. On the other hand, the empirical contributions present a focus on characteristics of students going into postgraduate education and nature or features of the postgraduate environment. Most of them use descriptive statistics or some econometric techniques

2.2. Theoretical Background: Explaining preference, choices, and decisions.

Students transitioning to PGT education tend to follow two paths: either they enter immediately after UG study or they enter later on, after a stint in full-time employment (or other engagements). Given the complexity of the decision, and the many factors at play, there is not a single theory that can embed everything or different aspects of the decision-making process, therefore we use different theories from a range of disciplines to explain this decision-making process. One of our contributions is to provide a unifying approach to explain educational transition choices into PGT. Understanding the motivations, the process and the drivers at play when making this decision is pertinent toward any structured model of educational decision-making. In this section, we review some of these theories that we use in the unifying approach. This theory provides different models to explain motivations, processes and drivers. The diagram below provides a synoptic view of how we have organised these theories.

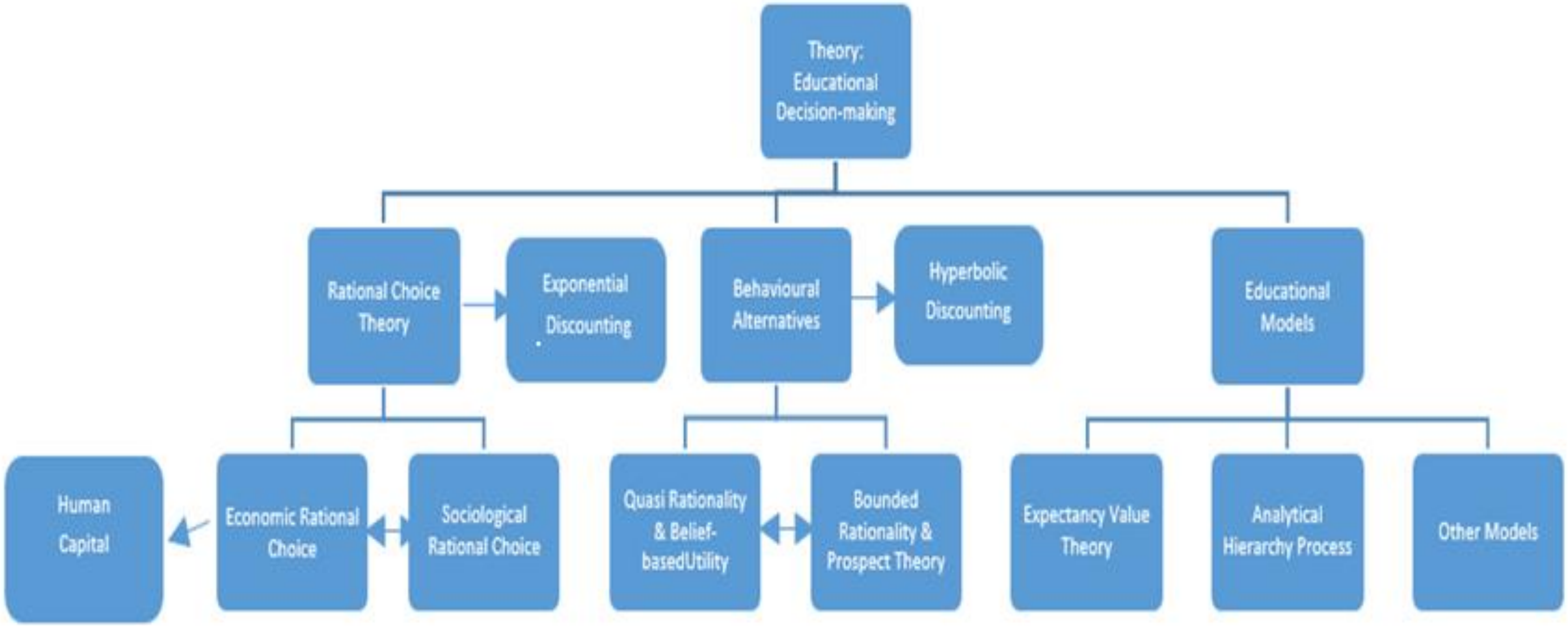


Figure 2.1: A Diagram of the Theoretical Framework

The decision-making process that characterises the transitions to taught postgraduate (PGT) education has very little been studied. Perhaps, this is based on the assumption that PGTs represent largely an extension of the undergraduate education, therefore transition is non-existent (O'Donnell et. al, 2009). Thus, entrants to PGT courses are assumed to be of commanding knowledge regarding the course they intend to study as admissions are primarily based on undergraduate degree classification amongst other criteria (Tobbell and O'Donnell, 2013; Tobbell et. al, 2010). Therefore, to understand the nature of the two distinct groups of potential PGT students, we consider various theories of decision-making that span economics, sociology and education disciplines.

2.2.1 Rational Choice Theory.

Fundamentally, rational choice pertains to the individual's objective to choose the best option out of a set of alternatives in a particular event. The concept of rationality has been explained to suit various perceptions of individual decision-making process. A broad definition of rationality alludes to the ability to make reasoned decisions following a logical and fact-based process (Oxford Dictionary, 2007). The thought-process in rational decision-making is guided by expressing preference behaviour for an option based on personal belief elicitation given a clear understanding of available options. Shafir and LeBoeuf (2002) outline three criteria which must be met to satisfy individual rational decision-making through preference behaviour. Preference behaviour is to be logically consistent; it must follow primary rules of probability; and it must solely be formed based on evidence in favour of an option to another. Hence, as a rational decision maker, the student's decision-making process to transition to PGT education is based on an objective understanding of the factors that affect such decision and the alternative (i.e. full-time employment) to PGT education.

Such decision to proceed from a stage of education to another- or re-join the formal education process- as rational individuals move along educational hurdles[20] following the assumption of instrumental rationality. Here, instrumental rationality refers to an efficient

[20] Such educational hurdles in higher education are primarily between moving directly from undergraduate to postgraduate education; and from full-time employment back to Higher education (especially postgraduate education).

process of rational thinking which does not assert specific emphasis on the value of the end-result, hence it is a process "aimed at maximising expected returns to education" (Jaeger, 2007). In other words, decisions made based on a careful consideration of the variables, influence the occurrence of an event without any emphasis on the limits on such variables. This pure instrumentality assumption, upon which the Economic Rational Choice Theory (ERC) is based, can be enriched by value/belief-oriented view of rationality to account for sociality and personality factors that influence educational choice. This approach is in line with the Sociological Rational Choice (SRC) Theory further developed in this chapter.

2.2.1.1 Time Preference and Rational Choice: Exponential Discounting

Rational economic theory- in line with a rational evaluation of future consequences- makes the assumption that people evaluate between options depending strictly on the length of delay between obtaining either option (Camerer, 1999). In other words individuals are only concerned with the amount of time it takes to achieve a particular option. The rational student evaluating between the choice to proceed to a PGT course, will only choose to go immediately if her future utility cannot compensate for the period of time she spends waiting. In other words, the student will choose to wait if she believes waiting will yield a better reward as opposed to transitioning immediately. A primary critique of this form of time preference behaviour is its assumption of time-consistency, which is embedded in the relationship between an individual's perception of her options and the time delay in obtaining each item (Loewenstein and Prelec, 1992; Frederick et al, 2002). Although the concept of constant discount rate may be considered as parsimonious, it fails to account for changes in time preference. When evaluating PGT decision-making, the individual making decisions using an exponential discounting framework will choose to proceed to PGT immediately after graduation from undergraduate studies as long as the loans available today will be available in the future[21].

[21] If an individual is given the option to transition immediately to a PGT programme as well as the option to transition in the future, (on the promise that tuition and maintenance costs will be provided via loan) she will choose to transition immediately. This is because she will presume that her future earnings will conveniently cover any potential lost earnings from studying for an additional year.

2.2.1.1 Economic Rational Choice Theory.

The conventional economic viewpoint asserts that individuals invest in postgraduate taught degrees (PGT) based on the notion that the skills attained through studies would aid in equipping them to apply for job roles requiring a more limited array of skills. The accreditation of a PGT[22] degree qualification is perceived as a confirmation of skill acquisition. Thus, the opportunity cost of continuing into PGT or returning to PGT education exceeds the opportunity cost of engaging in full-time employment. In other words, they rationally deduce that their return to education largely exceeds the private cost of education. These returns are based on the human capital differentials the individual gains from investing in an extra year of schooling, such as wage differentials, and compensating differentials (Schultz, 1961).

These differentials are explained in Human capital theory, which examines the mechanisms under which human capital is acquired, utilised and acknowledged (Schultz, 1961; Becker, 1964). In this sense, human capital encapsulates the services a worker can provide as a result of skills innately attributed to the worker's self or acquired through education and training (Psacharopoulos, 1996). Fundamental to this theory is the individual's ability to improve on her human capital through engaging in endeavours (e.g. training) to yield better returns. The benefit of such investments to improve human capital can only be confirmed through its effect on the individual's lifetime earnings stream (Mincer, 1974).

Pertaining educational attainment, Becker's (1964) seminal model on individual investment in education, factors in "continued education" as a substitute for potential earnings; thus implying education to be an investment good. Testing Becker's model empirically, Willis and Rosen (1979) use a structural model of the demand for schooling post-secondary education factoring earnings expectations and family background in the decision to study at university level. They find mainly that the increase in lifetime expected earnings following university education significantly influences the decision to proceed to university education. However,

[22] Postgraduate Taught degrees (PGTs) are degree programmes which typically last between 1 and 2 years. Most graduates from PGTs receive Masters of Science (M.Sc), Masters of Arts (Mas), and Postgraduate Certificates (P.G.Cert). They are all based on advanced teaching and learning as opposed to postgraduate research programmes (PGRs) such as Masters by Research (MRes) and PhDs.

these findings fail to acknowledge the effects of other factors besides the returns to education, which may affect the decision-making process of the individual such as school academic quality (Wilson, 2001). When measures of school quality are included in the model, we find conflicting results. On the individual perspective, Altonji and Dunn (1996) find that school expenditures[23] per pupil have a positive effect on the rate of return to education. On the state-level, Card and Krueger (1992) find that men who attended schools with low student/teacher ratios, higher paid teachers and longer average term-time had a significantly positive increases in their return to education. Potential reasons for such differences include methodological processes and measures of school quality that differ between both papers.

Thus, from a human capital perspective, the primary benefit of participating in PGT education is the increased projection in potential lifetime earnings because of knowledge gained. Conversely, the main cost of such transition is purely economic: this includes the primary cost (tuition and living expenses) of obtaining a PGT related degree, and the opportunity cost of participating in PGT education as opposed to engaging in another activity (e.g., job-hunting). Therefore, the decision to proceed to PGT is thus an optimization problem subject to several constraints and enablers (such as personal, social, economic). It is a sequential process consisting of a range of steps depending on the individual's mode of entry, as a "continuer" or as a "prospective returner". These two types of prospective students have different optimization problems as well as different enablers and constraints.

A different angle to express the importance of [postgraduate] education in the labour market is the idea that productivity only exists due to the nature of the job at hand. Here, education does not play a direct role in productivity or economic development per se, but correlates with attributes a job requires of prospective workers. At the extreme viewpoint, education- mainly its benefits- is an illusion of graduates who have undergone the process of acquiring such knowledge. Proponents of the Signalling Theory (Spence, 1973; Weiss, 1995; Barron et. al. 1989) and Labour Market Segmentation Theory (Reich et. al., 1973; Bowles and Gintis, 1973; Osterman, 1975) support this vantage point. From the mild view of the unproductive nature of education, labour market segmentation emphasises the constraints that exist

[23] Such expenditures include provision of tutelage, stationery, and amenities.

(mainly discriminatory) which delineates education (particularly higher education) as a redundant endeavour to attain. The existence of labour market imperfections divides the labour force into three groups (lower tier, secondary, and upper tier jobs) with earning in most lower tier and secondary jobs as strictly based on the time spent at work (Osterman, 1975). Deconstructing the various groups within the labour force into segment (based on distinction attributed to class, race, and gender e.t.c.) trivialises education as a contributing factor to productivity. However, it maintains a *reductio ad absurdum* reflecting human capital as a notion founded on matching individualistic attributes to economic productivity. The more obscure view, Signalling Theory purports education to simply be referred to as an identifier that aids in the employment process. Any grandiose connotation of a degree qualification as a direct ticket towards employment is viewed as illusory. Thus human capital- including education- are not useful characteristics as independent sources in the production process but only and as signals in the allocation of tasks in the labour market.

2.2.1.3 Sociological Perspective.

Predominantly from the sociological perspective is the Sociological Rational Choice (SRC) theory. Similar to the economics stance on Rational Choice Theory (RCT), the SRC defines learners (students) as rational individuals who aim to maximise returns from education. However, the SRC extends the Economic Rational Choice theory (ERC) by considering social concepts, stating that decision-making towards educational attainment is subject to the individual's economic and social goals (Jaeger, 2007). These social concepts[24] defining identity affect choice. By doing so, proponents of the model have used it to explain the phenomenon of growing educational inequality amidst an increased focus on widening participation in education (Breen and Goldthorpe, 1997; Morgan, 2005; Breen and Johnson, 2005).

As explained by Jaeger (2007), Breen and Goldthorpe (1997) identify three core assumptions of the SRC which have become a standard rubric in further theoretic modelling of the concept. Firstly, there is utility derived from further investment in education. Secondly, students are

[24] These social concepts are mainly divided into two: an individual's perception of her identity, and the individual's view of societal perception on her identity.

rational forward-thinking individuals. Finally, education is a tool to maximise expected utility used by students based on available information. Unlike the economic rational choice theory, the SRC defines utility as a function dependent on both the individual's economic circumstances as well as the social context in which she exists in (Hechter, 1994). Such social contexts allow for factors such as peer-effects and family status as influential in the rational decision-making process. In other words, sociological factors are not completely exogenous of rational decision-making, but are directly contributory towards individual's decision-making processes.

Akerlof and Kranton (2000) apply the assumptions from social identity theory to explain the sociological factors that influence individual decision-making giving an economist's perspective. As Tajfel's (1972) social identity theory states, the individual understands herself to belong to a social group which possesses some significance for which she is connected to emotionally. He further explains individual identity in two forms: individual social identity (acknowledging identity with others) and individual personal identity (acknowledging unique and distinct identity from others) (Tajfel et. al. 1984). In a marked extension of Tajfel's work, Turner's (1985) social categorisation theory defines the individual's identity as embedded in the social category with which she associates herself. The individual assumes the identity of the category she identifies with when engaged in self-categorisation (the ability for the individual to name herself in specific ways relative to other social categories). Thus, an individual's self-categorisation exists as a form of comparison in societal structures, which depict hierarchy and power (e.g. male v. female; white v. black) (Hogg and Abrams, 1988). Identifying with a social category implies an acknowledgement of the meaning and expectation ascribed to such identity (Stryker, 1980). Such social categorisations have beneficial and detrimental effects to both individuals and social categories alike. Such effects are emanated across societal structures.

In their depiction of personal identity in the utility function, Akerlof and Kranton (2000) express two fundamental ideas drawn from the psychology literature. Firstly, the individual has a self-image, which is multifaceted to create a wholesome identity showing multiple membership to various social categories (e.g. ethnicity, gender, marital status). Through this wholesome self-image, the individual can express her identity either as social or personal depending on the scenario. Secondly, an individual's self-image is directly related to her behaviour through internalising a set of rules attributed to a social category. Therefore, behaviour is the existing content that defines an individual's self-image.

2.2.2 Behavioural Alternatives.

Unlike the RCT, the behavioural alternatives presented here establish limitations to individual decision-making process. These alternatives introduce the role of cognitive biases and procedural constraints in the individual's perception on her choices and the resulting decisions made. The concepts presented here are solutions to the common critique on RCT in two ways. The first solution presents theories that define human individual decision-making as a process limited by a disproportionate distribution of risk behaviour over gains and losses, as well as based on the amount of information she possesses to make an informed decision. The second theory adds to the critique of RCT by exploring the way the individual makes decisions through time and the cognitive behaviour that exposes a myopic view in favour of gains in present as opposed to future gains. These models are discussed below with particular reference to education decision-making as students' transition to PGT degrees.

2.2.2.1 Behavioural Approach to Time Preference: Hyperbolic Discounting.

The RCT assumption of exponential discounting of choices over time is being refuted in the behavioural economics literature. As is the case with the Human Capital Theory, the longer the individual spends acquiring skills relevant, the easier it would be to access the labour market. This assumption is supported by the idea that the opportunity cost of not gaining such skills is the inability to create the niche skills relevant for progression through employment. Such assumption fails to indicate the gap between individual intentions and subsequent action as transient emotional states are not recognised to be influencers in decision-making processes.

Contrary to this notion is the concept of dynamic inconsistency, where individual preferences are subject to change over time. Such changes over time are caused by a change in perception between the time intentions are made and the action that occurs afterwards (Takahashi, 2011). In other words, individuals express low discount rates when projecting their intentions on future events, and such discount rates increase markedly as such future event arrives leading to a diversion from prior intention. Hyperbolic discounting proposes a time-inconsistent approach towards discounting which factors in the delay between intentions and actions as well as re-weighting of decisions over time (Laibson, 1997). This asserts that individuals are impulsively swayed by the relevance of a reward as opposed to the length of delay awaiting for the reward as assumed by RCT (Camerer, 1999).

What can be inferred on transition decisions to PGT education from hyperbolic discounting is that, decisions are made in a dynamic manner, which could change depending on factors beyond either credit constraints or identity perceptions and disparities. Potential PGT students are subject to the effects of hyperbolic discounting through the existence of projection bias in two specific ways. For the graduants expecting their results, the decision to proceed to PGT education is partly based on projected results. Conversely, for the returning learner, this decision is partially based on the current state of employment, the nature of current job, and the probability that proceeding into PGT education brings about the career progression mainly desired by these people.

2.2.2.2. Bounded Rationality and Prospect Theory.

A major critique of the RCT is derived from the limitations its assumptions place on the way individuals' process information. As with the case of perfect markets exhibiting perfect competition, the individual is assumed to possess perfect information on the intricacies involved in the market process. However, the educational system has proven to be a market –similar to many others- that is imperfect, and thus displays information asymmetry. Herbert Simon (1955) observed such defects in the expected utility theory when he proposed the idea of a bounded rational behaviour in individual decision-making. In his analogy, three major barriers limit the process of decision-making the individual is involved in: cognitive biases in information processing; the time constraint involved in assessing choices; and the available information in place to make such decision.

The relevance of information has been emphasised in the literature on education decision-making. In their assessment on the effect of student loans on student decision-making, Christie and Munro (2003) find that a poor amount of information implies that students are poor decision-makers regarding the cost and benefits of studying in higher education. Contrary to the RCT norm, the decision to proceed into PGT is based on familial and social circumstances, as well as a huge reliance on heuristics. Such poor decision-making also affects career decision-making as Greenback and Hepworth (2008) find. Following interviews with 30 undergraduate students on their career prospect upon concluding their current study, they find that students conform to apply satisficing as a measure to make such choices. They further emphasise that social capital based on social class systems is a crucial factor that affects the amount of information an individual possesses to make decisions.

In a more deeply probing critique of the RCT, prospect theory postulates that individual decisions to deviate from a set of alternatives are not random, but systematic instead (Kahneman, 2012; Ariely, 2008). When transitioning to PGT education- similar to when they make decisions about other aspects of their lives- individuals are assumed to have a probabilistic tendency of ignoring perfect opportunity costs to honour sunk costs. They also disproportionately overweigh losses whilst discounting gains as they undergo their decision-making process. Such systematic deviations are caused by heuristics and biases individuals employ to help make decisions as they go through assessing various options available to them (Diamond et. al. 2012).

2.2.2.3. Quasi Rationality and Belief-based utility

Similar to the notion of bounded rationality, quasi-rationality suggests that individuals are prone to allowing systematic biases influence their day-to-day decision-making processes (Dean and Sharfman, 1993). These systematic biases are derived through learned experiences or heuristics. Seminal work on this concept was developed by Russell and Thaler (1985) who argued in their paper that market prices are not strictly rational because all agents are not purely rational thinking individuals. In other words, market prices never reach a rational equilibrium as fundamentally believed in conventional economic theory. As Thaler (1991: xxi) states: “In some well-defined situations, people make decisions that are systematically and substantively different from those predicted by the standard economic model.”

To understand why people may choose to make decisions that may not maximise their satisfaction, literature on “belief-based utility” has grown in recent years to explain such phenomenon. Contrary to conventional[25] economic theory on utility, proponents of belief-based utility assert that individuals, when in decision-making scenarios, are influenced by the beliefs they hold with relation to the choices they may have to make. Thus, a person’s beliefs may cause her to make a decision that may not maximise her utility, but satisfies her as she sticks to her beliefs. Following the work by Loewenstein (1987), where he asserts that delayed consumption affects one’s anticipated utility and could have direct-utility consequences, there have been a range of behavioural models exploring this phenomenon and its influence on decision-making behaviour. These models typically provide solutions to the question: “To what extent does timing of information delivery influence an individual’s perceived utility?” The answer to this question is not conclusive as there are motives to assert early delivery of information is preferred (Koszegi and Rabin, 2009), as well as motives to suggest the contrary (Scheweizer and Szech, 2013; Falk and Zimmermann, 2016). Importantly, Golman and Loewenstein (2014) propose that environmental factors contribute to when one prefers to receive information to aid her decision-making process.

The findings from Golman and Loewenstein (2014) enriches the understanding on transitions to PGT education from undergraduate studies. At the point where the individual is presented with the initial choice set (at Year 0) to transition into PGT education, belief-based utility purports that the individual would not make her decision strictly based on the utility to be

[25] Conventional economic theory explains utility to come in two forms: experienced utility and decision utility. Experienced utility refers to the subjective derived pleasure one obtains as a result of stimulus from an action. On the other hand, decision utility is an estimation of experienced utility derived through a period of decision-making.

expected from adding degree to her certificates, the time between completing a Masters' degree and yielding dividends from studies could be crucial in an individual's decision-making.

2.2.3 Education Models of Transition to PGT education

Early literature on the transition from undergraduate to PGT study focused on identifying the characteristics of students who transitioned to postgraduate education through the ideas of student involvement and retention. According to Tinto's theory of student departure (Tinto, 1975; Tinto, 1993), the ability of the student to integrate to Higher Education (HE) both academically and socially determines whether she drops-out or persists to graduation. Tinto identifies two major reasons for dropping out of university: firstly, student failure such that the HEI decides she can no longer study there, and voluntary departure from HEI. Enablers such as individual attributes, family attributes and support infrastructure (e.g. teaching support, and counselling) influence both of these reasons to aid student performance and transition to HE.

Extending this theory to consider postgraduate education, Ethington and Smart (1986) use a causal model to investigate the process that leads undergraduate students to graduate school. By measuring student institutional and socio-economic backgrounds, they find that academic performance is an immense influence on the students' propensity to transition to graduate school. Furthermore, students whose parents are better educated perform better academically than those from less-educated households do; thus having a higher propensity to transition to postgraduate education than their classmates from less-educated backgrounds.

2.2.3.1. The Marketing Communications Strategy Model

Though explorative, the literature on characteristics of individuals who study PGTs fail to discuss the cognitive or methodical process of the student education decision-making to study a PGT course. In the literature thus far, Donaldson and McNicholas (2004) derive the most comprehensive model on postgraduate decision-making for continuing students. By means of a conceptual marketing communications strategy, this model identifies five stages in the decision-making process: Needs recognition, Information search stage, Evaluating All Alternatives stage, Purchase stage.

In the needs recognition stage, the student expresses the need for a postgraduate programme by building up a rationale to explain the need for a PGT degree, choosing the HEI and degree to study, and gathering information. The second stage of the PGT decision-making process is the Information Search stage. Two factors are important in the information search process: the type of information; and the source of information. Information on tuition fee and overall financial costs are crucial in the decision to study a postgraduate (PG) degree. With the advances in technology, the sources of gathering information has become more versatile. Though research on the sources of information students seek in their PGT decision-making process is limited, one can extrapolate that these sources would be similar to those used in the UG decision-making process; but with varying intensity. In selecting their preferred source of information, Balls and Vincent (1998) and Slack et. al. (2014) reason that students prefer information from their primary social networks (e.g. friends and family), and from third parties (e.g. student ambassadors at open-days) as opposed to information from formal information (e.g. university prospectus and study guides). This could mainly be because of the generalised nature of the information in formal media, which does no cater to the individual queries students may have.

The Evaluating All Alternatives stage is the most important stage in the decision-making process. In this stage, the student assesses all the information she has about the relevant HEIs she is interested in. Conventional economic theory postulates that the student weights all alternatives following an evidence-based search for information. The Purchase stage is finalised after the student has made the decision to study a PGT course. At this point, such analysis of the need recognition is mainly reflective; aimed at establishing a level of satisfaction with the chosen HEI.

Following this process, Mellors-Bourne et al (2014), demarcates the procedure into three major stages and two contributing stages in the decision-making process. As expressed in figure 1, the main stages include Motivators[26], Engagement and Exploration, and Decision-making and application. On the other hand, the contributing stages-, which consists of hygiene[27] factors and aspirations for learning and career development-, are designed to facilitate the Motivations stage. The Motivators stage refers to the series of justifying factors that a potential returning student considers when applying for PGT study. Based on Hertzberg (1966) Motivation-Hygiene theory, the first group of justifying factors explores how realistic a PGT education is. The other range of justifying factors are the individual's aspirations towards career development through learning. This aspect mainly refers to individuals returning to education for the as a means of self-improvement. The next stage in the PGT decision-making process for returning students is the Engagement and Exploration stage. Typically, the types and sources of information gathered would be relatively similar, however returning individuals are considered less likely to be concerned by financial considerations and more concerned about the constrains from commitments to family and work. The final stage- being the Decision-making stage involves acknowledging the HEI of interest, making detailed queries if needed, and making an application to the HEI. At this point, the returning student can only hope for an acceptance to study at the HEI applied.

Although, these stages may be applicable to graduates and undergraduates considering PG study, this model fails to be an ultimate model of the individual PGT decision-making process. In general, the literature on the PGT decision-making process is very little, with the available models being adaptations from research on models on UG decision-making process (see Manski and Wise, 1983; Hossler et. al. 1999, Vrontis et. al., 2007).

[26] Motivators are the factors that make the behaviour more likely to occur when present. Such motivators will include current or future work demands, potential family benefits, and maintenance of learning identity.

[27] Hygiene factors here refer to factors that have to be present to allow a particular behaviour to occur (e.g. availability of PGT courses, accessibility to learning facilities, access to childcare support, positive attitude to learning.

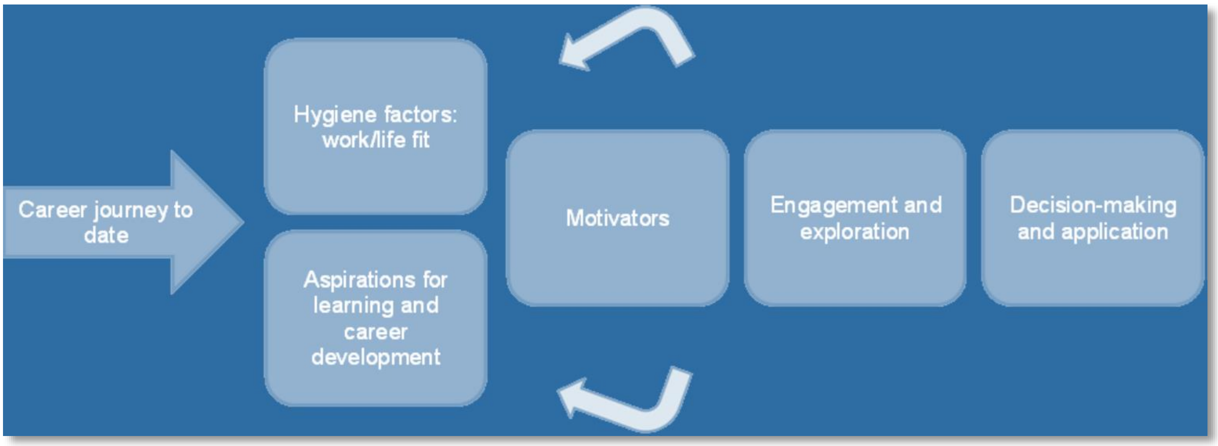


Figure 2.2: Decision-making process of Prospective PGT students (Mellors-Bourne et al, 2014).

Mellors-Bourne et al (2014) further categorises the type of student transitioning in two groups. The first group consist of individuals who choose to transition to PGT studies as soon as they graduate from undergraduate studies (called 'continuers). This group are typically younger in age and aim to study as full-time students. The second group is called the 'prospective returner'. These individuals consist of individuals who choose to transition to PGT after a few years at work. They are predominantly older in age and are more financially secure- in comparison to the continuers.

2.2.3.2. Gale and Parker Model on Higher Education Transitions.

Within the education literature, Gale and Parker (2014) identify student transitions into higher education, as a process consisting of three stages. The first stage of the model specifies the way universities approach transitions to PG education. This is called, "induction". Due to its institutional approach, the conditions on which students' transition is determined by the current university they attend. Thus, the puzzle becomes the need to categorise students following the institutions requirements; such that the student that succeeds in transitioning from UG to PG study has to be comfortable working within the already existing conditions (Quinn, 2010; Thomas, 2002; Ecclestone, 2002).

The second stage- called development- views transitions to higher education based on the notion of 'transition as development'. This model incorporates identity as a crucial element that can be shaped or transformed through the process of transitioning. Rice et al (2009) explain this model as a facility that appeals both to the student personifying her identity as a student as part of her overall identity as well as the student developing a sense of identity through the course she studies[28]. This stage explains transitions as a means to further gain skills for the workplace. The final stage of the process is the "becoming" stage. Here, the transition process is defined as an empowering activity that is conducted with a high degree of self-awareness. It opposes the notion that people transition to higher education to fill a gap in their professional lives caused due to unemployment and other mitigating factors (Ecclestone et al, 2010). Unlike the latter two stages, this stage assumes a non-linear approach to understanding the student experience (Gill, 2012; Mellors-Bourne, 2016). In other words, the student experience in higher education is not described as an event without any changes during the event. Instead, it understands that the student experience as a non-linear one, that changes on a daily basis.

2.2.3.3. Expectancy-value Theory of Achievement Motivation

To derive a fundamental understanding of the nature of individuals' innate propensity to achieve success through internalised drive, Eccles et al (1983) derive a model that seeks to explain this phenomenon. Developed as a framework to explain performance of adolescents in mathematics, the expectancy value model posits that the individual's perception of her expectations and value system directly predict her motivation to succeed and subsequent success. Crucially, it predicts that the individual would select the option with the largest combination of expected success and value when faced with more than one behavioural choice.

In this model, values are understood as beliefs an individual possesses about the end outcome of an event. Subjective value refers to how various tasks fulfil the needs of individuals that undertake such tasks. Eccles et al (1983) explain values in four components: intrinsic values,

[28] E.g. the student can identify herself as an economist because she is studying to become an economist.

attainment value, usefulness of the task and cost. The individual obtains 'attainment value' as a result of deriving an importance for doing a job well. Intrinsic value refers to the satisfaction one derives as a result of fulfilling a task. The usefulness of a task or utility value refers to how one perceives a current task as crucial towards her future aspirations. The cost here refer to the sacrifice an individual has to make to accomplish a task.

On the other part, expectancies are defined in Eccles et al (1983) as beliefs an individual derives about her performance in a task. Here, the individual assesses the weight of a task and compares her skills and competencies before deriving a belief of how well she thinks she will perform in the task. Eccles et al (1983) divide expectances into two types: outcome expectations and efficacy expectations. Outcome expectations are based on the potential result of a response towards a task. Efficacy outcome explains the individual's certainty of an ability to deliver on the prospects of a task.

2.2.3.4. Analytic Hierarchy Process.

As developed by Thomas Saaty, the Analytic Hierarchy Process (AHP) is a technique founded on management and psychology theories used to elucidate multi-criteria decision-making events involving objective and subjective conditions (Saaty, 1977). With the assumption of the individual as a rational decision-maker, this model allows the individual to explore decision-making in a procedural manner; making a decision based on pairwise comparisons of options available (Ishizaka and Labib, 2011).

Due to the procedural nature of AHP, education decision-making processes for the individual is based on the amount of information available to the individual and how well the individual can identify her choices or motives (Saaty, 1987). In the case pertinent to this research, the prospective applicant would have to be aware of the effect to which issues of credit constraint, and identity perceptions and disparities influence their decision-making process. The important element of the AHP is the fact that, as a model mainly designed for group decision-making, adapting it to consider the individual as a unit decision-maker does not impose on the individual axioms on which it ought to follow. It simply provides the individual with the mechanism on which to evaluate choices.

A major criticism of the AHP as a model of decision-making is the arbitrary nature of ranking alternatives produced through its pairwise comparisons (Dyer, 1990; 1992). This is because, pairwise comparisons are made based on a subjective response on a ratio scale. He argues that the classical utility theory, unlike the AHP, carefully defines its elicitation questions to fit the rule of making a choice from a set of alternatives based on the subject matter of inquiry. The AHP therefore relies on a subjective evaluation of strength of preferences which possesses inherent biases as explained in the behavioural alternatives section of this review.

Theory	Author(s)/Year	Predictions
Rational Choice Theory	Various -	People make decisions with the sole aim of maximising the benefit and reducing the cost of such decisions.
Bounded Rationality	Simon (1954)	People do not seek strictly to maximise utility, but to satisfice.
Exponential Discounting	Samuelson (1937)	Individuals weigh the outcomes of making decisions in the future with those of the present time equally. Thus they only have preference for consumption of a good based on perceptions about the utility.
Hyperbolic Discounting	Laibson (1997)	People have a tendency to prefer making a decision sooner rather than later. This is due to immediate gratification.
Gale and Parker Theory	Gale and Parker (2014)	Student transitions consist of induction, development and becoming stages.
Expectancy-value Theory of Achievement Motivation	Eccles (1998)	The individual would select the option with the largest combination of expected success and value when faced with more than one behavioural choice.

Table 2. 2: Summary of theories

2.3 Empirical Contributions and studies on postgraduate education decision-making

Although there is little available literature on transitions from undergraduate study to PGT, the recent uptick in research is a result of concerns about widening participation in PGT degree programmes and expected changes on funding provided for PGT students. Most available research have focused on the students' experience after[29] the degree (Morgan, 2014; Morgan 2015). A reason attributed to this issue was the perception of PGT students as individuals with better information of the higher education environment implied that they were not of major interest to researchers (Tobbell et al, 2010; Tobbell and O'Donnell, 2013).

Despite these efforts, recent contributions to the debate have ignored the effects of these tuition fee loans on transition patterns. This section aims to provide a critique of recent contributions on this topic before exploring the effects of socio-economic factors - such as access to finance and individual identity- on one's willingness to study for a PGT degree certificate.

2.3.1. The UK Taught Postgraduate Education environment: Two types of students

The crucial aim of the paper in this thesis is to study the effect of identity disparities and economic constraints on individual decisions to transition to PGT; either immediately after undergraduate studies or at some point in the future. This part of the introductory chapter explores the nature of the postgraduate environment in the UK with an especial emphasis on the defining characteristics of the student population.

Taught postgraduate (PGT) education in the UK typically refers to degree programmes, which an individual embarks on upon completion of her first degree with the aim of receiving a specialised, advanced study into a particular field. The Quality Assurance Agency (QAA) identify these programmes as Masters Degrees, Postgraduate Diplomas (PG Dip), and

[29] An example of this is the Postgraduate Taught Experience Survey (PTES), which aims to mark trends in student perception of their experience in PGT education.

Postgraduate Certificate of Education (PGCE). These degree programmes are awarded under a level 7 certification in the Framework of Higher Education Qualification (FHEQ) specialisation by the QAA (QAA, 2014). PGTs typically run for one year under full-time (FT) study, or two years under part-time (PT) study. Students admitted to study a PGT course are required to possess a minimum undergraduate degree qualification of an upper second-class (2:1) degree as well as a detailed and expert understanding of the course they wish to study. On the other hand, the students expect to achieve knowledge and vital skills that can further enhance their career prospects and intellectual endeavours (Tomlinson, 2008; Brown, 2003; Barber et al. 2004). To satisfy the expectations of HEIs and prospective students, the QAA (2014) stipulates that the student show a thorough understanding of fundamental concepts and a sufficient ability to apply originality when expressing knowledge of such concepts during her period of study as requisite for a PGT degree award.

Although the QAA carefully explains the requisite for award of a PGT degree and expected transferable skills thereof, its requirements consider prospective PGT students as a homogenous group. When differences in student approach to academic practice and experience are not included into an understanding of PGT student identity, difficulties may arise (O'Donnell et al. 2009; Tobbell and O'Donnell, 2013). To provide context to remedy this issue, prospective students tend to be studied based on factors they consider when making the decision to study for a PGT degree qualification. In other words, the decision to study for a PGT degree is considered as an optimisation problem, which consists of a range of steps depending on the student's mode of entry. The student's mode of entry can be either "continuing graduate" or "returning student". Therefore the two types of student are: continuers and prospective returners (Mellors-Bourne et al, 2014).

In this study, Continuers is defined as recent graduates who decide to continue with higher education in the following academic session after graduation from undergraduate study. Characteristically, they show an above-average academic performance at undergraduate level and aim to define a better route into employment through enhancing knowledge from prior studies (Mellors-Bourne et al, 2014). Using data from the Higher Education Statistics

Agency (HESA), HEFCE (2016) observed an increase in the rate of transition to PGT from 6.1% in 2002/03 to 6.5% in 2013/14. Critically, a significant proportion of men, BME graduates and individuals from areas with a high young participation rate in HE, transitioned immediately into PGT study in comparison to women, white graduates and individuals from areas with a low young participation rate respectively. Although the overall transition rate between 2002/03 and 2013/14 academic sessions show a slight increase, the 6.5% rate of transition is the latest in a fall in transition rates, which peaked at 8.3% during the 2008/09 academic session. Possible factors causing the reduction in continuers represented in PGT education include the financial crisis of 2007/2008 and the fear of increased student debt (Strike, 2015; Milburn, 2012).

Conversely, Prospective Returners refer to recent graduates who chose to engage in the labour market immediately after they graduate from their undergraduate study, with the intention of returning to a HEI to pursue a PGT degree qualification. Mellors-Bourne et al (2014) suggest that prospective returners consist of individuals who use PGT degree qualifications as a means to change careers or progress beyond a current career limit (given prior qualifications. I-graduate (2013) further suggests that- due to a significant number of prospective returners being engaged in full-time employment- they tend to apply to fewer HEIs than their continuer counterparts. Comparing between continuers and prospective returners (likely to pursue a PGT degree after 3 and 5 years of completion of undergraduate studies), HEFCE (2016) found that graduates were less likely to transition to PGT as time progressed. This suggests that prospective returners are more likely to transition into the PGT education within 2 years of graduation from undergraduate education.

Thus, the literature on transitions to PGT education in the UK indicates a crucial existence of identity disparities where some social groups are over-represented whilst some others are under-represented for reasons due to gender disparities, ethnic group differences, socioeconomic and geographical factors. In addition, the prospect of returning to an HEI to study for a PGT degree dissipates beyond three years after graduation from undergraduate study (HEFCE, 2016). To understand why such trends persist, the next section explores recent changes in UK HE policy in relation to PGT study and PG education at large. Although there has been a clear expression of trends and motives of individuals making transitions into PGT education, there remains to be an empirical comparative study of the lifetime financial opportunity cost of transitioning to PGT at various time-periods after graduation from undergraduate study.

2.3.2 The Economic factors: Access to Credit and accumulated debt constraints.

The effects borne from credit constraints are founded on students' accessibility to sources of funding for the duration of their courses. The English funding system for HE consists of three main features: tuition fees, maintenance grants, and maintenance loans (Dearden et. al. 2014). Whilst in undergraduate (UG) study students have an open-access to income-contingency loans to subsidise tuition fee and living costs, the PGT student only has access to the Professional and Career Development Loan (PCDL). Though not initially created for PG students, the PCDLs are commercial bank loans between £300 and £10,000 per student loan that borrowers are required to pay between 2 and 6 months after graduation. In the 2013/2014 academic session, 75% of students secured loans from various commercial banks through the PCDL initiative. Despite the loan, 72% of UK PGT Masters students were identified as self-funding towards their tuition fee costs. Furthermore, there are no limits on fees for various courses across universities for PG study as opposed to undergraduate study where there is a fixed tuition fee across universities. As HEFCE (2015) report on its Consultation on Support for Postgraduate Study, PGT Master's courses are more expensive than other postgraduate courses and postgraduate research (PGR) courses. Within the PGT framework, courses in the social sciences were observed to have the highest fees whilst courses in arts and humanities charged the lowest tuition fees.

Such pressures of credit constraints on the PGT decision-making process is presumed to be different when comparing between prospective continuing students and those returning back to HE following a hiatus to focus on other life endeavours. Increases in undergraduate tuition fees have led to speculations that it would lead to a reduction in enrolment to PG study

(Browne, 2010). The Purcell et. al, (2012) longitudinal survey on career decision-making and labour market trends found that additional student debt for current undergraduates was a major deterrent towards PG Study. Conversely, Croxford and Raffe (2014) find –in their research on institutional differentiation amongst UK HEIs- that returning prospective students are more likely to be from middle class to upper class backgrounds; thus they are more likely to have necessary funds within the family to aid facilitate a return to PG study.

2.3.3 The Issue of Social milieu and individual idiosyncrasies.

The early research that looked into PGT student perceptions, conducted their research incorporating PGT students amongst all other PG students. For instance, on behalf of the National Postgraduate Committee, Darwen et al (2002) asked 8000 PG students questions regarding factors they considered when making the decision to study for a PG degree, student status (i.e. FT or PT), how they fund their studies, and their future career prospects. They received 982 responses[30] of which 47% were Masters Students, 4% were MBAs and the remainder were either PGR or PGCE students. They found that 72% of respondents paid tuition fees themselves, with 74% of this subset describing their funds as insufficient. In addition, young (21-25 year olds) were more likely to spend more than they had as income, thus accruing debt. Using both quantitative and qualitative research methods, Stuart et al (2008) found that UK domiciled undergraduates were less willing to proceed immediately after their undergraduate degrees to work as opposed to overseas students. These UK domiciled students cited the need to get gainful employment and 'taking a break from studies' as the two main reasons for their unwillingness to proceed. Interestingly, demographic factors such as age, occupational class and financial constraints produced no significant results. Tobbell et al (2008) use a grounded theory approach and ethnographic research to analyse educational transitions to PG programmes. With a sample of 15 students a 6 staff members, a series of interviews were conducted. The key findings from their research suggest that HEI focus on financial imperatives put postgraduate funding and support at a disadvantage. Other findings include; experience at undergraduate level does not play a significant role in one's

[30] This means that they had a 12% response rate.

participation at PG level, and academic staff tend to use the same teaching methods when engaging with PG students as they do with their UG students.

Regarding the perceptions individuals may have about PGT students which may influence decision-making, entrants to PGT courses are assumed to be of commanding knowledge regarding the course they intend to study as admissions are primarily based on undergraduate degree classification amongst other criteria (Tobbell and O'Donnell, 2013; Tobbell et. al, 2010). On the contrary, evidence suggests that PG students in general have identified themselves as individuals who do not fully possess the necessary skills required for an impactful participation in PG study. Magano (2011) narrative study on transitions of black female students to doctorate degree programmes found that students were unable to establish a learning relationship with their supervisors due to an inferiority complex they felt in the presence of their supervisors. Akin to the PGR scenario as documented by Magano (2011), the PGT study dynamic is expected to depict the power distribution between students and teachers. Given the presumed increased autonomy PGT students have over their participation in respective courses, it would be logical to infer that students would be susceptible to such pressure from power dynamics. Continuing students may find transitioning to the PGT environment more difficult due to the sudden nature of the change as opposed to returning students whose experiences in the labour market makes them more familiar with power structures.

Whilst investigating educational transition from undergraduate to postgraduate programmes, Mullen et al (2003) use data from the Baccalaureate and Beyond Longitudinal Study (B&B) to conduct multinomial logistic regression models to ascertain 'who goes to graduate school'. Controlling for parents' education, and institutional attainments, they find that family educational background has no effect on student enrolment to MBA. However, 18% of students whose parents had a high school degree proceeded to master's degree as opposed to 22% of students whose parents had postgraduate degrees, representing a small effect of parental education background. Thus, a motivating factor for students from better-educated backgrounds is simply the fact that the student's parents have experienced postgraduate education; creating a reference point for such a decision to study a PGT to emanate.

This is different for the returning learner who seeks to study a PGT course to advance career prospects and/or pursue knowledge in a particular subject. The primary motivating factor is mainly a result of graduates feeling dissatisfied by the 'non-graduate' jobs they obtain post-graduation (Yorke, 2004; Cranmer, 2006; Bridgestock, 2009). In a survey of graduates using data from Higher Education Statistical Agency (HESA) and the Destination of Leavers from Higher Education (DLHE), d'Aguiar and Harrison (2015) find that returning students tend to be graduates from elite universities who have failed to secure the jobs they require, as well as individuals from minority ethnic groups and women also.

Credit constraints have also been shown to affect different social groups in different ways. Given the nature of the PGT funding system, the trends in PGT enrolment have depicted the number of entrants reduced by 17% between the 2008/2009 and 2013/2014 academic sessions (HESA 2013) contributing to negative effects on social mobility and widening participation. In his independent review on social mobility and child poverty, Milburn (2012) notes that the fall in student enrolment for PG (PGT and PGR alike) is mainly apparent in the reduction of student enrolment from lower income backgrounds. As careers that are more professional require PG certificates, such reduction leads to a social exclusion of individuals from lower income backgrounds in top professional careers. Whitty and Mullan (2013) further notice- that individuals from lower income backgrounds are less likely to continue immediately into PG study, but are more likely than those from affluent backgrounds to return to PG study 3 years afterwards. He attributes this return as a second chance where individuals are able to secure support from family. This extends on Wakeling and Kyriacou (2010) research on widening participation across the HE system where they find that 50% of PGR students studied their undergraduate degrees in Russell Group universities.

2.3.4 The Association between Debt from Undergraduate Study and Continuation into Postgraduate Study

As prior mentioned, debt acquired during undergraduate study (linked with tuition and maintenance) constitutes a major factor that affects individuals' transition into PG education. Although evidence for this assertion is well established as expressed earlier in this chapter, the grounds for consensus on the nature of the impact of debt on enrolment and studying at postgraduate level has been proven difficult to reach.

One of the most interesting countries to study on the association between prior student debt from undergraduate study and transition into postgraduate education is the United States[31] (US). Students in the US have access to at least one of two[32] types of loans: Federal student loans accessible to students; and private loans. Typically, the Federal student loans accessible to students charge smaller interest rates in comparison with private loans. They also do not require prior or good credit history to gain access to it as would be the case for private loan access. However, the limits on how much to borrow are smaller for Federal student loans accessible to students. Hess, (2017) reports that approximately 70% of graduates complete university with tuition fee loans each year. Thus, of the 19.9 million people who enrolled into university for undergraduate study in 2018 according to College Board (2018), approximately 13 million may graduate with student debt to pay. Furthermore, with average student debt of $37,172 (Friedman, 2018) and average costs of tuition amongst other expenses for a year at $21,370 per year (College Board, 2018), student loans can be seen as an integral part of the overall student experience at US higher education.

Given the landscape of student debt in the United States, it becomes very pertinent to understand how this affects transitions beyond undergraduate education into postgraduate study. At this juncture, it is important to note that the access to student loans for

[31] The comparisons made here would be based on four-year undergraduate programmes and NOT two-year programmes (often called "Junior College" or "Community College"). This is because, the certificates offered cannot be used to transition into PG education.
[32] There is also the Federal student loans which are made to parents. This is not included as the burden of repayment is left to parents for this type of loan.

postgraduate students has become different since 2011, when the Budget Control Act[33] (BCA) was signed into law by President Barack Obama which had new implications of reduced student support on graduate enrolment. Prior to the implementation of the BCA into law, research in the United States that discussed the effects of pre-existing loans and debt on enrolment into graduate school has been inconclusive with evidence yielding a variety of results which can be either that a negative relationship exists between the two terms or positive[34]/insignificant.

The perspective that indicates a negative relationship between debt accrued and postgraduate transition stems from the notion that current high undergraduate debt serve as a disincentive to transition into postgraduate education (Choy and Gies, 1997; Millett, 2003). Choy and Gies (1997) use the Baccalaureate and Beyond (B&B) AND Beginning Postsecondary Student (BPS) studies for people[35] who graduated in 1992/93 to study amongst other motives, the debt burden of these students as implied by their incomes and their repayment status. Although the career choices of bachelor's degree holders was not affected with debt, it was observed to be correlated with a negative effect on immediate enrolment into postgraduate education. Using the same dataset as Choy and Gies (1997, Millett (2003) findings support Choy and Gies (1997) and further notes that the students who had educational debt were more likely to come from households with parents without bachelor's degrees. For instance, about 34% of students with less than $5,000 debt, 32% of those with debt between $5,000 and $9,000; 42% of those with debt between $10,000 and $14,999, and 28% of students with debt exceeding $15,000 had parents who's highest education was a high school certificate. This is in direct contrast to 19.5% of those who had no educational debt coming from households were both parents did not have any bachelor's degrees and 40.2% of such students having parents with advanced degrees. Thus, as Millett (2003) states, the potential

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[33] The Budget Control Act (BCA, 2011) was a law derived to curb the impending debt crisis in 2011 through cutting US Federal deficit. As part of the BCA, the US government decided to stop subsidising graduate students in the form of Subsidised Federal Student loans. These Subsidised Federal Student Loans were designed such that the government covered interest on loans during the time graduate students study.

[34] Positive and insignificant relationships are bracketed together because they both do not show that there is an effect of debt on enrolment into postgraduate courses.

[35] The sample size here was a total of 19,000 of which 11,000 were from the B&B study that looked at those who obtained baccalaureates and the BPS data focused on non-baccalaureates.

better lifetime earnings derived from studying at a postgraduate level is not incentive enough for graduates with high debts to transition into PG. To corroborate the findings of Choy and Gies (1997), Malcolm and Dowd (2012) studied people who graduated in the 2002/03 academic session from both undergraduate and master's degrees using merged data of the 2003 output from the National Survey of Recent College Graduates (NSRCG) on the student level and merging it with industry-level data from The Institute of College Access and Success (TICAS), the 2002-2003 College Board Annual Survey of Colleges and Universities (CBASCU), Barron's Profiles of American Colleges and the Integrated Postsecondary Education Data System (IPEDS). This was conducted with the aim of observing what the impact of current and potential debt is on the decision to proceed into STEM related master's degree programmes. Among those with prior debt, the prospect of obtaining more debt was a deterrent from pursuing a master's degree. Latinos, African Americans, Whites and Asians were 13.8%, 10%, 5.5% and 10.2% respectively less likely to enrol into master's degrees in comparison to their non-borrowing counterparts of the same ethnic group. Furthermore, individuals who were non-borrowers were less likely than those who had prior debt to enrol into master's degree programmes if there was a prospect of having to borrow to fund their degree.

On the other hand, research which perceives debt to possess a positive relationship with transitions into postgraduate education posit that students who borrow more have a more thorough understanding of educational debt as essential towards receiving the long-term financial benefits of obtaining a postgraduate degree (Heller, 2001; and Kim and Eyermann, 2006). For instance, Heller (2001), in her study on the effect of educational debt acquired during undergraduate study and the likelihood for such students to enrol into postgraduate study, it was found that there was an insignificant relationship between the two events. However, the dataset used were from students that graduated prior to the 1992[36] Higher Education Amendments. To challenge the veracity of these findings, Kim and Eyermann (2006) using data from the Cooperative Institution Research Program (CIRP) of the Higher Education Institution (HEI) at the University of California Los Angeles (UCLA), compare plans

[36] The 1992 Higher Education Amendments were a series of policies devised to improve wider participation within Higer Education Istitutions in the United States. A part of these amendments was the provision of an increase in the student loan limits and more flexibility in the eligibility for acquisition of student loans.

for students who had attended university between 1985 – 1989 (before the amendments) and 1994 – 1998 (after the amendments) to observe the nature of effect more borrowing would have on transitions into postgraduate education. Critically, they find that the loan structure prior to 1992 had no significant effect on enrolment to graduate school as evidenced in Heller (2001). Interestingly, for the students in the 1994 – 1998 cohort, although there is no statistically significant effect of the loan structure post 1992 on decisions of individuals from low and high income to transition into graduate school, there was a statistically significant positive effect on people from middle income households to transition into graduate schools as a result of the more flexible access to loans. More recently, with regard to the impact of BCA 2011, Muehlenbein et al (2016) studied the effect of a reduction in the availability of subsidised loans for graduate education on enrolment for degree programmes in graduate school. With data from the Texas Schools Project Education Research Center at the University of Texas, they find that there was no significant impact on the enrolment figures.

In the United Kingdom, the clearest differences[37] in the impact of debt on transitions into postgraduate education can best be observed through comparing between England and Scotland. In England, the undergraduate tuition fee structure has changed substantially over the last 20 years. Between 2006 and 2011, the undergraduate tuition fees were at £3,375 with an income repayment threshold of £15,000 with the availability of maintenance grants. By 2012, tuition fees had increased to £9,000 while income repayment threshold[38] and maintenance grants remained at the same value. In 2017, students were charged £9,250 with income repayment threshold at £21,000 and the removal of maintenance grants which was replaced by maintenance loans. Currently, home students are charged £9,250 for tuition fees as ay 2018/19 academic session, with an increase in income repayment threshold to £25,000 and no maintenance grants. The Student Finance England also provides means-tested loans to help students in need to financial aid as they study as well as non-means tested loans which depend on the individual's living situation[39]. Contrastingly, in Scotland, home students are

[37] It is important to note that comparisons are made considering mainly full-time education.
[38] In 2016, the UK government increased the income repayment threshold to £21,000.
[39] According to The Complete University Guide, for the 2018/19 academic session, if an individual lives at home and applies for a non- means tested maintenance loan, she could receive up to £7,324. This changes if the

charged a tuition fee of £1,820 for the 2018/19 academic session with access to maintenance loans of up to £5,750 and a bursary of up to £1,875 depending on the student's household income (The Complete University Guide, 2018). Students studying in Scotland from other parts of the UK are charged at the £9,250 (for students from Norther Ireland and England) and £9,000 (for students from Wales).

With the gains that have been highlighted by the Office for Students (2018), the increase in undergraduate tuition fees over the years has been accompanied by an increase in graduate contributions and reduced government costs. For instance, the Institute of Fiscal Studies (2018) reports that between 2011 and 2018, total cost of HE increased from £15.1 billion to £17.3 billion which has been funded in large part, by graduate contributions as expressed in the Table 2.2. Thus, over time, HE which was funded 60% by loans is currently being funded 96% by loans. Regarding long term debt burden on undergraduates, the two key impactful variables are the income repayment threshold and the interest rates. According to the Belfield et al (2018) of the Institute for Fiscal Studies (IFS), increases in the tuition fees, repayment period[40] and interest rates acted to increase lifetime graduate contributions; whereas, increasing the income repayment threshold reduced average repayments.

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student lives studies in London and thus lives away from home (up to £11,354), studies outside London and lives away from home (up tp £8,700) and up to a year of living and studying abroad (up to £9,963).

[40] Repayment period was increased from 25 years to 30 years in 2012.

Table 2. 3: Money flows under various student finance systems (2018 prices).

	2011 system	*2012 system*	*2017 system*	*Current system*
RAB charge	33.0%	36.8%	34.1%	46.8%
				Cost per borrower
Total up-front government spend	£43,700	£55,200	£53,300	£52,300
Of which, loans	*60%*	*86%*	*96%*	*96%*
Long-run graduate contribution	£17,600	£30,000	£33,800	£26,700
Long-run taxpayer subsidy	£26,100	£25,100	£19,600	£25,600
				Total costs (including nonborrowers)
Total up-front government spend	£15,100m	£18,400m	£17,600m	£17,300m
Of which, direct grants	*£6,800m*	*£2,700m*	*£800m*	*£800m*
Total long-run government contribution	£9,300m	£8,500m	£6,500m	£8,500m

Source: Belfield et. al (2018) for the Institute for Fiscal Studies

In spite of the higher tuition fees in England, Universities UK (2018) state that application rates for UK undergraduate degrees from students of areas with low participation in higher education increased by 22.6%, which was a record increase. By contrast, Scotland[41] experienced its first decline (of 16.7%) of students from areas where there are low participation in higher education. When comparing entry rates into Higher Education Institutions (HEIs) for the 2017/18 against entry rates in 2007/08, it is noted that HEIs in England had a decline of 12.6% of students domiciled in England while entry of students residing in Scotland fell by 15.3%. In Scotland, however, HEIs noticed an increase of 28.8% of students domiciled in England over the period of 2007/08 – 2017/18 while home students entering Scottish HEIs fell by 11.6%. Overall, England accounts for 82% of all undergraduate entrants in the UK with Scotland having 9.8% of the population of entrants into UK HEIs. Thus, although people are more likely to apply to English universities, there is a shift in preference in favour of Scottish HEIs. Universities UK (2018) attribute the declining entry into English universities as an impact of the increased tuition fees and reduced number of people studying part-time. On the other hand, the increase in the number of English student that enrol into Scottish HEIs is attributed to an attraction students have to such institutions. Considering that enrolment into English HEIs from students domiciled in England has reduced over the 10 years since 2007/08 academic session while enrolment of such students has increased in Scottish HEIs, what can be observed regarding the transitions into PGT study in these HEIs?

A crucial difference between funding PGT education between England and Scotland on is the fact that although students are both eligible for £10,000, the structure of the loans are different. In England, the loans are available for tuition purposes only which have been shown to be largely positive since they were fully introduced in 2016/17 academic session. In December 2013, the UK government announced the launch of a pilot study (often called PSS1) to test out various methods that can be used to provide support to graduates considering PGT education in England (HEFCE, 2013). The proposition of the PSS study arose in large part due to preceding trends between 2002/03 – 2012/13 academic sessions showing that access to finance is very limited to PGT students with 72% having no financial backing for their studies and thus rely on bank loans to fund their studies. Led by Prof. Paul Wakeling, this scheme

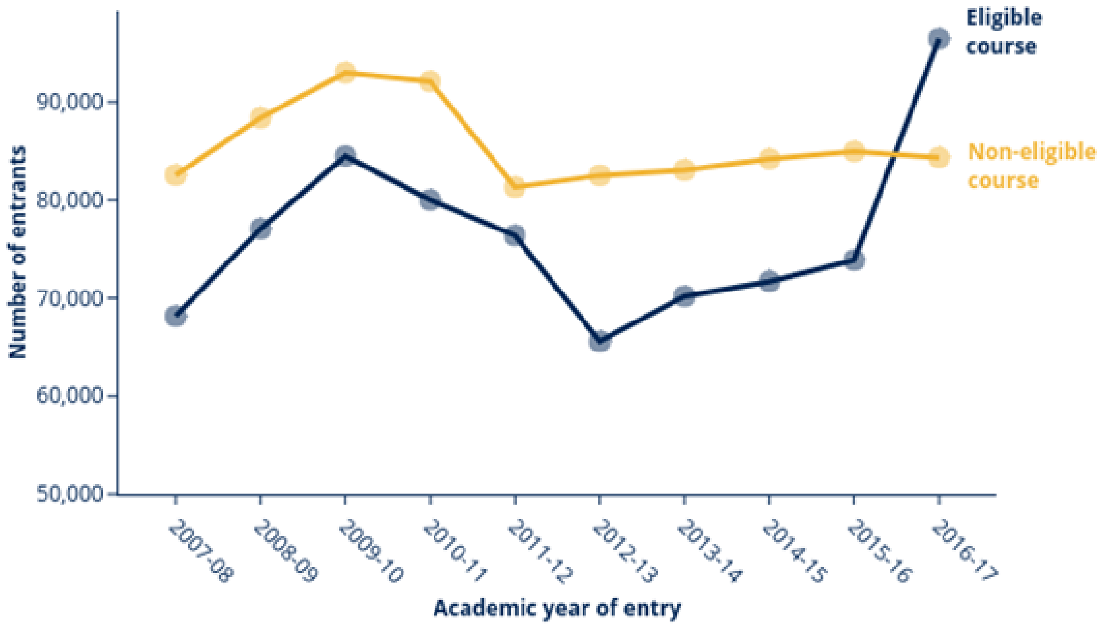
[41] The data used by Universities UK here was derived from the Scottish Index of Multiple Deprivation dated 2016. It is important to note that Universities UK used data from UCAS for their analysis and as a third of young applicants who's application were not processed through UCAS.

included 20 English HEIs who were to share a £25 million investment into the scheme and the scheme was to be tested out during the 2014/15 academic session. Some of the most pertinent findings from the pilot study included there is a need for postgraduate education as expressed by graduates and funding plays a major role towards an individual's success in PGT education and; targeting funding measures would be critical toward widening participation in postgraduate education in England (Wakeling, 2015).

Following these findings, the UK government proceeded to advance in the PSS by offering a £50 million investment providing scholarships worth[42] £10,000 to 10,000 students. Termed PSS2, the evaluation of the scheme from Wakeling et. al (2017) found some remarkable outcomes from the scheme. For instance, some institutions in the scheme reported increases in the number of postgraduate students from Black, Asian and Minority Ethnic groups (BAME), individuals from lower-income households and those who were the first in their households to study at higher education. However, it was noted that the rising undergraduate tuition fees was a contributing factor towards lower overall absolute number of postgraduate student numbers. With these progress reported, the UK government decided to roll-out the Master's loan scheme from 2016/17 onwards. Testing the impact of these loans, the Office for Students (2018) studied data from the Higher Education Statistics Agency (HESA). For courses eligible for the Master's loan scheme, the Office for Students (2018) observe a 31% increase in entry to PGT courses between 2015/16 – 2016/17 academic sessions; whereas there was a 1% decrease in courses that were not eligible for the £10,000 tuition fee loan as represented in Figure 2.1 below.

[42] The scholarships were designed such that each student was partly funded (£5,000) from the UK Government and partly funded from their institutions (£5,000).

Figure 2.1: Number of entrants to postgraduate courses.



Source: Higher Education Statistics Agency (2018)

This statistic depicts the merit of student loans as an enabler for enhancing widening participation in postgraduate education. Overall, students aged 25 and under show the largest entry into postgraduate study (37% increase), with both genders (29% increase for females and 32% increase for males), disabled students (15% increase) and all ethnicities (74% increase for black students, 20% increase for white students and 24% increase for Asian students) all showing increase in entry into PGT courses.

Unlike England, in Scotland, the loans are split[43] into tuition and living costs for domiciled students (Student Funding Council, 2018). According to the Scottish Funding Council (2018), taught postgraduates entrants increased by 4.5% between 2015/16 – 2016/17 academic sessions to make up 15.6% of the total population of students in Scottish HEIs. For Scottish domiciled students, there has been an increase of 28.6% in entrants into PGT courses between 2012/13 and 2016/17 academic sessions. As a whole, what is being observed in this

[43] For full-time one-year courses, students are eligible for a living-cost loan of £4,500 as well as a tuition loan for £5,500.

comparison is that in spite of the debt burden associated with tuition loans for postgraduate education, it does not serve as a disincentive for people to transition into PGT education.

Chapter 3: Theoretical Model

3.1. Introduction.

In this chapter, we draw from theories and empirical insights reviewed in Chapter 2 to model educational choices. We will consider two main different theoretical paradigms, namely the fully rational and the bounded rational approaches, each of which rely on specific axioms and assumptions about individual inter-temporal decision-making behaviour. In modelling choices, we will use an interdisciplinary approach that draws insights from several fields to take into account the role of individual identity, of financial enablers and constraints (benefits, costs and opportunity costs), and of preferences about time discounting behaviour (exponential discounting or hyperbolic discounting).

Taking each theoretical paradigm apart, we will proceed to derive a series of general closed-form mathematical solutions using a discrete time case of the optimal stopping theory. The optimal stopping theory is an ideal model here because it points out the best possible time to take an action to maximise utility. Thus, the main assumption underlying both rational choice model and bounded rationality model in the context of this study is at the core of optimisation theory: individuals will select and follow that sequence of inter-temporal choices that maximize their well-being (utility), which depends on consumption and educational choices (identity), over a discrete time of 10 years[44], starting from the moment they graduate. In the same spirit as the standard intertemporal optimisation method, we directly derive the desired "demand" functions (the patterns of consumption). Indirectly, we infer- through saving- the identity values of proceeding into PGT, and hence the optimal value of well-being (which satisfies the relevant intertemporal budget constraint). This standard approach is thus a "demand" approach and, as such, it does not depend on the level of supply of the HE

[44] The rationale behind using 10 years as the time period to be investigated was predominantly because as at 2014 when this thesis started, the UK government was considering to only fund students who were aged below 30 and had completed their undergraduate study. Due to the fact that a majority of students attending universities for undergraduate studies complete their studies at 21, a period of 10 years is a feasible perspective to take.

provision. In this specific case, the choice of the optimal time to enter PG study does not depend on the availability of courses (i.e. the supply-side argument). The supply side of education should come from an analysis of HE providers, based on arguments of profit maximisation, provision of merit goods, externalities and government policies. The interaction between supply of HE provision, and derived demand of PG choices would determine the equilibrium[45] point where demand for PGT and supply of PGT (through creating access to study PGT modules) coincide. Thus, the analysis covered in this chapter refers to a series of general closed-form mathematical solutions of the "consumers'" maximization problem.

In this chapter, the theoretical contributions of this study are: to derive a mathematical solution of when it is best to transition into PGT; to illustrate graphically, this solution by choosing some reasonable parameters; and to consider both the rationality paradigm as well as the bounded rationality perspectives. To derive the various closed-form solutions, we will start by discussing the features of the well- being/utility function for an individual who does not choose to proceed into a PGT course at any point in time. In other words, we will show the optimal solution of not going into PGT and we compare it to the optimal solution of going either immediately or at some point in the future. The "best" of all these optimal solutions represents the optimal stopping point, that is the solution which indicates if and when to go into PG study.

3.2. Theoretical Framework

The crucial aim of this thesis is to identify the existence –in a non-stochastic setting – of the optimal time at which an individual chooses to transition from undergraduate education or work to a full-time PGT degree programme and to conduct a series of sensitivity analyses under various scenarios and policies.

[45] It is important to emphasise here that the aim of this study is not to derive the equilibrium point where demand and supply of PGT education meet. It is strictly to explore the demand-side of the argument as earlier stated.

We set up a deterministic dynamic discrete choice model with annual decisions about individuals' transitions into postgraduate education from their actual current status. The optimal decision is therefore an optimal stopping time, and it is derived under two different behavioural assumptions about the maximizing agent. Under one assumption, the individual is the standard *rational maximizer* "homo economicus". This individual has a complete understanding of the choices available, can solve a sequence of discrete deterministic dynamic programming problems and select the best among the optimal policy functions to identify the optimal entry time into PG education. Her choice is self-enforcing or time consistent because, at any point in time, she will not have any incentive to depart from this original plan. The time consistency condition makes this rule the same as an optimal stopping solution.

The second type of agent is a *bounded rational individual* in that, in facing the same choices and constraints as the rational individual, she is not able to plan ahead her transition into PG, and hence she is not able to use an optimal time consistent path. She also needs to solve a sequence of intertemporal maximization problems under limited constraints. However, in choosing her optimal point of transition, she initially implements a plan consistent with the choice of not pursuing a PG. As time advances, she reconsiders this decision and changes her mind at a time when transitioning into PG represents the first (relative) optimal stopping point and the final (absolute) stopping point provided that the intertemporal advantages of transitioning are larger than the intertemporal advantages of continuing of not going. In other words, it is as if she used an optimal stopping type of approach in that she is faced with the task of choosing whether to continue with a particular choice pattern (i.e., not to go) or stop and transit into PG. We derive that, given our assumption about the value function, the first (relative) optimal stopping is unique and hence it is an (absolute) optimal stopping point. Due to the pattern of initial and subsequent choices, the not fully rational plan is not a time consistent policy.

In this model the difference between a fully rational individual and a bounded rational individual both facing the same conditions and type of utility is that at the time of graduation, the fully rational individual would be able to plan when to transit into a PG and to behave consistently, from the start and during the waiting time, with the plan. Each period she would follow the optimal rule of the entire plan. On the other hand, the bounded rational individual, is not able to plan in advance, so she can change from one plan (not going) to another (going). Thus, the two types of agents face the same identical intertemporal utility function and constraints; all variables are the same. It is the optimization process that differs so that the differences in results are purely due to the effect of applying a different decision process.

For both types of agents, we consider two discounting assumptions. The first is the exponential discounting which implies that the marginal rate of substitution between consumption of any pair of points in time depends on how far apart those two points are. The second discounting assumption is hyperbolic discounting which presents an imbalance in individuals' perception of preference through time with smaller rewards at the present time taking a larger weight of preference over larger potential rewards in the future. It is the discounting that prefers rewards now rather than later and procrastinate costs and become impatient about benefits. Both discounting processes are exercised on both rational and bounded rational individuals at the baseline scenario. In subsequent scenarios, only the hyperbolic discounting is used for the individual.

3.3 Model

The primary model arrangement is derived from the works of Card (1999) further adapted to consider the role of time inconsistent preference behaviour in education decision-making processes by Kemptner and Tolan (2015). We derive the model structure from the emphasis that prospective PG students aim to maximise the present-discounted lifetime utility subject to underlying constraints that affect their lifetime prospects under the assumption that she is fully rational and under the alternative assumption that she displays some behavioural biases. Under both paradigms the individual faces the following choices about PGT: to never transition into PG (***NPG***), to immediately transition into PG (***PG***), and to transition into PG any time within 1 and 10 years after graduation from undergraduate study (***W|PG***[46]). The difference between the fully rational and the bounded rational is about HOW these choices are made, namely about HOW the solution to the problem is derived.

3.3.1 Rational Choice Individual

We start from a fully rational individual who can calculate at the time of graduation 12 optimal paths (each one is optimal in relation to the relevant intertemporal budget) and then choose the best among these paths. The choice of the best among these optimal paths, will be the best planned time, if ever, to pursue a PGT degree. This means that the rational individual can plan ahead the "optimal stopping time". For instance, if she chooses to go to PG education at time t (from t=0 meaning immediately after graduating to t=10 meaning ten years after graduating), it is because this choice provides her with the highest utility than any other option including not to go at all.

Technically, the fully rational individual maximizes 12[47] inter-temporal utilities under the 12 relevant inter-temporal budget constraints, and then compares all these optimal solutions to choose the best one, selecting in this way the maximum of the 12 maxima. Due to the shape of the utility function (a standard logarithmic function), the solution of this deterministic discrete dynamic optimization problem is unique and time consistent[48]. This implies that the best decision represents not just the first stopping time but the optimal stopping point, as it this plan, given the possibility of revising year after year, would be the same one selected at any point in time without any change to it

[46] It is assumed that the individual who chooses to proceed to PG education at a future date chooses to spend some time at full-time work; which contributes in her savings.
[47] The reason why there are 12 inter-temporal utilities to maximise is because the individual has to make decisions in 12 settings. This means that the individual has to decide never proceed into PGT, to proceed immediately after UG, and to proceed into PGT within 10 years of graduating from UG (i.e., should I transition in year 1?, should I transition in year 2?, e.t.c.)
[48] The property of time consistency of the solution is additive and separable in nature.

3.3.1.1. The inter-temporal budget constraint: Wages, interest rate, past debt, future debt and final saving.

We have a set of 12 different inter-temporal budget constraints (each one derived from discounting and adding a set of yearly budgets) and each of the 12 possible choices about PGT has its own associated inter-temporal budget. The inter-temporal budget constraint reflects the profile of the lifetime resources associated with the choice about PGT. Clearly the profile of the lifetime resources changes according to the choice about if and when pursue a PGT. Although the 12 inter-temporal budgets will have different present discounted values, they are all derived under the same common assumptions about wages, repayment of past and future debt, and interest rates. We discuss these assumptions more in details in the next section.

Wages: In the baseline scenario, we assume that PGT **will not earn** a wage premium. In other words, we are not making use of the human capital theory and assume that the decision to proceed to PG education is due to factors besides economic advantages related primarily to the socio-personal identity. We assume that at the time of graduation, the basic labour income is the same as the one recorded in 2015 (as £21,000 per year). This wage is indicated as $\boldsymbol{w_0}$**.** We assume that the annual rate of growth of this wage is constant and equal to "g". The wage at time "i" (meaning "i" years after graduation) is:

$$w_i = w_o(1 + g)^i \qquad (3.1)$$

It is assumed that once the individual starts working, her wages are the sole source of her income. The assumption of no wage premium will change under an alternate scenario.

Interest rate: We assume a unique rate of interest, indicated as $\boldsymbol{r}$, constant throughout the period, that will be used to capitalize and discount variables. This assumption will change under an alternative scenario and the cost of borrowing will be different from the interest rate on saving.

Debt and Savings: We assume that at the time of graduation, every individual has accumulated an "undergraduate debt" of £45,000 through undergraduate study. We also assume that the debt is interest-free. In other words, it is given at subsidised rate of zero (we will change this assumption later on) and it will have to be repaid within 25 years of graduation from undergraduate study. Extra borrowing is possible if and when PGT is pursued. The various assumptions about debt repayment are as follows:

A) $\boldsymbol{Q^{UG}}$: This is the debt incurred after undergraduate studies. This amount is justified by calculating £27,000 of 3 years of tuition fees and £18,000 of maintenance loans. We assume that this is expected to be paid off within 25 years of graduation from studies. Because the time period relevant in our study is within a 10 year period, we only look for the effect of this debt on individual decision-making within the 10 year period the study is interested in and we assume that whatever the decision on PG transition, the individual should have at the end of the 11th time period an amount of savings that is enough to repay the remaining undergraduate debt. This assumption will be changed through a sensitivity analysis on savings. Each year, the quota to be repaid will be £2,250 per year.

B) $\boldsymbol{Q^{PG}}$**:** This is the debt incurred as a result of transitioning into postgraduate studies. The individual would be able to borrow up to £10,000 from the government interest-free under the government PGT lending scheme. This is expected to be paid off within 5 years of graduation from studies and she could also borrow another £10,000 free for living expenses also to be repaid within 5 years. However, this last assumption will be modified to allow for the use for personal savings and thus reduce the amount of borrowing in postgraduate studies needed for living expensed. We assume that the student in the PG would be a full-time student without any income from job, fully relying on sole debt (if she decided to go immediately after graduation) or on debt and past saving (if she decided to delay the decision of pursuing a PGT at a later stage). We assume that if an individual were to choose to go into PGT within the first 5 years since graduation, she will be able to repay the full PGT debt. However, if she choose to postpone it at a later date, we assume that she will have enough savings in the years following PGT, so to be able to repay the remaining PG as well as the UG. In the baseline scenario the annual repayment quota is £4,000 for 5 years. We also derive a solution that allows to borrow less for living expenses by using past savings and we modify the annual repayment quotas accordingly.

C) $Savings$: At Year 0, the individual's savings is what is left over after consumption and the annual quota of debts have been taken from current income. Furthermore, it is assumed that at Year 10, the individual would have saved enough money to repay all remaining debt.

Value Function:

We define the value function as the sum of the present discounted values of yearly utility functions. The utility function is time invariant but “status” dependent and preferences are always defined over consumption. Thus, each of the 12 values will be maximized with respect to a sequence of yearly consumption, under the associated intertemporal budget constraint.

The assumption that the utility function is “status” dependent implies that the arguments of the utility functions, from which the individual draws satisfaction and utility, depend on the status of having or not having a PGT degree. In the case that no degree is pursued, or until a degree is postponed, the utility function(s) depends ONLY on levels of consumption. However as soon as an individual transits into PGT and, for a certain period after it, the utility depends on levels of consumption and on an identity index that we will define more in details later on.

We assume a logarithmic function because of its well behaved mathematical properties (transitivity, monotonicity and continuity) and it can represent preferences as separable, transitive and additive. The individual seeks to maximise her utility through maximising a string of consumptions (represented as $\boldsymbol{c_i}$). The two key variables of the utility function are the discounted factor and the “status” dependent identity index variable.

Discount Rate

We assume an exponential discounting process represented as $\boldsymbol{\delta^i}$. This discounting process best expresses a standard rational decision maker because it assumes that the trade-offs between the utility derived in a time period is totally independent of the utility derived at a delayed time period. This means that additional information over time does not change the individual's preferences over various utility values. Therefore, the individual maximises her utility by calculating –at Year 0- the various utilities expected through all time periods and deciding at that point when to transition into PG education.

To test the decision-making process, we alter the discounting process for comparative purposes by making it hyperbolic in nature. This exerts the effect of assuming that the rational individual's decision-making process is sensitive to the difference between making a choice at present time and deferring such choice to a future date. By doing so, we ask: *"what would the purely rational individual do if she had a preference for choices closer to the immediate time period as opposed to choices at a distant time in the future?"* The rational individual is still assumed to possess full information on her decision-making processes. We further do this to compare how a rational decision maker would plan her decision if she took into consideration the notion that she may prefer a choice at a sooner time period in comparison to a delayed option. This may lead to choose a different optimal stopping point. However, once a choice is made, the pattern of consumption is still time consistent.

Identity

We assume that individuals draw utility from consumption and an identity index which depends on postgraduate degree decision. In this study, identity is defined as a proxy that encapsulate several different social and personal factors such as prestige, competence, recognition and intrinsic value perceived amongst family and friends- all factors that come as a result of participating at postgraduate degree. The relevance of the effect of identity on an individual's transition to postgraduate education is based on the concept of *hedonic adaptation*. By hedonic adaptation, the individual's transition to PG study derives an initial increase in satisfaction. Over time, the individual becomes more used to the new status quo, thus the novelty of it wears off. In our model, we assume an increase at a decreasing rate after three time periods have elapsed. Frederick and Loewensein (1999) explain that changes in life's events have a crucial impact on individual behaviour. However, these changes only represent a small impact on individual subjective wellbeing over time (Frederick and Loewenstein, 1999; Tellegen et al, 1988). Thus, an individual who decides to proceed into PG at time t will reap from an initial new level of satisfaction which will last until time t+3.

In the model, this process is represented as the $\boldsymbol{\varphi_i}$, and it is applied only in the case where the individual considers transitioning from undergraduate study into postgraduate education. We define this variable using the following equation:

$$\varphi_{i,j} = (\alpha + \beta i - \gamma i^2) + S_{i-1} * \left(\frac{1+r}{5}\right) \qquad (3.2)$$

i=J,…, 10

J=0,…,10

$$S_{-1} = 0 = S_0$$

$$J, \varphi_i = 0\ for\ i < J$$

The identity index we propose has the following properties:

At ***j = 0***, right after graduation, the index is increasing at a decreasing rate up to a maximum point and then it starts to decrease up to zero after 10 years. For j>0, the pattern is still the one of a parabola, but it will not reach zero, because the horizon is shorter than 10.

The coefficient $\boldsymbol{\alpha}$ is a time invariant gain given by value that explains the net effect of various factors, that include economic factors (such as the extrinsic value of education in terms of £10,000 fees[49] paid to receive a service) as well as the intrinsic value of education as assumed by the expectancy value theory drawn from gaining status, recognition, sense of achievement. Added to this time invariant gain, there is another intrinsic time-varying gain associated with time ***i***. The presence of the second and third terms captures the intrinsic "identity" gain of a PGT degree that increases with time (according the coefficient β) up to a certain point, and then it decreases with time according to the coefficient γ). This effect is due to the presence

[49] The PG fees are not directly into the utility function, but included indirectly through the identity variable. It has two effects. Firstly, it will affect the living expenses. Secondly, it will affect indirectly the α variable.

of adaptation and other psychological costs and the fear of debt as explained in the expectancy value theory, all factors that reduces the values attached to the PGT degree.

Finally the variable $\boldsymbol{S_{i-1}}$ in equation **2** represents current available resources at time ***i*** in the form of capitalized savings coming from previous income after having deducted previous consumption and quotas of repaid debt. We divide these current available resources by 5 to account for the 5 time periods within which an individual pursuing a PG degree is expected to pay off her debt. It is also used as a prompt to indicate the limited nature of the effect of a PG programme such that the individual only benefits from the added effect of identity for a 5 year time period.

The utility function is constructed with a belief mechanism based on the individual's identity. Here, we assert that the individual possesses beliefs that are difficult to change despite the attractiveness of a certain level of satisfaction (Charness and Rabin, 2002). Applying this concept shows the limiting nature of individual rationality as expressed in Rabin (2013).

Rational Individual Choices	OBJECTIVE: to maximize the present discounted value the Lifetime utility functions	CONSTRAINT: Under the Intertemporal budget constraint	SOLUTION Value function (time consistent solution)
She chooses not to pursue PG studies (a)	$Max_{\{c_i\}}\left[{V_0}^{NPG}=\sum_{i=0}^{10}U^{NPG}(c_i)\delta^i\right]$ (1)	$G^{NPG}=\left\{w_0\sum_{i=0}^{10}(1+g)^i(1+r)^{-i}-Q^{UG}\sum_{i=0}^{10}(1+r)^{-i}\right.$ $\left.-s_{10}^{NPG}(1+r)^{10}\right\}$ (3)	$\widehat{V_0}^{NPG}=\sum_{i=0}^{10}U^{NPG}(\hat{c}_i)\delta^i$ (4) The solution is $\{\hat{c}_i\}=\frac{\delta^i(1+r)^iG^{NPG}}{\sum_{i=0}^{10}\rho^i}$ $\hat{c}_i=\delta(1+r)\hat{c}_{i-1}$
She choose to pursue PG studies immediately (b)	$Max_{\{c_i\}}\left[V_0^{PG}=\sum_{i=1}^{10}U^{PG}(c_i+\varphi_i)\delta^i\right.$ $\left.+U^{PG}(c_0+_0\varphi_0)\right]$ (5) Where: $U^{PG}(c_i)=\ln(c_i+_0\varphi_i)$ (6) $c_0=£10{,}000$	$G_0^{PG}=\left\{w_0\sum_{i=1}^{10}(1+g)^i(1+r)^{-i}-Q^{PG}\sum_{i=1}^{5}(1+r)^{-i}\right.$ $\left.-Q^{UG}\sum_{i=1}^{10}(1+r)^{-i}-_0s_{10}^{PG}(1+r)^{-10}\right\}$ (7)	$\tilde{V}_0^{PG}=\sum_{i=1}^{10}U^{PG}(\tilde{c}_i+_0\varphi_i)\delta^i+U^{PG}(c_0+_0\varphi_0)$ (8) The solution is: $\{\widetilde{c_i}+_0\varphi_i\}=\frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}\delta^{i^i}}*\left[G_O^{PG}+\sum_{i=0}^{10}0,\varphi_i(1+r)^{-i}\right]$ $\tilde{c}_i+\varphi_i=\tilde{c}_{i-1}(1+r)\delta+_0\varphi_{i-1}(1+r)\delta$ Where φ_{i-1} is equation 3
She chooses to delay the pursuing of PG studies (delay time is 1 to 9 years after graduation) (c)	$Max_{\{c_i\},\{C_s\}}\left[V_J^{PG}=\sum_{i=0}^{J-1}U^{NPG}(c_i)\delta^i+\sum_{s=J}^{10}U^{PG}(c_s+_J\varphi_s)\delta^s\right]$ (9) j = 1, … , 10	$G_J^{W\|PG}=w_0\sum_{i=0}^{J-1}(1+g)^i(1+r)^{-i}+D_{liv}^{PG}(1+r)^{-J}+w_0\sum_{s=J+1}^{10}(1+g)^J(1+r)^{-J}$ $-Q^{PG}\sum_{s=J+1}^{5}(1+r)^s$ $-\left[Q^{UG}\sum_{i=0}^{J-1}(1+r)^{-i}+Q^{UG}\sum_{s=J+1}^{10}(1+r)^{-s}\right]-_JS_{10}^{PG}(1+r)^{-10}$ J = 1, …, 10	$\tilde{V}_J^{PG}=\sum_{i=0}^{J-1}U^{NPG}(\hat{c}_i)\delta^i+\sum_{s=J}^{10}U^{PG}(\tilde{c}_s+_J\varphi_s)\delta^s$ (11) (j = 1, … , 10) Solution: $\{\widetilde{c}_i,c_s\}=\frac{\delta^i(1+r)^iG^{NPG}}{\sum_{n=0}^{10}\delta^n}+\frac{\delta^i(1+r)^i}{\sum_{n=0}^{10}\delta^n}*\left[G_J^{PG}+\sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right]-\varphi_i$ (12) $\tilde{c}_0=\frac{G^{PG}+\sum_{s=J}^{10}\varphi_s(1+r)^{-s}}{\sum_{n=0}^{10}\delta^n}$ $\tilde{c}_i=\tilde{c}_{i-1}*(\delta^i(1+r)^i)$ $\tilde{c}_s=\tilde{c}_{s-1}*(\delta^i(1+r)^i)+\left[\varphi_{s-1}\delta(1+r)^i-_J\varphi_s\right]$

Table 3. 3: Rational Choice Decision-Making. Note: (The intertemporal budget constraint function is represented as ***G***[50] *to imply the various modes of entry into postgraduate education).*

[50] For instance, G^{NPG} refers to "not transitioning into PG education ay Year 0"; G^{PG} is used to refer to individual to "transition to PGF education at Year 0" and $G^{W|PG}$ is for those who are "transitioning to PG education after spending some time at full-time employment".

3.3.2 Bounded Rational Individual

Similar to the rational choice individual, the bounded rational individual is faced with the same decisions about PGT, which are: to never transition into PG (NPG), to immediately transition into PG (PG), and to transition into PG any time within 1 and 10 years after graduation from undergraduate study (W|PG). The difference between the fully rational and the bounded rational is about HOW these choices are made, namely about HOW the solution to the problem is derived. The major difference is that the fully rational individual is able to plan her optimal stopping point and act upon it. She is able to solve simultaneously 12 dynamic problems, and to choose the best path and to follow it from the start. Given that the plan is a time consistent one, she would follow exactly the same path even if, at a later time, she were asked to re-evaluate her decision. The bounded rational agent, on the other hand, acts as if she cannot solve a simultaneous problem. Her boundedness manifests in the fact that, until she decides to pursue a PGT, she will follow the consumption path associated with the decision of never going into PGT.

In the rational case, where the transition into PGT is fully planned, the agent follows levels of consumption before the PGT degree that are consistent with the optimal stopping point. So BEFORE and until transiting into a PGT degree – if and when PGT were chosen- she follows a trajectory of consumption that is not the same as the trajectory of consumptions that she would have followed if PGT had not been chosen. The same cannot be said for the bounded rational individual. Here, **BEFORE** and until transiting into PGT –if and when PGT were chosen – the bounded individual would follow the same pattern of consumption that she would have followed if PGT were never chosen.

This sequentially leads to comparing and selecting across time inconsistent solutions. She still maximizes her choices by selecting the path that provides the highest value function by comparing which path would give her the highest value if she changed the status quo of not going into PGT. This is in line with a status quo bias and other biases observed in behavioural economics. To understand how this is explored, we observe the intertemporal budget constraint and utility of the bounded rational individual.

Intertemporal Budget Constraint

Unlike the purely rational individual, the bounded rational individual is not entirely forward looking. This is because of the behavioural biases she has in her decision-making process. The 12 intertemporal budget constraints (each associated to the 12 value functions to optimize) for the bounded rational individual make use of the same variables as the rational individual. These variables are: wages ($\boldsymbol{w_i}$), interest rates ($\boldsymbol{r}$), debt ($\boldsymbol{Q^{UG}}, \boldsymbol{Q^{PG}}$), and savings ($\boldsymbol{S_i}$). The differences between the intertemporal budgets of the fully rational and of the bounded rational are that for the latter ones, before and until the status quote changes, the levels of consumption would be already known (taken from the solution of Never going into PGT).

Utility

As explained prior, the typical bounded rational individual acts as if she maximises her utility in a sequential way, re-calibrating the process in each time period. If she decided not to go into PGT, she would choose a consumption level as if she had decided never to go. We follow a sequential procedure based on comparing between the two options available at Year 0. If she decided not to go into PGT she would then consider whether to go at time 1, not re-choosing the level for year 0. Thus the optimization at each stage takes the level of consumption of past status quo as given (the fully rational agent will, on the other hand, optimize simultaneously at any time, the entire path of consumption before choosing the optimal stopping point).

The variables represented within the utility functions are similar to those presented in the purely rational procedure. The individual seeks to compare utility by focussing on consumption levels and the impact of identity- as a result of transitioning to PG education- on her overall utility.

Table 3. 4: Bounded Rational individual decision-making.

Choices	OBJECTIVE: to maximize the present discounted value the Lifetime utility functions	CONSTRAINT: Under the Intertemporal budget constraint	SOLUTION Value function (time inconsistent solution)
She chooses not to pursue PG studies (a)	$Max_{\{c_i\}}\left[V_0{}^{NPG}=\sum_{i=0}^{10}U^{NPG}(c_i)\delta^i\right]\quad(13)$ Where: $U^{NPG}(c_i)=\ln(c_i)\quad(14)$ i = 0, …, 10	$G^{NPG}=\left\{w_i\sum_{i=0}^{10}(1+g)^i(1+r)^{-i}-Q^{UG}\sum_{i=0}^{10}(1+r)^{-i}-s_{10}^{PG}(1+r)^{10}\right\}\quad(15)$ i = 0, …, 10	$V^{NPG}=Max\sum_{i=0}^{10}U^{NPG}(c_i)\delta^i\quad(16)$ Solution: $\{\hat{c}_i\}=\frac{\delta^i(1+r)^iG^{NPG}}{\sum_{i=0}^{10}\rho^i}\quad(17)$ $\hat{c}_{i+1}=\delta^i(1+r)\hat{c}_i$ i = 10, …, 10
She choose to pursue PG studies immediately (b)	$Max_{\{c_i\}}\left[V_0^{PG}=\sum_{i=0}^{10}U^{PG}(c_i+\varphi_i)\delta^i\right]\quad(18)$ Where: $U^{PG}(c_i)=\ln(c_i{+}_0\varphi_i)\quad(19)$ i = 0, …, 10	$G^{PG}=\left\{D^{PG}+w_i\sum_{i=1}^{10}-Q_1^{PG}\sum_{i=1}^{5}(1+r)^{-i}-Q_1^{UG}\sum_{i=1}^{10}(1+r)^{-i}\right.$ $\left.-s_{10}^{PG}(1+r)^{10}\right\}\quad(20)$ i = 0, …, 10	$V^{PG}=Max\sum_{i=0}^{10}U^{PG}(c_i+\varphi_i)\delta^i\quad(21)$ Solution: $\{\widetilde{c}_i\}=\frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}\rho^i}*\left[G^{PG}+\sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right]-\varphi_i\quad(22)$ i = 0, …, 10 $\tilde{c}_i=\tilde{c}_{i-1}(1+r)\delta^i+\varphi_{i-1}(1+r)\delta^i-\varphi_i$
She chooses not to go but to reconsider yearly the pursuing of PG studies (delay time is 1 to 9 years from graduation) (d)	$Max_{\{C_s\}}\left[V_J^{PG}=\sum_{i=0}^{J-1}U^{NPG}(\hat{c}_i)\delta^i+\sum_{s=J}^{10}U^{PG}(c_s)\delta^s\right]\quad(23)$ (j = 1, … , 10)	$G^{W\|PG}=\left\{w_0\sum_{i=0}^{J-1}(1+g)^i(1+r)^{-i}+D^{PG}(1+r)^J+w_0\sum_{s=J+1}^{10}(1+g)^J(1+r)^{-J}\right.$ $-Q^{PG}\sum_{s=J+1}^{5}(1+r)^s$ $-\left[Q^{UG}\sum_{i=0}^{J-1}(1+r)^{-i}+Q^{UG}\sum_{s=J+1}^{10}(1+r)^{-s}\right]-\sum_{i=1}^{10}\hat{c}_i(1+r)^i$ $\left.-S_{10}^{PG}(1+r)^{-10}\right\}\quad(24)$ i = 1, …, 10	$\tilde{V}_J^{PG}=\sum_{i=0}^{J-1}U^{NPG}(\hat{c}_i)\delta^i+\sum_{s=J}^{10}U^{PG}(\tilde{c}_s)\delta^s\quad(25)$ (j = 1, … , 10) Solution: $\{\widetilde{c_s}\}=\frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}\rho^i}*[G^{PG}+\sum_{i=0}^{10}\varphi_i(1+r)^{-i}]-\varphi_i\quad(26)$ (j = 1, … , 10) $\tilde{c}_i=\frac{G^{PG}+\sum_{i=0}^{10}\varphi_i(1+r)^{-i}}{\sum_{i=0}^{10}\rho^i}*(\delta^i(1+r)^i)-\varphi_i$

3.3.3. Summary of Model

The model presented above will be applied to all scenarios identified in the modelling and analysis process. These scenarios are: baseline, wage rate premium, and interest rate premium. The baseline scenario is calibrated so that the individual is INDIFFERENT between choosing to proceed into PG education or not choosing to go. Given the fact that the intertemporal budgets and the time span horizon of maximization is the same for both agents, (as sequentiality has not yet occurred at time 0), the two solutions of NPG and immediate PG are also identical across the fully rational and the bounded rational agent. All other values will be different due to the different maximisation process.

In other words, at Year 0, the individual has not added any specific incentive to proceed or not to proceed into PG education. The situation can however change if the decision were delayed and the individual can find that delaying the transition into PGT can bring a higher utility than never to go or to go immediately.

Beyond the baseline scenario, we have two alternate scenarios, in chapter 5, that explore to what extent the optimal stopping time (and hence the decision of if and when transiting into the PGT) when, more realistically we add a wage premium and higher costs of borrowing for postgraduate studies.

The wage premium scenario presents the argument where the individual decision-making is tested given various increases in initial wages at Year 0. Following this argument is the supposition that the individual has an initial preference to transition into PG education from a human capital perspective. This human capital perspective is defined as: 'the individual would transition into PG education if she believes that she will gain an added utility from studying at a PG education in comparison to her counterparts who choose not to study at PG level.' However, this preference is not a strict one in the sense that the conditions for a direct move into PG education is based on two premises: firstly, the individual should prefer the expected lifetime utility from studying for a PG degree to the option of not studying, and secondly, that the preference to veer towards a PG programme is based on the notion that it is the most preferred utility option over the time period studied.

As imagined, when we add the *Wage Growth Premium Scenario,* we obtain that pursuing a PGT immediately after graduate studies is clearly preferred to not going at all. However going immediately may not be the best decision, and delaying to later date could be best. So we still need to find an optimal stopping point and to compare it to the baseline scenario to understand the effect of human capital in this model. This is reflected in the table below.

To show how this is reflected, we explore how the individual reacts to various increments in income at the time of graduation from undergraduate studies (Year 0). A key question we seek to ask is "*is there a wage level where the individual would see transitioning to PG immediately after graduating from undergraduate studies as her best possible option?"* We discuss the findings of this process at the next section.

Finally, we consider the *Interest Rate Premium Scenario*. Here, we obtain that relative to the baseline scenario, the option not to go to PG immediately after graduating from undergraduate studies is more attractive than the choice of going into PG immediately, right after graduating from undergraduate studies. However, it may be the case that at some point in time, the utility of going into PG is higher than the utility of not going. So again we need to find an optimal stopping point and understand to what extent different interest rate and cost of borrowing can affect the delay into PGT. To do this, we compare what would happen if the individual- at the level of expected wage after graduating from undergraduate studies (£21,000) - is faced with various increments of interest rates. *Could there be a level of interests so constraining that the individual would be dis-incentivised to add an "extra burden of debt" by studying for a PG degree*? We depict what we the dilemma is in the table below.

The interest rate premium represents a 'fear of debt' scenario. It appeals to the notion that extortionate interest rates could deter individuals from proceeding to PG education. Thus, we assume from Year 0 that the individual has an initial preference- though not strict- of transitioning into the world of work after graduation due to the perceived pressures that come with paying student debt incurred through an added year of studying. We test with various hypothesised interest rates and analyse for the possibility of whether there will be a point where the individual would consider transitioning to PG education despite her presumed fear of debt.

3.3 Conclusion

In this section, we explained the theoretical underpinning of the model we propose to model choices and to derive the optimal time to transit into PG, if ever. The model draws from different disciplines and was designed to answer some fundamental questions. These questions included:

- When is it optimal to transition into PGT education given the constraints, enablers and preferences in place at the time of graduation from undergraduate study?
- Which time preference solution yields a higher utility across within different decision-making processes?
- How would the optimal transition time be affected by human capital factors and costs of borrowing?
- Can government policies nudge PGT decisions?

Using different assumptions on rationality (how agents solve the maximization process) and different assumptions on variables affecting the budget constraints and time preference discounting, we derived the solutions. The next section will provide a discussion of these solutions, and will offer insightful perspectives gained from sensitivity analysis and simulations of different scenarios.

Chapter 4: Mathematical Derivation of Optimal Stopping Solution within different choices.

4.1 Introduction

In this section, we present the solution of both rational choice and bounded rational decision makers adjusted to consider a deterministic model structure with a finite lifetime utility. To understand the subsequent modelling process, a table is written below with a brief description of the variables to be used. Here, we derive the utility maximisation solutions for the individual considering a baseline scenario where both types of agents are indifferent on the decision to proceed into PGT depending on the time discounting process they follow.

Variable	**Definition**
$\hat{c}_i, \tilde{c}_i$	Optimal Consumption
s	Savings
Q^{PG}	Quota spent of PGT degree
Q^{UG}	Quota spent on UG degree
D^{PG}	PGT tuition fee debt + living costs
D^{UG}	UG tuition fee debt + living costs
δ	Discount factor
g	Wage growth rate
r	Interest rate
j, φ_i	Identity index

Table 4. 2: A list of variables

In this chapter, we will commence by deriving the utility maximising solution for the rational choice agent under both exponential and hyperbolic discounting perspectives. This will then be followed by the same series of derivations for the bounded rational agent. We then proceed to derive any solutions for the various sensitivity analyses and alternative scenarios which represent adjustments of variables which will be derived in the baseline scenario.

4.2 Rational Choice Model

To explore how the rational choice individual makes decisions, we will attempt to explore how the individual is expected to react in various types of time consistency assumption. Chiefly, we will explore this behaviour under the exponential discounting and hyperbolic discounting profiles.

4.2.1 Exponential Discounting for the Rational Choice Agent

The rational choice individual, considering time in perfect consistency assumes no particular effect of time on her decision-making process. We explore this position in the various choice profiles placed to the individual regarding proceeding into PG education.

4.2.1.1 The Case of No Transition to PGT after Graduation (NPG)

The following assumptions are to be made in the case where the individual chooses not to proceed into PGT education:

Assumption 1 (Undergraduate debt). This quota (D^{UG}) consists of a £9,000 of tuition fees per year and a £6,000 maintenance loan facility obtained in each year of study. Over a period of 3 years, this amount sums to £45,000.

Assumption 2 (Repaying debt). Every year, a fixed quota of the undergraduate debt (Q^{UG}) is repaid with no interest on debt. Full debt repayment completed within a 20-year period as depicted below:

$$Q^{UG} = \frac{D^{UG}}{20} \tag{4.1}$$

Assumption 3 (Savings). At Year 0, the individual's savings is what is left over after consumption and the annual quota of debts have been taken from current income. Furthermore, it is assumed that at Year 10, the individual would have saved enough money at Year (s_{10}^{NPG}) to repay all remaining debt.

Assumption 4 (Interest Rates). The value of interest rates (r) is assumed to be the same for all variables discounted. We assume them to be constant over time.

Assumption 5 (Wages). There is no wage premium in the baseline scenario. Thus wages ((w_i^{NPG})) grow at an annual rate of g=0.018. At Year 0, the individual assuming it to proceed into full-time work will expect to receive £21,000.

$$w_i^{NPG} = w_{i-1}^{NPG}(1+g) = w_0^{NPG}(1+g)^{-i} \tag{4.2}$$

Assumption 6 (Discount Factor- Exponential). To express the rational individual's decision-making process, we use an exponential discounting process. We assume in this exponential discounting process assumes a constant return can be depicted following Samuelson (1937) process as ρ^i, where ρ at time $i = 0$ is valued at 0.99.

Assumption 7 (Utility Function). The utility function is logarithmic, additive and separable. The individual is assumed to derive full utility from consumption alone.

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 0 (graduation year) to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{NPG} = \sum_{i=0}^{10} U^{NPG}(c_i)\,\rho^i \tag{4.3}$$

Where:

$$U^{NPG} = \ln(c_i) \tag{4.4}$$

for $i = 0, \dots, 10$

The series of annual budget constraints from i = 0;... ; 10 are:

$$Year\ 0: w_0^{NPG} - Q_0^{UG} = c_0 + s_0 \tag{4.5}$$

$$Year\ 1: w_0^{NPG}(1+g)^1 - Q_1^{UG} = c_1 + s_1 \tag{4.6}$$

$$Year\ 2: w_0^{NPG}(1+g)^2 - Q_2^{UG} = c_2 + s_2 \tag{4.7}$$

$$\vdots$$

$$Year\ 9: w_0^{NPG}(1+g)^9 - Q_9^{UG} = c_9 + s_9 \tag{4.8}$$

$$Year\ 10: w_0^{NPG}(1+g)^{10} - Q_{10}^{UG} = c_{10} + s_{10}^{NPG} \qquad (4.9)$$

The above budgets can be added into the IBC^{NPG} as:

$$w_0 \sum_{i=0}^{10} (1+g)^i (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{NPG}(1+r)^{-10}$$
$$= \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.10)$$

The left hand part of **equation 11** is expressed in(G_0^{NPG}), so that the equation can be written as:

$$G_0^{NPG} = \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.11)$$

The Lagrangian function is defined as follows:

$$\mathcal{L} = V_0^{NPG} + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=0}^{10} U^{NPG}(c_i)\, \rho^i + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right] \qquad (4.12)$$

The First Order Conditions in relation to c and λ are expressed as:

$$\frac{\partial V_0^{NPG}}{\partial c_i} = \frac{\rho^i}{c_i} - \lambda (1+r)^{-i} = 0 \qquad (4.13)$$

For i=0,…,10

$$\frac{\partial V_0^{NPG}}{\partial \lambda} = G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} = 0 \qquad (4.14)$$

By solving the system of 11 equations, we have the time consistent solution:

$$\lambda = \frac{\sum_{i=0}^{10} \rho^i}{G_0^{NPG}} \qquad (4.15)$$

$$\hat{c}_i = \frac{\rho^i (1+r)^i G_0^{NPG}}{\sum_{i=0}^{10} \rho^i} \qquad (4.16)$$

$$\therefore \hat{c}_i = \hat{c}_{i-1}\rho(1+r) \qquad (4.17)$$

4.2.1.2 <u>The Deterministic Case (PG Immediately) - The Case of the Continuing Student</u>

For the rational individual who chooses to proceed into PGT education immediately after graduation from undergraduate study, we make the following assumptions:

Assumption 8 (Fees due to PG study). The fees expenses incurred to pursue a Masters degrees (PG_{fees}) are assumed to be £10000 or financed by a government scheme free of interest rates:

$$D_{fees}^{PG} = PG_{fees} + c_{liv} \qquad (4.18)$$

Where:

$$PG_{fees} = £10{,}000 \qquad (4.19)$$

Assumption 9 (Student living expenses). Living expenses of a continuing student c_0 are assumed to be fixed at £10,000 also financed by debt c_{liv} = £10,000 free of interest rates D_{liv}^{PG}. Fees (PG_{fees}) expenses are also fixed at £10000.

Assumption 10 (Savings). Savings at time t = 0 for a continuing student is assumed to be s_0 = 0. This means that the student does not save any of the postgraduate borrowing. At t = 10 it is assumed that the individual will have enough saving to repay the remaining undergraduate debt. s_{10}^{PG} is equal to (£45000-£24750=£20,450).

Assumption 11 (Wage Premium). There is no wage premium in the baseline scenario. Therefore, at any point w_i^{NPG} =w_i^{PG}; therefore with a rate of growth of wages constant at an annual rate of (g =0:018). w_i^{PG}evolves according to (1+g); w_0^{NPG} = w_0^{PG}= £21,000.

Assumption 12 (Overall Debt). The postgraduate total debt D^{PG} for a continuing student is assumed to the sum of the debt for D_{fees}^{PG} and D_{liv}^{PG} be £20,000 and is the sum of 2 components: D_{fees}^{PG} and D_{liv}^{PG}. Both debt are interest-rate free and thus the interest rates is 0. D^{PG} = D_{liv}^{PG} + D_{fees}^{PG}. This is the total graduate debt.

Assumption 13 (Postgraduate Debt). The postgraduate debt D^{PG} is repaid is repaid in 5 years after PG graduation at a constant quota of Q^{PG} = £20,000/5 starting right after finishing PG.

Assumption 14 (Undergraduate Debt). The undergraduate debt of £45,000 D^{UG} is repaid in 20 years as a constant quota of Q^{UG} = £2250 if wages is equal or greater than £21,000.

Assumption 15 (Identity Index). Explained in the model, the identity index (j, φ_i) first increases at a decreasing rate and then decreases which equals 0 at t = 10. The utility function is a function of consumption and the identity. It is assumed to be logarithmic, additive and separable.

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 1 (1year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{PG} = \sum_{i=0}^{10} \ln(c_i +_0 \varphi_i)\, \rho^i + \ln(c_0 +_0 \varphi_0) \tag{4.20}$$

for i=1,...,10

Subject to a yearly budget constraint where i= (1,..., 10) at time 0

$$D^{PG} = c_0 + s_0 + PG_{fees} \tag{4.21}$$

Here $c_0 = c_{liv} =$ £10,000 and $s_0 = 0$

$$w_0^{PG}(1+g)^1 - Q^{PG} - Q^{UG} = c_1 + s_1 \tag{4.22}$$

$$w_0^{PG}(1+g)^2 + s_1(1+r) - Q^{PG} - Q^{UG} = c_2 + s_2 \tag{4.23}$$

$$\vdots$$

$$w_0^{PG}(1+g)^9 + s_8(1+r) - Q^{PG} = c_9 + s_9 \tag{4.24}$$

$$w_0^{PG}(1+g)^{10} + s_9(1+r) - Q^{PG} = c_{10} + s_{10}^{PG} \tag{4.25}$$

The intertemporal budget constraint of an individual continuing a masters is the following IBC^{PG}:

$$D^{PG} + w_0 \sum_{i=0}^{10} (1+g)^1 (1+r)^{-i} - Q^{PG} \sum_{i=1}^{5} (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{PG} (1+r)^{-10}$$

$$= \sum_{i=1}^{10} c_i (1+r)^{-i} + c_0 + PG_{fees} \qquad (4.26)$$

The D^{PG} on the left-hand-side of the equation and the values for c_0 and cliv will cancel out. Thus, the left-hand-side is represented as G_0^{PG} in the following manner:

$$G_0^{PG} = \sum_{i=1}^{10} c_i (1+r)^{-i} \qquad (4.27)$$

The Lagrangian is defined as follows:

$$V^{PG} + \lambda \left[G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right]$$

$$= \sum_{i=1}^{10} U^{PG} (c_0 +_0 \varphi_i) \rho^i + \lambda \left[G^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right] \qquad (4.28)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V_0^{PG}}{c_i} = \lambda - \frac{\rho^i}{(c_i +_0 \varphi_0)} = 0 \qquad (4.29)$$

$$\frac{\partial V^{PG}}{\lambda} = G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} = 0 \qquad (4.30)$$

Solution

$$\lambda_0^{PG} = \frac{\sum_{i=0}^{10} \rho^i}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i}} \qquad (4.31)$$

The time consistent solution:

$$\tilde{c}_0 = c_{liv} = £10{,}000 \qquad (4.32)$$

$$\tilde{c}_i = \frac{\rho^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i} \right] -_0 \varphi_i \qquad (4.33)$$

And:

$$\tilde{c}_i = \tilde{c}_{i-1} (1+r) \rho^i +_0 \varphi_{i-1} (1+r) \rho^i -_0 \varphi_i \qquad (4.34)$$

4.2.1.3 <u>The Case of the Returning student (W|PG)</u>

When the individual decides not to venture into PG study after a short spell at full-time employment, the set of assumptions we make look at the students starting out on the perspective as one who is not proceeding to PG education immediately after PG study, but will likely venture into PG study in the future.

The following assumptions are to be made in the case where the individual chooses not to proceed into PGT education:

Assumption 16 (Undergraduate debt). With the assumption that the individual is graduate from a university, the individual incurs an overall debt from undergraduate study (D^{UG}) which consists of a £9,000 of tuition fees per year and a £6,000 maintenance loan facility obtained in each year of study. Over a period of 3 years, this amount sums to £45,000.

Assumption 17 (Repaying debt). Every year, a fixed quota of the undergraduate debt (Q^{UG}) is repaid with no interest on debt. Full debt repayment completed within a 20-year period with a pause in the year the individual chooses to proceed into a PG study as depicted below:

$$Q^{UG} = \frac{D^{UG}}{20} \qquad (4.35)$$

Assumption 18 (Fees due to PG study). At the point where into PG study, she incurs some expenses to pursue a Master's degree (PG_{fees}) are assumed to be £10,000 or financed by a government scheme free of interest rates:

$$D_{fees}^{PG} = PG_{fees} + c_{liv} \qquad (4.36)$$

where

$$PG_{fees} = £10{,}000 \qquad (4.37)$$

The postgraduate debt D^{PG} is repaid is repaid in 5 years after PG graduation at a constant quota of Q^{PG} = £20,000/5 starting right after finishing PG.

Assumption 19 (Overall Debt). The postgraduate total debt D^{PG} for a continuing student is assumed to the sum of the debt for D_{fees}^{PG} and D_{liv}^{PG} be £20,000 and is the sum of 2 components: D^{PG}_{fees} and D^{PG}_{liv}. Both debt are interest-rate free and thus the interest rates is 0. D^{PG} = D^{PG}_{liv} + D^{PG}_{fees}. This is the total graduate debt.

Assumption 20 (Savings). At Year 0, the individual's savings is what is what is left over after consumption and the annual quota of debts have been taken from current income. At t = 10 it is assumed that the individual will have enough saving to repay the remaining undergraduate debt. s^{PG}_{10} is equal to (£45000-£24750=£20,450).

Assumption 21 (Interest Rates). The value of interest rates (r) is assumed to be the same for all variables discounted. We assume them to be constant over time.

Assumption 22 (Wage Premium). There is no wage premium in the baseline scenario. Therefore, at any point w^{NPG}_i = w^{PG}_i; therefore with a rate of growth of wages constant at an annual rate of (g =0:018). w^{PG}_ievolves according to (1+g); w^{NPG}_0 = w^{PG}_0= £21,000.

Assumption 23 (Discount Factor- Exponential). To express the rational individual's decision-making process, we use an exponential discounting process. We assume in this exponential discounting process assumes a constant return can be depicted following Samuelson (1937) process as ρ^i, where ρ at time $i = 0$ is valued at 0.99.

Assumption 24 (Utility Function). The utility function is logarithmic, additive and separable. The individual is assumed to derive full utility from consumption alone.

Assumption 25 (Identity Index). Explained in the model, the identity index (j, φ_i) first increases at a decreasing rate and then decreases which equals 0 at t = 10. The utility function is a function of consumption and the identity. It is assumed to be logarithmic, additive and separable.

OBJECTIVE: To maximise present discounted utility over a period of 10 years (from Year i = 1 (1 year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$Max_{\{c_i\},\{C_s\}}\left[V^{PG}_J = \sum_{i=0}^{J-1} U^{NPG}(c_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s +_J \varphi_s)\rho^s\right] \quad (4.38)$$

Where:

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.39)$$

For j = 1,…, 10

Given that the individual chooses to transition into PG education after some[51] years of working in full-time employment, the model commences from a perspective that the individual decides not to proceed to PG immediately after graduation at Year 0. We expect the annual budget constraint as:

$$Year\ 0\colon w_0^{NPG} - Q_0^{UG} = c_0 + s_0 \quad (4.40)$$

$$Year\ i\colon w_0^{NPG}(1+g)^i - Q_i^{UG} = c_i + s_i \quad (4.41)$$

Where $i \to 0, \cdots, J$

At the year the individual transitions into PGT education, her annual[52] budget constraint will be the amount of money borrowed for full-time education. We represent this as:

$$Year\ J\colon D^{PG}(1+r)^{-j} = c_j + s_0 + PG_{fees} \quad (4.42)$$

For the periods afterwards, we have an annual budget constraint as:

$$Year\ s\colon w_0^{PG}(1+g)^s - Q^{PG} - Q^{UG} = c_s + s_s \quad (4.43)$$

$$\vdots$$

$$w_0^{PG}(1+g)^{s+5} + s_{s+5}(1+r) - Q^{PG} - Q^{UG} = c_{s+5} + s_{s+5} \quad (4.44)$$

For the remaining years until Year 10, the individual's annual budget is expressed as:

$$w_0^{PG}(1+g)^9 + s_8(1+r) - Q^{PG} = c_9 + s_9 \quad (4.45)$$

$$w_0^{PG}(1+g)^{10} + s_9(1+r) - Q^{PG} = c_{10} + s_{10}^{PG} \quad (4.46)$$

[51] The individual may choose to move into PG education between 1 and 9 years of working in a full-time job.
[52] Here, we further assume that the individual does not include her savings as a part of her consumption.

The above budgets can be added into the $IBC^{W|PG}$ as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D_{liv}^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$
$$- Q^{PG} \sum_{s=J+1}^{5} (1+r)^s$$
$$- \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{UG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - {}_J S_{10}^{PG} (1+r)^{-10}$$
$$= \sum_{i=0}^{j-1} c_i (1+r)^{-i} + \sum_{s=j+1}^{10} c_s (1+r)^{-s} \qquad (4.47)$$

The left-hand-side is represented as G_0^{PG} in the following manner:

$$G^{W|PG} = \sum_{i=0}^{J-1} c_i (1+r)^{-i} + \sum_{s=J+1}^{10} c_s (1+r)^{-s} \qquad (4.48)$$

The Lagrangian is defined as follows:

$$V^{W|PG} + \lambda \left[G^{W|PG} \sum_{i=0}^{J-1} c_i (1+r)^{-i} + \sum_{s=J+1}^{10} c_s (1+r)^{-s} \right]$$
$$= \sum_{i=1}^{10} U^{W|PG} \left(\ln(c_i) + \ln\left(c_i + {}_J\varphi_s\right) \right) \rho^i$$
$$+ \lambda \left[G^{W|PG} \sum_{i=0}^{J-1} c_i (1+r)^{-i} + \sum_{s=J+1}^{10} c_s (1+r)^{-s} \right] \qquad (4.49)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V^{W|PG}}{c_i} = \lambda - \frac{\rho^i}{\left(c_s + {}_J\varphi_s\right)} = 0 \qquad (4.50)$$

$$\frac{\partial V^{W|PG}}{c_s} = \lambda - \frac{\rho^i}{c_s} = 0 \qquad (4.51)$$

$$\frac{\partial V^{PG}}{\lambda} = G^{W|PG} \sum_{i=0}^{J-1} c_i (1+r)^{-i} + \sum_{s=J+1}^{10} c_s (1+r)^{-s} = 0 \qquad (4.52)$$

Solution

$$\lambda = \frac{\sum_{i=0}^{10} \rho^i}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i}} \qquad (4.53)$$

The time consistent solution:

$$\{\widetilde{c_\iota}, c_s\} = \frac{\rho^i (1+r)^i G^{NPG}}{\sum_{i=0}^{10} \rho^n} + \frac{\rho^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G_J^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \qquad (4.54)$$

$$\tilde{c}_0 = \frac{G^{PG} + \sum_{s=J}^{10} \varphi_s (1+r)^{-s}}{\sum_{i=0}^{10} \rho^i} \qquad (4.55)$$

$$\tilde{c}_i = \tilde{c}_{i-1} * \left(\rho^i (1+r)^i\right) \qquad (4.56)$$

4.2.2 Hyperbolic Discounting for the Rational Choice Agent

The rational individual who makes decisions considering that time may not be constant implies a degree of time inconsistency. To this end, the core assumption that changes relates to the nature of the discounting function. This is depicted in the various choices the individual faces:

4.2.2.1 The Case of No Transition to PGT after Graduation (NPG)

We apply the same conditions stipulated for the No PG entry (NPG) student in exponential discounting profile except for the assumption on discounting. We state this assumption as:

Assumption 16 (Hyperbolic Discounting). A hyperbolic discounting process is used to explain the effect of the need to satisfy immediate gratification on individual decision-making. Following the Laibson (1997) and Loewenstein and Prelec (1992) prescribed process, we have:

$$(1 + hi)^{-\frac{\theta}{h}} \qquad (4.57)$$

where h, θ > 0. h establishes how far the functions departs from a constant discounting process, while the θ variable depicts the degree of discounting that occurs.

Thus, we have a similar objective as presented below:

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 0 (graduation year) to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{NPG} = \sum_{i=0}^{10} U^{NPG}(c_i)\,(1+hi)^{-\frac{\theta}{h}} \qquad (4.58)$$

where

$$U^{NPG} = \ln(c_i) \qquad (4.59)$$

for $i = 0, \dots, 10$

The IBC^{NPG} is identical to **equation 10** as follows:

$$w_0 \sum_{i=0}^{10} (1+g)^i (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{NPG}(1+r)^{-10}$$
$$= \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.60)$$

The left hand part of **equation 38** is expressed in(G_0^{NPG}), so that the equation can be written as:

$$G_0^{NPG} = \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.61)$$

The Lagrangian function is defined as follows:

$$\mathcal{L} = V_0^{NPG} + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=0}^{10} U^{NPG}(c_i)\,(1+hi)^{-\frac{\theta}{h}} + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right] \qquad (4.62)$$

The First Order Conditions in relation to c and λ are expressed as:

$$\frac{\partial V_0^{NPG}}{\partial c_i} = \frac{(1+hi)^{-\frac{\theta}{h}}}{c_i} - \lambda(1+r)^{-i} = 0 \qquad (4.63)$$

For i=0,…,10

$$\frac{\partial V_0^{NPG}}{\partial \lambda} = G_0^{NPG} - \sum_{i=0}^{10} c_i(1+r)^{-i} = 0 \qquad (4.64)$$

By solving the system of 11 equations, we have the time consistent solution:

$$\lambda = \frac{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}}{G_0^{NPG}} \qquad (4.65)$$

$$\hat{c}_i = \frac{(1+hi)^{-\frac{\theta}{h}}(1+r)^i G_0^{NPG}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} \qquad (4.66)$$

$$\therefore \hat{c}_i = \hat{c}_{i-1}(1+hi)^{-\frac{\theta}{h}}(1+r) \qquad (4.67)$$

4.4.2.2 <u>The Deterministic Case (PG Immediately) - The Case of the Continuing Student</u>

We present the situation where the individual chooses to proceed to PG immediately after graduating from undergraduate education in a similar style as is the case with the rational choice perspective.

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 1 (1year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{PG} = \sum_{i=0}^{10} \ln(c_i {+}_0\varphi_i)\,(1+hi)^{-\frac{\theta}{h}} + \ln(c_0 {+}_0\varphi_0) \qquad (4.68)$$

for i=1,…,10

Subject to a yearly budget constraint where i= (1,…, 10) at time 0

$$D^{PG} = c_0 + s_0 + PG_{fees} \qquad (4.69)$$

Here $c_0 = c_{liv} = £10{,}000$ and $s_0 = 0$

The intertemporal budget constraint of an individual continuing a masters is the following IBC^{PG}:

$$D^{PG} + w_0 \sum_{i=0}^{10} (1+g)^1 (1+r)^{-i} - Q^{PG} \sum_{i=1}^{5} (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{PG} (1+r)^{-10}$$
$$= \sum_{i=1}^{10} c_i (1+r)^{-i} + c_0 + PG_{fees} \qquad (4.70)$$

The D^{PG} on the left-hand-side of the equation and the values for c_0 and cliv will cancel out. Thus, the left-hand-side is represented as G_0^{PG} in the following manner:

$$G_0^{PG} = \sum_{i=1}^{10} c_i (1+r)^{-i} \qquad (4.71)$$

The Lagrangian is defined as follows:

$$V^{PG} + \lambda \left[G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=1}^{10} U^{PG} (c_0 +_0 \varphi_i) (1+hi)^{-\frac{\theta}{h}} + \lambda \left[G^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right] \quad (4.72)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V_0^{PG}}{c_i} = \lambda - \frac{(1+hi)^{-\frac{\theta}{h}}}{(c_i +_0 \varphi_0)} = 0 \qquad (4.73)$$

$$\frac{\partial V^{PG}}{\lambda} = G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} = 0 \qquad (4.74)$$

Solution

$$\lambda_0^{PG} = \frac{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i}} \qquad (4.75)$$

The time consistent solution:

$$\tilde{c}_0 = c_{liv} = £10{,}000 \qquad (4.76)$$

$$\tilde{c}_i = \frac{(1+hi)^{-\frac{\theta}{h}} (1+r)^i}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left[G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i} \right] -_0 \varphi_i \qquad (4.77)$$

And:

$$\tilde{c}_i = \tilde{c}_{i-1}(1+r)(1+hi)^{-\frac{\theta}{h}} + {}_0\varphi_{i-1}(1+r)(1+hi)^{-\frac{\theta}{h}} - {}_0\varphi_i \tag{4.78}$$

4.2.2.3 <u>The Case of the Returning student (W|PG)</u>

OBJECTIVE: To maximise present discounted utility over a period of 10 years (from Year i = 1 (1 year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$Max_{\{c_i\},\{C_s\}}\left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(c_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + {}_J\varphi_s)(1+hi)^{-\frac{\theta}{h}}\right] \tag{4.79}$$

where

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i + {}_J\varphi_s\right) \tag{4.80}$$

for j = 1, … , 10

Given that the individual chooses to transition into PG education after some[53] years of working in full-time employment, the model commences from a perspective that the individual decides not to proceed to PG immediately after graduation at Year 0. We expect the annual budget constraint as:

$$Year\ 0: w_0^{NPG} - Q_0^{UG} = c_0 + s_0 \tag{4.81}$$

$$Year\ i: w_0^{NPG}(1+g)^i - Q_i^{UG} = c_i + s_i \tag{4.82}$$

$$\vdots$$

At the year the individual transitions into PGT education, her annual[54] budget constraint will be the amount of money borrowed for full-time education. We represent this as:

$$D^{PG}(1+r)^{-j} = c_j + s_0 + PG_{fees} \tag{4.83}$$

[53] The individual may choose to move into PG education between 1 and 9 years of working in a full-time job.
[54] Here, we further assume that the individual does not include her savings as a part of her consumption.

For the periods afterwards, we have an annual budget constraint as:

Here $c_j = c_{liv} = £10{,}000$ and $s_0 = 0$

$$w_0^{PG}(1+g)^s - Q^{PG} - Q^{UG} = c_s + s_s \tag{4.80}$$

$$\vdots$$

$$w_0^{PG}(1+g)^{s+5} + s_{s+5}(1+r) - Q^{PG} - Q^{UG} = c_{s+5} + s_{s+5} \tag{4.85}$$

For the remaining years until Year 10, the individual's annual budget is expressed as:

$$w_0^{PG}(1+g)^9 + s_8(1+r) - Q^{PG} = c_9 + s_9 \tag{4.86}$$

$$w_0^{PG}(1+g)^{10} + s_9(1+r) - Q^{PG} = c_{10} + s_{10}^{PG} \tag{4.87}$$

The above budgets can be added into the $IBC^{W|PG}$ as:

$$\begin{aligned} w_0 \sum_{i=0}^{J-1} (1+g)^i\,(1+r)^{-i} + D_{liv}^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J\,(1+r)^{-J} \\ - Q^{PG} \sum_{s=J+1}^{5} (1+r)^s \\ - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{UG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - {}_J S_{10}^{PG}(1+r)^{-10} \\ = \sum_{i=0}^{j-1} c_i (1+r)^{-i} + \sum_{s=j+1}^{10} c_s (1+r)^{-s} \end{aligned} \tag{4.88}$$

The left-hand-side is represented as G_0^{PG} in the following manner:

$$G^{W|PG} = \sum_{i=0}^{J-1} c_i (1+r)^{-i} + \sum_{s=J+1}^{10} c_s (1+r)^{-s} \tag{4.89}$$

The Lagrangian is defined as follows:

$$V^{W|PG} + \lambda\left[G^{W|PG}\sum_{i=0}^{J-1} c_i(1+r)^{-i} + \sum_{s=J+1}^{10} c_s(1+r)^{-s}\right]$$
$$= \sum_{i=1}^{10} U^{W|PG}\big(\ln(c_i) + \ln(c_i +_J \varphi_s)\big)\,\rho^i$$
$$+\lambda\left[G^{W|PG}\sum_{i=0}^{J-1} c_i(1+r)^{-i} + \sum_{s=J+1}^{10} c_s(1+r)^{-s}\right] \qquad (4.90)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V^{W|PG}}{c_i} = \lambda - \frac{(1+hi)^{-\frac{\theta}{h}}}{(c_s +_J \varphi_s)} = 0 \qquad (4.91)$$

$$\frac{\partial V^{W|PG}}{c_s} = \lambda - \frac{(1+hi)^{-\frac{\theta}{h}}}{c_s} = 0 \qquad (4.92)$$

$$\frac{\partial V^{PG}}{\lambda} = G^{W|PG}\sum_{i=0}^{J-1} c_i(1+r)^{-i} + \sum_{s=J+1}^{10} c_s(1+r)^{-s} = 0 \qquad (4.93)$$

Solution

$$\lambda = \frac{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i(1+r)^{-i}} \qquad (4.94)$$

The time consistent solution:

$$\{\tilde{c}_i, c_s\} = \frac{(1+hi)^{-\frac{\theta}{h}}(1+r)^i G^{NPG}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} + \frac{(1+hi)^{-\frac{\theta}{h}}(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G_J^{PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \qquad (4.95)$$

$$\tilde{c}_0 = \frac{G^{PG} + \sum_{s=J}^{10}\varphi_s(1+r)^{-s}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} \qquad (4.96)$$

$$\tilde{c}_i = \tilde{c}_{i-1} * \left((1+hi)^{-\frac{\theta}{h}}(1+r)^i\right) \qquad (4.97)$$

4.3 Bounded Rational Model

Unlike the rational choice agent, the bounded rational agent does not possess full information about the prospects of transitioning into PGT. Thus, her decision to proceed into PGT at any point within the time scale of this analysis is dependent on comparing each utility prospect of proceeding into PGT at any point in time with the prospect of not proceeding into PGT. The individual does not have a calculated knowledge of her overall utility through time, but is only aware of how much utility she has at a particular point in time. This subsection seeks to show how this is derived. Similar with the approach for the rational choice agent, we commence by exploring the exponential discounting perspective and then move on into the hyperbolic discounting perspective.

4.3.1 Exponential Discounting for the Bounded Rational Agent

Here, we commence by viewing the scenario where there is no transition into PGT. From there, we move on into the case where the individual proceeds into PGT immediately after graduation from UG studies. Finally, this part of the section ends with the case where the individual proceeds into PGT within 10 years of graduation from UG studies.

4.3.1.1 The Case of No Transition to PGT after Graduation (NPG)

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 0 (graduation year) to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{NPG} = \sum_{i=0}^{10} U^{NPG}(c_i)\,\rho^i \qquad (4.98)$$

Where:

$$U^{NPG} = \ln(c_i) \qquad (4.99)$$

For $i = 0, \dots, 10$

The series of annual budget constraints from i = 0;… ; 10 are:

$$Year\ 0: w_0^{NPG} - Q_0^{UG} = c_0 + s_0 \qquad (4.100)$$

$$Year\ 1: w_0^{NPG}(1+g)^1 - Q_1^{UG} = c_1 + s_1 \qquad (4.101)$$

$$Year\ 2: w_0^{NPG}(1+g)^2 - Q_2^{UG} = c_2 + s_2 \qquad (4.109)$$

$$\vdots$$

$$Year\ 9: w_0^{NPG}(1+g)^9 - Q_9^{UG} = c_9 + s_9 \qquad (4.100)$$

$$Year\ 10: w_0^{NPG}(1+g)^{10} - Q_{10}^{UG} = c_{10} + s_{10}^{NPG} \qquad (4.102)$$

The above budgets can be added into the IBC^{NPG} as:

$$w_0 \sum_{i=0}^{10} (1+g)^i (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{NPG}(1+r)^{-10}$$
$$= \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.103)$$

The left hand part of **equation 11** is expressed in(G_0^{NPG}), so that the equation can be written as:

$$G_0^{NPG} = \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.104)$$

The Lagrangian function is defined as follows:

$$\mathcal{L} = V_0^{NPG} + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=0}^{10} U^{NPG}(c_i)\, \rho^i + \lambda \left[G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} \right] \qquad (4.105)$$

The First Order Conditions in relation to c and λ are expressed as:

$$\frac{\partial V_0^{NPG}}{\partial c_i} = \frac{\rho^i}{c_i} - \lambda (1+r)^{-i} = 0 \qquad (4.106)$$

For i=0,…,10

$$\frac{\partial V_0^{NPG}}{\partial \lambda} = G_0^{NPG} - \sum_{i=0}^{10} c_i (1+r)^{-i} = 0 \qquad (4.107)$$

By solving the system of 11 equations, we have the time consistent solution:

$$\lambda = \frac{\sum_{i=0}^{10} \rho^i}{G_0^{NPG}} \qquad (4.109)$$

$$\hat{c}_i = \frac{\rho^i (1+r)^i G_0^{NPG}}{\sum_{i=0}^{10} \rho^i} \qquad (4.110)$$

$$\therefore \hat{c}_i = \hat{c}_{i-1} \rho (1+r) \qquad (4.111)$$

4.3.1.2 The Deterministic Case (PG Immediately)- The Case of the Continuing Student

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 1 (1year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{PG} = \sum_{i=0}^{10} \ln(c_i + {}_0\varphi_i)\, \rho^i + \ln(c_0 + {}_0\varphi_0) \qquad (4.112)$$

For i=1,…,10

Subject to a yearly budget constraint where i= (1,…, 10) at time 0

$$D^{PG} = c_0 + s_0 + PG_{fees} \qquad (4.113)$$

Here $c_0 = c_{liv} =$ £10,000 and $s_0 = 0$

$$w_0^{PG}(1+g)^1 - Q^{PG} - Q^{UG} = c_1 + s_1 \qquad (4.114)$$

$$w_0^{PG}(1+g)^2 + s_1(1+r) - Q^{PG} - Q^{UG} = c_2 + s_2 \qquad (4.115)$$

$$\vdots$$

$$w_0^{PG}(1+g)^9 + s_8(1+r) - Q^{PG} - Q^{UG} = c_9 + s_9 \qquad (4.116)$$

$$w_0^{PG}(1+g)^{10} + s_9(1+r) - Q^{PG} - Q^{UG} = c_{10} + s_{10}^{PG} \qquad (4.117)$$

The intertemporal budget constraint of an individual continuing a masters is the following IBC^{PG}:

$$D^{PG} + w_0 \sum_{i=0}^{10} (1+g)^1 (1+r)^{-i} - Q^{PG} \sum_{i=1}^{5} (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{PG} (1+r)^{-10}$$
$$= \sum_{i=1}^{10} c_i (1+r)^{-i} + c_0 + PG_{fees} \qquad (4.118)$$

The D^{PG} on the left-hand-side of the equation and the values for c_0 and cliv will cancel out. Thus, the left-hand-side is represented as G_0^{PG} in the following manner:

$$G_0^{PG} = \sum_{i=1}^{10} c_i (1+r)^{-i} \qquad (4.119)$$

The Lagrangian is defined as follows:

$$V^{PG} + \lambda \left[G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=1}^{10} U^{PG} (c_0 +_0 \varphi_i) \, \rho^i + \lambda \left[G^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right] \qquad (4.120)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V_0^{PG}}{c_i} = \lambda - \frac{\rho^i}{(c_i +_0 \varphi_0)} = 0 \qquad (4.121)$$

$$\frac{\partial V^{PG}}{\lambda} = G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} = 0 \qquad (4.122)$$

Solution:

$$\lambda_0^{PG} = \frac{\sum_{i=0}^{10} \rho^i}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i}} \qquad (4.123)$$

The time consistent solution:

$$\tilde{c}_0 = c_{liv} = £10{,}000 \qquad (4.124)$$

$$\tilde{c}_i = \frac{\rho^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i} \right] -_0 \varphi_i \qquad (4.125)$$

And:

$$\tilde{c}_i = \tilde{c}_{i-1}(1+r)\rho^i +_0\varphi_{i-1}(1+r)\rho^i -_0\varphi_i \quad (4.126)$$

4.3.1.3 The Case of the Returning student (W|PG)

The assumptions presented in the rational choice perspective will be adhered to in the bounded rational situation. However, the value being maximised will be the following:

$$\max_{\{C_s\}}\left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s+\varphi_s)\rho^s\right] \quad (4.127)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.128)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1}(1+g)^i\,(1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10}(1+g)^J\,(1+r)^{-J} - Q^{PG}\sum_{s=J+1}^{J+5}(1+r)^{-s} - \left[Q^{UG}\sum_{i=0}^{J-1}(1+r)^{-i} + Q^{PG}\sum_{s=J+1}^{10}(1+r)^{-s}\right] - S_{10}^{PG}(1+r)^{-10} = \sum_{i=o}^{10}\hat{c}_i\,(1+r)^{-i} \quad (4.129)$$

The time consistent solution:

$$\{\tilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}\rho^i} * \left[G^{PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \quad (4.130)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}}{\sum_{i=0}^{10}\rho^i} * \left(\rho^i(1+r)^i\right) - \varphi_i \quad (4.131)$$

4.3.2 Hyperbolic Discounting for a Bounded Rational Agent

In a similar pattern to how the rational choice individual's decision-making behaviour was explored, we will attempt to explore how the individual is expected to react when we assume a degree of time inconsistency in decision-making processes. These will also be explored under both the exponential discounting and hyperbolic discounting profiles.

4.3.2.1 The Case of No Transition to PGT after Graduation (NPG)

OBJECTIVE: To maximise present discounted utility over a period of 11 years (from Year i = 0 (graduation year) to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{NPG} = \sum_{i=0}^{10} U^{NPG}(c_i)\,(1+hi)^{-\frac{\theta}{h}} \qquad (4.132)$$

Where:

$$U^{NPG} = \ln(c_i) \qquad (4.133)$$

for $i = 0, \dots, 10$

The IBC^{NPG} is identical to **equation 10** as follows:

$$w_0 \sum_{i=0}^{10} (1+g)^i (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{NPG}(1+r)^{-10} = \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.134)$$

The left hand part of **equation 38** is expressed in(G_0^{NPG}), so that the equation can be written as:

$$G_0^{NPG} = \sum_{i=0}^{10} c_i (1+r)^{-i} \qquad (4.135)$$

The Lagrangian function is defined as follows:

$$\mathcal{L} = V_0^{NPG} + \lambda\left[G_0^{NPG} - \sum_{i=0}^{10} c_i(1+r)^{-i}\right]$$

$$= \sum_{i=0}^{10} U^{NPG}(c_i)\,(1+hi)^{-\frac{\theta}{h}} + \lambda\left[G_0^{NPG} - \sum_{i=0}^{10} c_i(1+r)^{-i}\right] \qquad (4.136)$$

The First Order Conditions in relation to c and λ are expressed as:

$$\frac{\partial V_0^{NPG}}{\partial c_i} = \frac{(1+hi)^{-\frac{\theta}{h}}}{c_i} - \lambda(1+r)^{-i} = 0 \qquad (4.137)$$

For i=0,…,10

$$\frac{\partial V_0^{NPG}}{\partial \lambda} = G_0^{NPG} - \sum_{i=0}^{10} c_i(1+r)^{-i} = 0 \qquad (4.138)$$

By solving the system of 11 equations, we have the time consistent solution:

$$\lambda = \frac{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}}{G_0^{NPG}} \qquad (4.139)$$

$$\hat{c}_i = \frac{(1+hi)^{-\frac{\theta}{h}}(1+r)^i G_0^{NPG}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} \qquad (4.140)$$

$$\therefore\ \hat{c}_i = \hat{c}_{i-1}(1+hi)^{-\frac{\theta}{h}}(1+r) \qquad (4.141)$$

4.3.2.2 <u>The Deterministic Case (PG Immediately) - The Case of the Continuing Student</u>

OBJECTIVE: To maximise present discounted utility over a period of 11 years from Year i = 1 (1 year after graduation to year 10) subject to a series of annual budget constraints (summarised into Intertemporal Budget Constraint (IBC)).

$$\max_{\{c_i\}} V_0^{PG} = \sum_{i=0}^{10} \ln(c_i +_0\varphi_i)\,(1+hi)^{-\frac{\theta}{h}} + \ln(c_0 +_0\varphi_0) \qquad (4.142)$$

For i=1,…,10

Subject to a yearly budget constraint where i= (1,…, 10) at time 0

$$D^{PG} = c_0 + s_0 + PG_{fees} \quad (4.143)$$

Here $c_0 = c_{liv} = £10{,}000$ and $s_0 = 0$

The intertemporal budget constraint of an individual continuing a masters is the followingIBC^{PG}:

$$D^{PG} + w_0 \sum_{i=0}^{10} (1+g)^1 (1+r)^{-i} - Q^{PG} \sum_{i=1}^{5} (1+r)^{-i} - Q^{UG} \sum_{i=0}^{10} (1+r)^{-i} - s_{10}^{PG} (1+r)^{-10}$$
$$= \sum_{i=1}^{10} c_i (1+r)^{-i} + c_0 + PG_{fees} \quad (4.144)$$

The D^{PG} on the left-hand-side of the equation and the values for c_0 and cliv will cancel out. Thus, the left-hand-side is represented as G_0^{PG} in the following manner:

$$G_0^{PG} = \sum_{i=1}^{10} c_i (1+r)^{-i} \quad (4.145)$$

The Lagrangian is defined as follows:

$$V^{PG} + \lambda \left[G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right]$$
$$= \sum_{i=1}^{10} U^{PG} (c_0 +_0 \varphi_i) \, (1+hi)^{-\frac{\theta}{h}}$$
$$+ \lambda \left[G^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} \right] \quad (4.146)$$

The First Order Conditions for i = 1, ..., 10 are

$$\frac{\partial V_0^{PG}}{c_i} = \lambda - \frac{(1+hi)^{-\frac{\theta}{h}}}{\left(c_i +_0 \varphi_0\right)} = 0 \quad (4.147)$$

$$\frac{\partial V^{PG}}{\lambda} = G_0^{PG} - \sum_{i=1}^{10} c_i (1+r)^{-i} = 0 \quad (4.148)$$

Solution

$$\lambda_0^{PG} = \frac{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}}{G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i (1+r)^{-i}} \quad (4.149)$$

The time consistent solution:

$$\tilde{c}_0 = c_{liv} = £10{,}000 \qquad (4.150)$$

$$\tilde{c}_i = \frac{(1+hi)^{-\frac{\theta}{h}}(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G_0^{PG} + \sum_{i=1}^{10} 0, \varphi_i(1+r)^{-i}\right] -_0\varphi_i \qquad (4.151)$$

and

$$\tilde{c}_i = \tilde{c}_{i-1}(1+r)(1+hi)^{-\frac{\theta}{h}} +_0\varphi_{i-1}(1+r)(1+hi)^{-\frac{\theta}{h}} -_0\varphi_i \qquad (4.152)$$

4.3.2.3 *<u>The Case of the Returning student (W|PG)</u>*

The assumptions presented in the rational choice perspective will be adhered to in the bounded rational situation. However, the value being maximised will be the following:

$$\max_{\{C_s\}}\left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s+\varphi_s)(1+hi)^{-\frac{\theta}{h}}\right] \qquad (4.153)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \qquad (4.154)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1}(1+g)^i\,(1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10}(1+g)^J\,(1+r)^{-J}$$
$$- Q^{PG}\sum_{s=J+1}^{J+5}(1+r)^{-s} - \left[Q^{UG}\sum_{i=0}^{J-1}(1+r)^{-i} + Q^{PG}\sum_{s=J+1}^{10}(1+r)^{-s}\right] - S_{10}^{PG}(1+r)^{-10}$$
$$= \sum_{i=o}^{10}\hat{c}_i\,(1+r)^{-i} \quad (4.155)$$

The time consistent solution:

$$\{\tilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \textstyle\sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \quad (4.156)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}}(1+r)^i\right) - \varphi_i \qquad (4.157)$$

4.4 Comparative Statics (Sensitivity Analyses)

In this section of the chapter, we express analysis of various forms with which debt is structured within the model. These forms are: full debt, partial debt and less debt repayment schemes. These comparative analyses are conducted strictly under the bounded rationality framework. Also, the individual decision-making process being analysed considers the situation where the individual decides to proceed to PGT studies after a period of being in work (W|PG). Each of these repayment schemes will be explained further and analysed in detail in the subsections below.

4.4.1 Full Savings Repayment Scheme

Under this repayment structure, the individual chooses to borrow money to support her studies regardless of the amount of money she had saved prior to her transition into PGT studies. This processes and assumptions are exactly the same as the bounded rationality framework under the baseline scenario. Thus, the final solutions are the same as those expressed in the baseline scenario under all circumstances of the bounded rationality framework.

4.4.1.1 Exponential Discounting

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)\rho^s \right] \qquad (4.158)$$

$$U^{W|PG} = \ln(c_i) + \ln(c_i +_J \varphi_s) \qquad (4.159)$$

For j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$
$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$
$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.160)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}\right] - \varphi_i \quad (4.161)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} \rho^i} * \left(\rho^i (1+r)^i\right) - \varphi_i \quad (4.162)$$

4.4.1.2 Hyperbolic Discounting

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)(1+hi)^{-\frac{\theta}{h}} \right] \quad (4.163)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.164)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$
$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$
$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.165)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}\right] - \varphi_i \quad (4.166)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}}(1+r)^i\right) - \varphi_i \qquad (4.167)$$

4.4.2 <u>Partial Savings Repayment Scheme</u>

Here, the individual decides to borrow to supplement what she saved during the period when she worked. Thus, we assume the following:

Assumption 26: The individual uses current wages to supplement her consumption during her postgraduate studies. The remainder is borrowed to complete the required amount of money needed to consume during her studies.

4.4.2.1 <u>Exponential Discounting</u>

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)\rho^s \right] \quad (4.168)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \qquad (4.169)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$
$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + \left(\frac{Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} - S_i^{PG}}{5} \right) \right]$$
$$- S_{10}^{PG}(1+r)^{-10} = \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.170)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \quad (4.171)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} \rho^i} * \left(\rho^i (1+r)^i \right) - \varphi_i \qquad (4.172)$$

4.4.2.2 Hyperbolic Discounting

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)(1+hi)^{-\frac{\theta}{h}} \right] \quad (4.173)$$

$$U^{W|PG} = \ln(c_i) + \ln(c_i +_J \varphi_s) \qquad (4.174)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$
$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + \left(\frac{Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} - S_i^{PG}}{5} \right) \right]$$
$$- S_{10}^{PG}(1+r)^{-10} = \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.175)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \quad (4.176)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}}(1+r)^i\right) - \varphi_i \qquad (4.177)$$

4.4.3 <u>Less Savings Repayment Scheme</u>

Finally, less savings assumes that the student would only borrow strictly for tuition fee coverage.

4.4.3.1 <u>Exponential Discounting</u>

$$\max_{\{C_s\}}\left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)\rho^s\right] \quad (4.178)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \qquad (4.179)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1}(1+g)^i\,(1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10}(1+g)^J\,(1+r)^{-J} - Q^{PG}\sum_{s=J+1}^{J+5}(1+r)^{-s} - \left[Q^{UG}\sum_{i=0}^{J-1}(1+r)^{-i} + \left(\frac{Q^{PG}\sum_{s=J+1}^{10}(1+r)^{-s} - S_i^{PG}}{5}\right)\right] - S_{10}^{PG}(1+r)^{-10} = \sum_{i=o}^{10}\hat{c}_i\,(1+r)^{-i} \quad (4.180)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}\rho^i} * \left[G^{PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \quad (4.181)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} \rho^i} * \left(\rho^i (1+r)^i\right) - \varphi_i \quad (4.182)$$

4.4.3.2 Hyperbolic Discounting

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)(1+hi)^{-\frac{\theta}{h}} \right] \quad (4.183)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.184)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J} - Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + \left(\frac{Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} - S_i^{PG}}{5} \right) \right] - S_{10}^{PG}(1+r)^{-10} = \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.185)$$

The time consistent solution:

$$\{\tilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \quad (4.186)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}} (1+r)^i \right) - \varphi_i \quad (4.187)$$

4.5 Optimal Stopping Solution within different choices- Alternate Scenarios

Below, there are two alternative scenarios will be explained in detail. These scenarios will be explored in the hyperbolic discounting framework.

4.5.1 Human Capital Theory: Increase Wage premium

In this alternate scenario, we seek to expose the effects of human capital benefit on an individual's decision to proceed to PGT education. Here, we explore what would be the optimum of optima for an individual faced in a scenario where the option to proceed into PGT education is strictly better than the option of not going at all. All analyses are done under the bounded rationality framework. We present this information and more in the following assumptions of the model:

Assumption 27: At Year 0, the individual that chooses to proceed to PGT education possesses a better utility than the other individual who chooses to proceed immediately into the workplace without any prospects of moving into PGT studies. Thus, it can be inferred that a preferable decision would be to transition to PGT at year 0.

Assumption 28: To show the effect of possessing human capital in the workplace has on individual decision-making, we compare how the optimum of optima given various wage amounts. These wage amounts are: £21,000; £23,000 and £25,000.

4.5.1.1 *Exponential Discounting*

$$\max_{\{C_s\}}\left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)\rho^s\right] \quad (4.188)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.189)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$

$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$

$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.129)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G^{PG} + \textstyle\sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \quad (4.190)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} \rho^i} * \left(\rho^i (1+r)^i \right) - \varphi_i \qquad (4.191)$$

4.5.1.2 Hyperbolic Discounting

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)(1+hi)^{-\frac{\theta}{h}} \right] \quad (4.192)$$

$$U^{W|PG} = \ln(c_i) + \ln(c_i +_J \varphi_s) \qquad (4.193)$$

For j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$

$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$

$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.194)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \textstyle\sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \quad (4.195)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} (1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}} (1+r)^i\right) - \varphi_i \qquad (4.196)$$

4.5.2 Cost of Debt: Increase Interest Rates

Here, we model the effects of costs of debt on an individual's decision to proceed to PGT education. In other words, we ask "to what extent could increase costs of proceeding to PGT deter people from proceeding into PGT education?" Conversely to the human capital scenario, we explore what would be the optimum of optima for an individual faced in a scenario where the option to not proceed into PGT education is strictly better than the option of proceeding to study a PGT degree at any point in time. All analyses are done under the bounded rationality framework. We present this information and more in the following assumptions of the model:

Assumption 29: At Year 0, the individual that chooses to not proceed to PGT education possesses a better utility than the other individual who chooses to proceed immediately into the PGT education at any point in time. Thus, it can be inferred that a preferable decision would be to not transition to PGT at year 0.

Assumption 30: To show the effect of costs of debt has on individual decision-making, we compare how the optimum of optima given various interest rates. These interest rates are: 0% and 5%.

4.5.2.1 *Exponential Discounting*

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)\rho^i + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)\rho^s \right] \qquad (4.197)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \qquad (4.198)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$

$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$

$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.199)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i (1+r)^i}{\sum_{i=0}^{10} \rho^i} * \left[G^{PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i} \right] - \varphi_i \quad (4.200)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10} \varphi_i (1+r)^{-i}}{\sum_{i=0}^{10} \rho^i} * \left(\rho^i (1+r)^i \right) - \varphi_i \quad (4.201)$$

4.5.2.2 *Hyperbolic Discounting*

$$\max_{\{C_s\}} \left[V_J^{PG} = \sum_{i=0}^{J-1} U^{NPG}(\hat{c}_i)(1+hi)^{-\frac{\theta}{h}} + \sum_{s=J}^{10} U^{PG}(c_s + \varphi_s)(1+hi)^{-\frac{\theta}{h}} \right] \quad (4.202)$$

$$U^{W|PG} = \ln(c_i) + \ln\left(c_i +_J \varphi_s\right) \quad (4.203)$$

for j = 1, … , 10

The $IBC^{W|PG}$ can be expressed as:

$$w_0 \sum_{i=0}^{J-1} (1+g)^i (1+r)^{-i} + D^{PG}(1+r)^{-J} + w_0 \sum_{s=J+1}^{10} (1+g)^J (1+r)^{-J}$$

$$- Q^{PG} \sum_{s=J+1}^{J+5} (1+r)^{-s} - \left[Q^{UG} \sum_{i=0}^{J-1} (1+r)^{-i} + Q^{PG} \sum_{s=J+1}^{10} (1+r)^{-s} \right] - S_{10}^{PG}(1+r)^{-10}$$

$$= \sum_{i=o}^{10} \hat{c}_i (1+r)^{-i} \quad (4.204)$$

The time consistent solution:

$$\{\widetilde{c_s}\} = \frac{\delta^i(1+r)^i}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left[G^{PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}\right] - \varphi_i \quad (4.205)$$

(j = 1, … , 10)

$$\tilde{c}_i = \frac{G^{W|PG} + \sum_{i=0}^{10}\varphi_i(1+r)^{-i}}{\sum_{i=0}^{10}(1+hi)^{-\frac{\theta}{h}}} * \left((1+hi)^{-\frac{\theta}{h}}(1+r)^i\right) - \varphi_i \qquad (4.206)$$

4.6 Value Functions: Time Discounting

Here, we discuss the structure of the time discounting values. Following Axtell and McRae (2007), we establish that the functions are discount functions that fulfil these necessary conditions:

Axiom 1: ρ(0) =1 implies that the present is not discounted.

Axiom 2: $\rho(i)$ decreases in a strictly monotone manner such that the $\rho'(i) < 0$ would imply that distant future values would be larger than values closer to the present time.

Axiom 3: $\rho(i) \geq 0 \; \forall \; i$.

Axiom 4: $\lim_{i\to\infty}\rho(i) = 0$. In other words, the discount function decreases to 0 as time progresses.

With these axioms, the discount function is applied under two different theoretical frameworks: exponential and hyperbolic discounting.

Proposition 1: *The exponential discount function is completely monotone and decreases with time.*

Proof:

We present our exponential discount function according to Samuelson (1937) exponential discount utility as:

$$\rho^i \qquad (4.207)$$

where $\rho > 0$. Obtaining the n^{th} derivative of this function leaves:

$$\left.\partial\rho^n(i)\middle/\partial\rho\right. = n! \qquad (4.208)$$

$n!$ decreases at a constant rate to zero as it is expanded to show common factors:

$$n! = n(n-1)! \qquad (4.209)$$

Thus, ρ^i is considered by its constant discount rate of $1/\rho$ (Laibson, 1997).

Proposition 2: *The hyperbolic discounting function is completely monotone and decreases with time.*

<u>Proof</u>:

To consider the discrete choice model as presented in equation (1), I consider the hyperbolic discounting (Laibson, 1997) adjustment to the discounting function as:

$$\delta(i) = (1+hi)^{-\frac{\theta}{h}} \qquad (4.210)$$

$$= \frac{\theta}{(1+hi)^h}$$

The first and second derivatives are represented below as

$$\delta'(i) = \frac{-\theta h}{(1+hi)^{h+1}} \leq 0 \qquad (4.211a)$$

$$\delta''(i) = \frac{-\theta h(h+1)}{(1+hi)^{h+2}} \geq 0 \qquad (4.212b)$$

The n^{th} derivative gives:

$$\delta^n(i) = (-1)^n \frac{\theta \prod_{d=0}^{n-1}(h+d)}{(1+hi)^{h+n}} \qquad (4.213)$$

Chapter 5 Results of the baseline scenario and sensitivity analysis

5.1. Introduction

The main objectives of this chapter are to present and discuss the results of the baseline scenario[55] and sensitivity analyses. What we do in this chapter is to take the closed-form solutions derived in Chapters 3 and 4 and illustrate them graphically thus creating a better idea of the time profile of the various optimal solutions and a clear visualization of the optimal stopping point in each case.

To do so, we take the general solutions and we replace symbols of structural parameters and exogenous variables with data that come either from other theoretical studies, factual evidence and recent government policies. In other words, we apply the general solution to real life situations close to reality. We stress that the general solution derived in Chapter 3 and Chapter 4 can be applied to other sets of data and different scenarios to simulate alternative situations.

We start with the baseline scenario of a fully rational agent and of a bounded rational agent. The core basis for comparison in this scenario is the effect of different time discounting processes on either of the individuals. Thus, for both types of agents, we consider two discounting assumptions namely: the standard exponential discounting and the hyperbolic discounting time preference structures. The applications and visualization of the general closed form solutions are conducted by using the values reported in Table 5.1.

[55] Alternative scenarios looking at situations where wages and interest rates affect decisions to transition into PGT would be considered in Chapter 6.

Variable	Definition	Source
$\hat{c}_i, \tilde{c}_i$	Optimal Consumption	Derived through model.
s	Savings	Derived through model
Q^{PG}	Quota spent of PGT degree	A PGT tuition fee of £10,000 divided by 5 years of payment
Q^{UG}	Quota spent on UG degree	Sum of undergraduate tuition fees divided by 20 years of payment.
D^{PG}	PGT tuition fee debt + living costs	Living costs are £10,000 based on government estimates.
D^{UG}	UG tuition fee debt + living costs	Living costs is calculated as 6000*3 = £18,000 + Tuition fees of £9,000*3
δ	Discount factor	Exponential discounting[Samuelson (1939)]; Hyperbolic discounting [Laibson 1997)]
g	Wage growth rate	Through ONS data.
r	Interest rate	Through ONS data.
j, φ_i	Identity index	Akerlof and Kranton (2001)

Table 5. 3: A list of variables used in the model.

After illustrating the optimal stopping point solution, we study its property using sensitivity analysis (section 5.3). The value of these exercises is to investigate how the optimal stopping point changes when the agent faces different borrowing constraints (i.e., ability to borrow the £10,000 offered by the UK Government, or absence of government funding to PGT scheme).

We proceed focusing on bounded rational decision-making agent only, to investigate how the optimal solution changes when we relax the strict constraint on final resources and allow the agent to have saved enough to still repay the remaining UG debt and only a quota of the PG debt. Figure 5.1 below illustrates the structure of this section. Below is a synoptic table expressing the structure of this section.

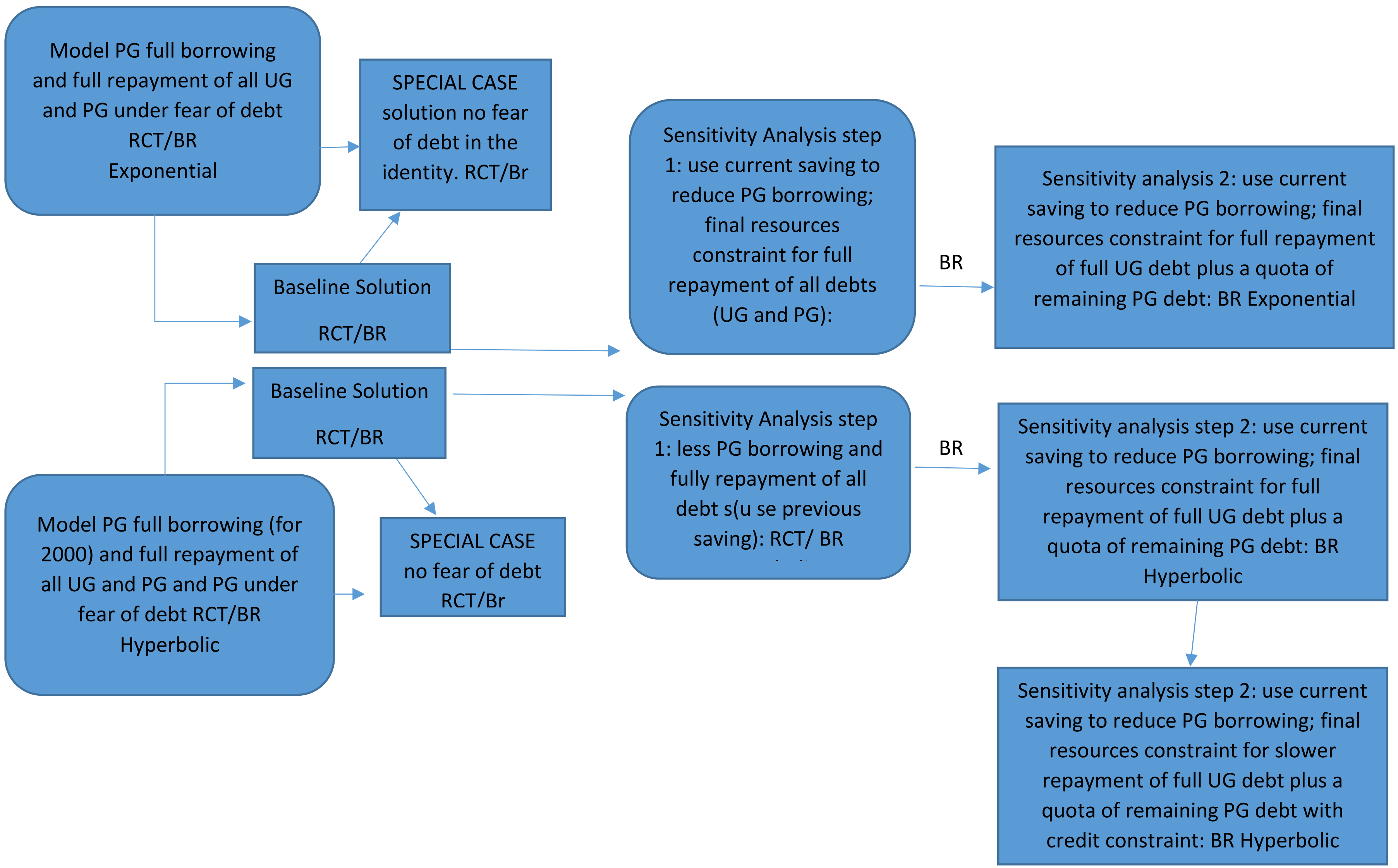


Figure 5.1: A Flowchart of the Baseline Scenario, sensitivity analysis on borrowing and repayment of PG debt.

5.2 The Baseline scenario results. Exponential Discounting: Comparing across theoretical approaches.

In this section, we compare the optimal solutions of the rational agent versus the bounded rational individual assuming that each of these agents is **indifferent between transitioning immediately into a PG** and moving immediately to full-time employment. It is important to remind that the baseline scenario does not consider the effect of a wage premium due to a PG degree. This is because the baseline scenario is designed to focus only on the role of non-financial concepts such as identity and fear of debt on the decision about PG. The wage premium and the Human Capital theory, will be added once the effect of these non-financial variables have been analysed. To do so, we assume the following: if the agent moved into full time employment immediately, she would earn the national average income of £21,000 and that wage would grow at an annual rate of 1.8% per annum. If the agent decides to wait, she would earn the national wage (and its growth) until she decides to move into PG. After returning into employment, the agent would earn the same wage as the one that she would have earned had she decided not to go into PG (in other words, she resumes the wage trajectory that she left). This guarantees that the wage premium is not one of the factors affecting her decision.

5.2.a Exponential Discounting

The information on Table 5.2.a shows for each year, the maximum utility she would gain if she decided to proceed to PGT education in that specific year. These optimal solutions are derived from maximizing the value function of the individual at each point in time with their associated inter-temporal budgets. For instance, if a rational agent with exponential discounting decided to wait for two years before going to PG (i.e. no delay of two years after UG graduation), her maximum utility would be 103.43. If she decided to go immediately (or not to go at all), her utility would be 103.2. The maximum values of these yearly value function represents the optimal stopping point solution which is therefore the maximum of all maxima.

Table 4.5.a: Baseline Scenario: Fear of debt (Borrow £20,000 for PG and enough final saving to repay any remaining debt of UG and PG) – Exponential Discounting (Identity Factor 131.52)			
No PG		**Rational – Exponential**	**Bounded – Exponential**
103.200475	**Year 0 (UG grad) delay**	103.2005	103.2005
	Year 1 delay	103.3719055	103.3992
	Year 2 delay	**103.4265818**	103.4915
	Year 3 delay	103.4213362	**103.5063**
	Year 4 delay	103.3745622	103.4538
	Year 5 delay	103.2950742	103.3424
	Year 6 delay	103.1815298	103.2532
	Year 7 delay	103.0315548	103.1132
	Year 8 delay	102.8363627	102.9216
	Year 9 delay	102.5769979	102.6506
	Year 10 delay	102.2132992	101.8315

Table 5. 4.a: Baseline scenario Value function (optimization under IBC)- Exponential Discounting

It is clear from this table, that under the baseline scenario assumption, the optimal waiting time is two years for a rational agent and 3 years for a bounded rational agent. Figure 5.2.a below is based on Table 5.2.a. The figure shows two curves; each curve joins 11 points with each point of the curve representing an optimal solution at a specific time after[56] graduation. In the figure, the orange curve represents the bounded rational path and the blue for the rational choice one.

[56] The bounded rational solution only has 10 points (not 11 points). This is because the final saving constraint does not enable to go into PG at time 10 (the agent would need to save the amount she borrows for PG and this would mean a zero consumption; and hence a non-feasible solution is not possible).

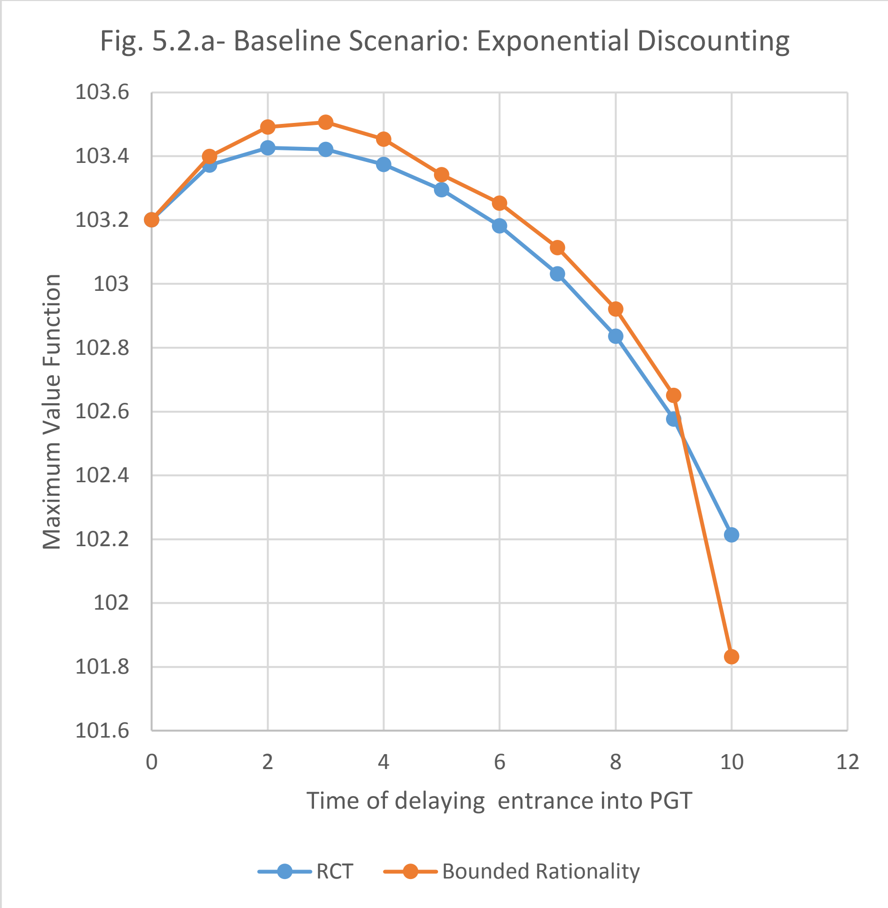


Figure 5.2.a: Baseline scenario Value function (optimization under IBC)- Exponential Discounting

From the Figure 5.2.a above, we observe that, as assumed in our model, at time Year 0, both the rational choice and bounded rational utility maximising solutions have [approximately] the same value (indeed the two agents, having the same parameters, will end up having at time Year 0 exactly, the same solutions: and they will be both indifferent between going immediately into PGT or going into full time employment). All curves in Figure 5.1.a show quasi parabolic behaviour: they start at the same point at Year 0 (at which the agent is indifferent between proceeding to PGT and not proceeding to PGT), increase monotonically and then eventually decline. The peak is the optimal stopping time, which represents the time that represents the highest utility that will be attained from transitioning to PGT. Thus, the individual will be best satisfied with a decision to venture into PGT education if she decided to study at this point. Due to the monotonic behaviour of the sequence of solutions, the peak point is unique and hence the first stopping point is also the optimal stopping time. It is clear that delaying the entry into PGT is the best choice for both types of individuals in this baseline scenario. However, the exact point in time where it is most feasible to make such transition is based on the theoretical assumption defining each individual's decision-making behaviour.

From Figure 5.2.a, it is observed that the optimal stopping time for the rational choice agent following an exponential discounting time preference is two years (represented by the blue line) after graduation while the optimal stopping time for the bounded rational individual is 3 years (as seen in the orange line). In other words, the rational choice agent will achieve a maximum lifetime utility when she makes transition to PGT education if she chooses to transition 2 years after graduation from undergraduate studies. The bounded rational agent will have her best utility when she chooses to make transition 3 years after graduating from undergraduate studies.

It is interesting to notice that in every year and up to Year 9, the Bounded Rational agent has a higher maximum utility than the rational agent. The situation changes after Year 9. This is explained by the fact the Rational Choice agent can each year (including year 10) plan her consumption path so to respect the intertemporal budget constraint. This planning enables her to be able to choose to go into PG even at year 10. On the other hand, the Bounded Rational agent, because of a lack of planning saves less and ultimately, her utility from transitioning in her 10^{th} year becomes less than her rational choice counterpart. A bounded rational agent consumes more along the way (as she makes her decision from the initial standpoint of not proceeding into PG education and making her choice to proceed at each passing year) than the rational agent (who makes her decision on when to proceed into PGT from the moment she graduates from UG studies given the "current state of the world").

5.2.b Hyperbolic Discounting

Table 5.2.b below shows the utility maximising solutions when transitioning into PGT at various years under hyperbolic discounting time preference structure (the orange line connecting utility maximising values in each year for the individual represents the bounded rational, while the blue line represents the rational choice series of utility maximising values).

The hyperbolic discounting parameter has been derived to guarantee the equivalence of the decision to never transit into PG (NPG) solution between the exponential and hyperbolic discounting time preference structures. These parameters are in line with the literature (Laibson, 1997). The solution of the transiting into PG (immediately) or at any time until year 10) are derived under the same identity function as the one exponential solutions above. Observing Table 5.2.b below, when the hyperbolic agent has the same identity factor as the exponential agent and she only differs in terms of discounting preferences, her optimal solution would be to postpone it further (for a rational agent) or to keep it at 3 year delay (bounded rational agent).

Table 5.2.b: Baseline Scenario: Fear of debt (Borrow £20,000 for PG and enough final saving to repay any remaining debt of UG and PG) – Hyperbolic Discounting. Same identity factor (131.52)			
No PG left no UG left		**Rational – Hyperbolic**	**Bounded – Hyperbolic**
103.2008	**Year 0 (UG grad) delay**	103.2008	103.2008
	Year 1 delay	103.3718	103.3991
	Year 2 delay	103.4726	103.5487
	Year 3 delay	**103.4909**	**103.5989**
	Year 4 delay	103.4527	103.563
	Year 5 delay	103.3714	103.4532
	Year 6 delay	103.2489	103.2730
	Year 7 delay	103.0855	103.0267
	Year 8 delay	102.8742	102.4941
	Year 9 delay	102.5983	102.1335
	Year 10 delay	102.2206	-

Table 5.2.b: Baseline scenario Value function (optimization under IBC)- Hyperbolic Discounting

From Tables 5.2.a and 5.2.b as well as Figures 5.2.a and 5.2.b, it is easy to see that at Year 0, both the rational choice and bounded rational utility maximising solutions have [approximately] the same value. This means that at Year 0, the individual is indifferent between going immediately into PGT and going into full time employment. The situation changes after Year 0, and the solutions become different. These solutions are derived from maximizing the value function of the individual at each point in time with their associated inter-temporal budgets. All curves in Figures 5.2.a and 5.2.b show quasi parabolic behaviour: they start at the same point at Year 0 (at which the agent is indifferent between proceeding to PGT and not proceeding to PGT), increase monotonically and then eventually decline. The peak is the optimal stopping time, which represents the time that represents the highest utility that will be attained from transitioning to PGT. Thus, the individual will be best satisfied with a decision to venture into PGT education if she decided to study at this point. Due to the monotonic behaviour of the sequence of solutions, the peak point is unique and hence the first stopping point is also the optimal stopping time. It is clear that delaying the entry into PGT is the best choice for both types of individuals in this baseline scenario. However, the exact point in time where it is most feasible to make such transition is based on the theoretical assumption defining each individual's decision-making behaviour.

Under hyperbolic discounting in Figure 5.2.b below, we observe a similar pattern. However, the curves are a more "bended" shape with a higher hump and a quicker descent until Year 7 where the utility maximisation values for the rational choice individual supersedes her bounded rational counterpart. This is observed in the crossing over of the orange line (representing bounded rational agent), through the blue line (representing the rational choice agent). The effect of the hyperbolic discounting is to choose a higher level of consumption (higher utility) at the beginning, and this difference dies out towards the end. This is in line with the idea behind hyperbolic discounting that individuals tend to postpone pain (procrastinating) and to prefer not to delay rewards (consumption).

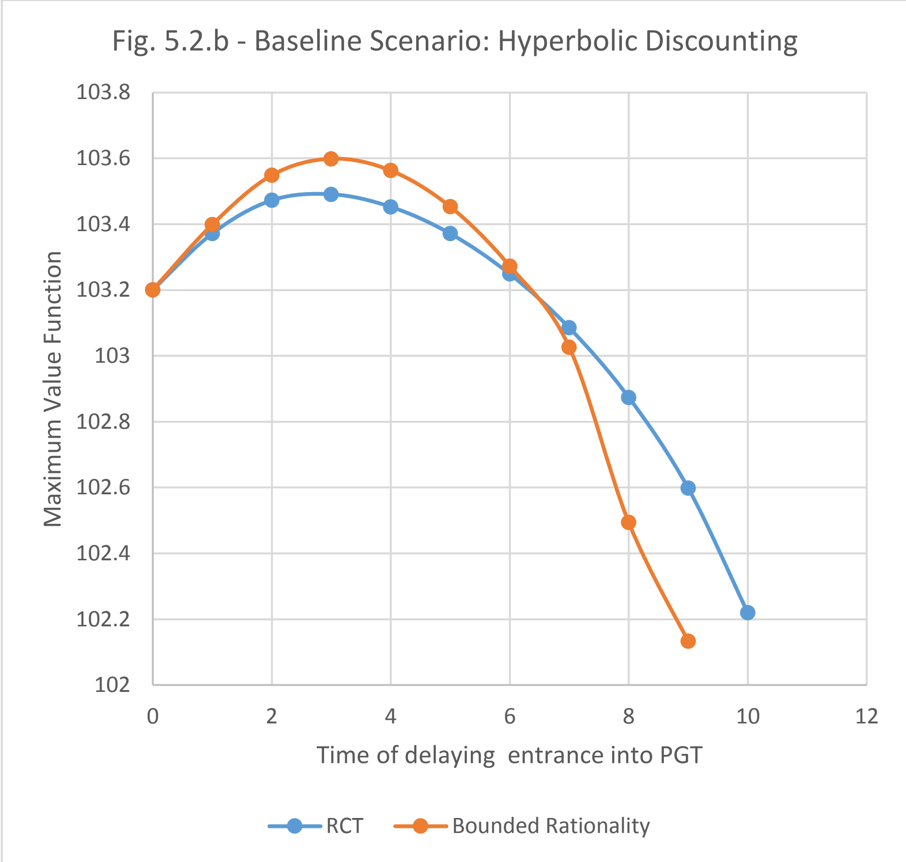
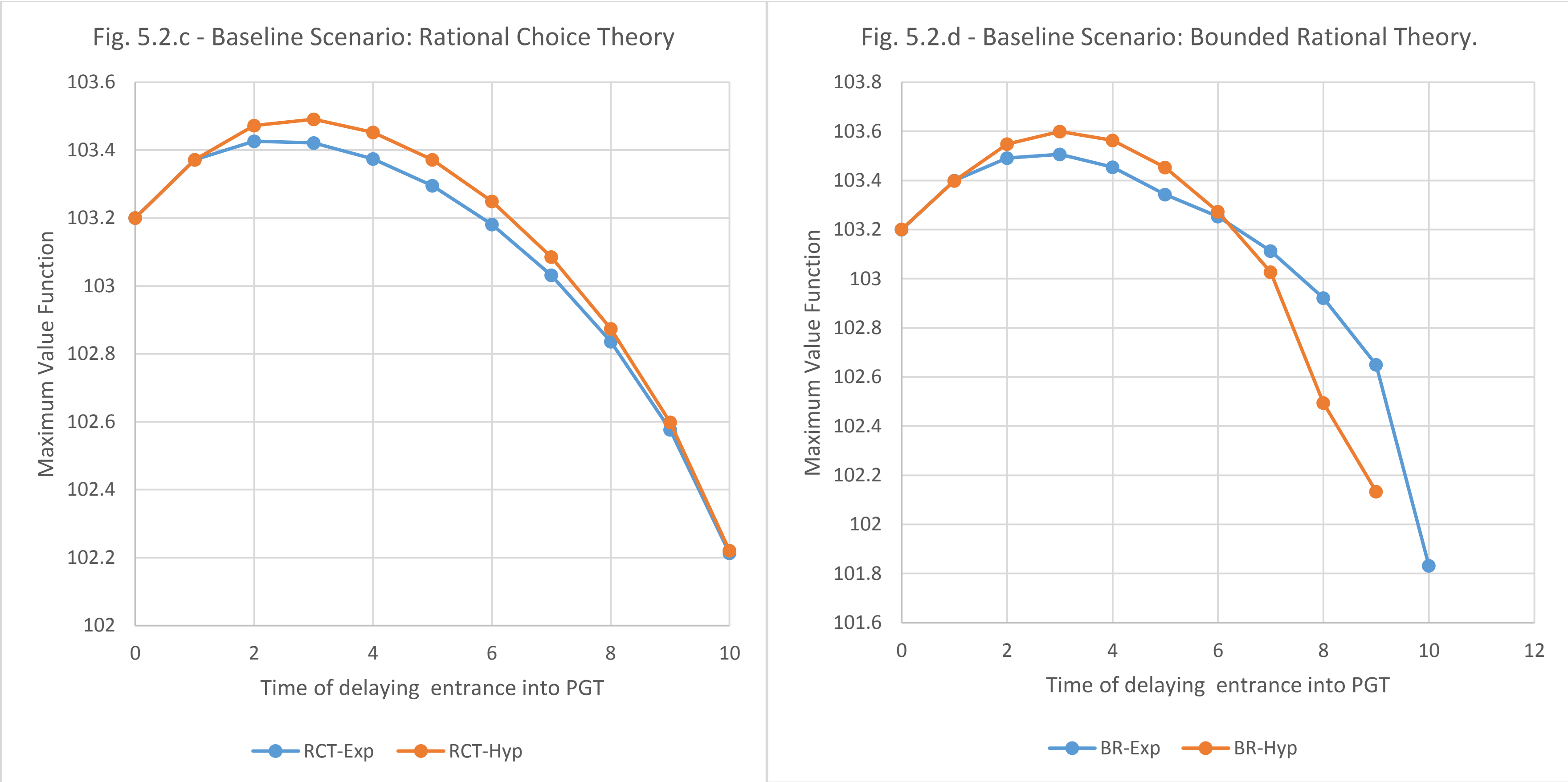


Figure 5.2.b: Baseline scenario Value function (optimization under IBC)- Hyperbolic Discounting

In both Figures 5.2.a and 5.2.b, the curves of the bounded rational agent lie above the curve of the rational choice agent. This means that the behavioural bias observed in the bounded rational agent leads to a small differential gain in well-being. The reason for this gap resides in the fact that the bounded rational agent- by not planning to go until the status quo is changed- can enjoy higher levels of consumption prior to going into PG. This behaviour and result are made possible by the fact that in the model, PGT students can borrow £20,000 and repay it within 5 years without any interest. The bounded rational agent, however, is worse off at later stages when the orange curve falls below the blue one. This is because this bounded rational individual would need to repay more, having not saved as much as the rational prior to enter PGT education due to a myopic view of the future.

When comparing the effect of time discounting based on decision-making strategies, we notice that exponential discounting leads to an overall lower level of utility over time. This is expressed in Figures 5.2.c and 5.2.d as expressed overleaf. As seen in the figures, the exponential discounting curves both show a consistent choice pattern over time as compared to a quicker reaction to the option of proceeding to PGT as expressed in the utility increase between Year 0 and Year 3 in both the rational choice and bounded rational agents. We also observe that despite their decision-making pattern, there is a convergence to parity at year 10 for the rational agent. However, we do not witness a similar development for the bounded rational agent as there is no utility to transition at year 10.

For the rational choice agent, we observe that the optimal stopping time is at Year 2 (i.e. 2 years after graduation from undergraduate studies) under exponential and it is postponed of one year under hyperbolic discounting time preferences. Furthermore, it is observed that the utility at Year 10 shows an (almost) equal utility between both discounting preferences. Unlike the rational choice agent, the bounded rational agent achieves her best utility from transition into PGT at Year 3 regardless of the discounting patterns. Although there is a similar behaviour in the curves as the utility profiles approach Year 10, it can still be noted that the student will have a better overall utility if her time preference pattern were hyperbolic as we observe the orange line staying consistently above the blue (exponential discounting) line.



Figures 5.2.c & 5.2.d: Comparing between rational choice and bounded rational agents

5.3 A Special Case of the Baseline Scenario: Corner Solution in the Absence of Fear of Debt

As a special case of the baseline scenario, we assume that the agent does not show fear of debt and hence, in her identity, it is not corrected with the reassuring effect of having accumulated past savings before transiting into a PG. The presence of the saving term in the identity index (see equation 2 in chapter 3) helps to reduce the fear of debt by providing reassurance about the ability to repay it. Tables 5.3.a and 5.3.b below show the solutions for the exponential and hyperbolic discounting preferences and Figures 5.3.a and 5.3.b illustrate those solutions.

Table 5.3.a: Special Case of Baseline Solution: No fear of debt- Fully repaid debt (UG and PG) Hyperbolic Discounting. Same identity factor			
No PG		**Rational – Exponential**	**Bounded – Exponential**
103.2005	**Year 0 (UG grad) delay**	**103.2005**	103.2005
	Year 1 delay	103.1915	103.1915
	Year 2 delay	103.1279	103.1279
	Year 3 delay	103.0327	103.0322
	Year 4 delay	102.9115	102.909
	Year 5 delay	102.7696	102.7615
	Year 6 delay	102.606	102.5831
	Year 7 delay	102.4261	102.366
	Year 8 delay	102.2351	102.0762
	Year 9 delay	102.0385	101.5121
	Year 10 delay	101.8423	-

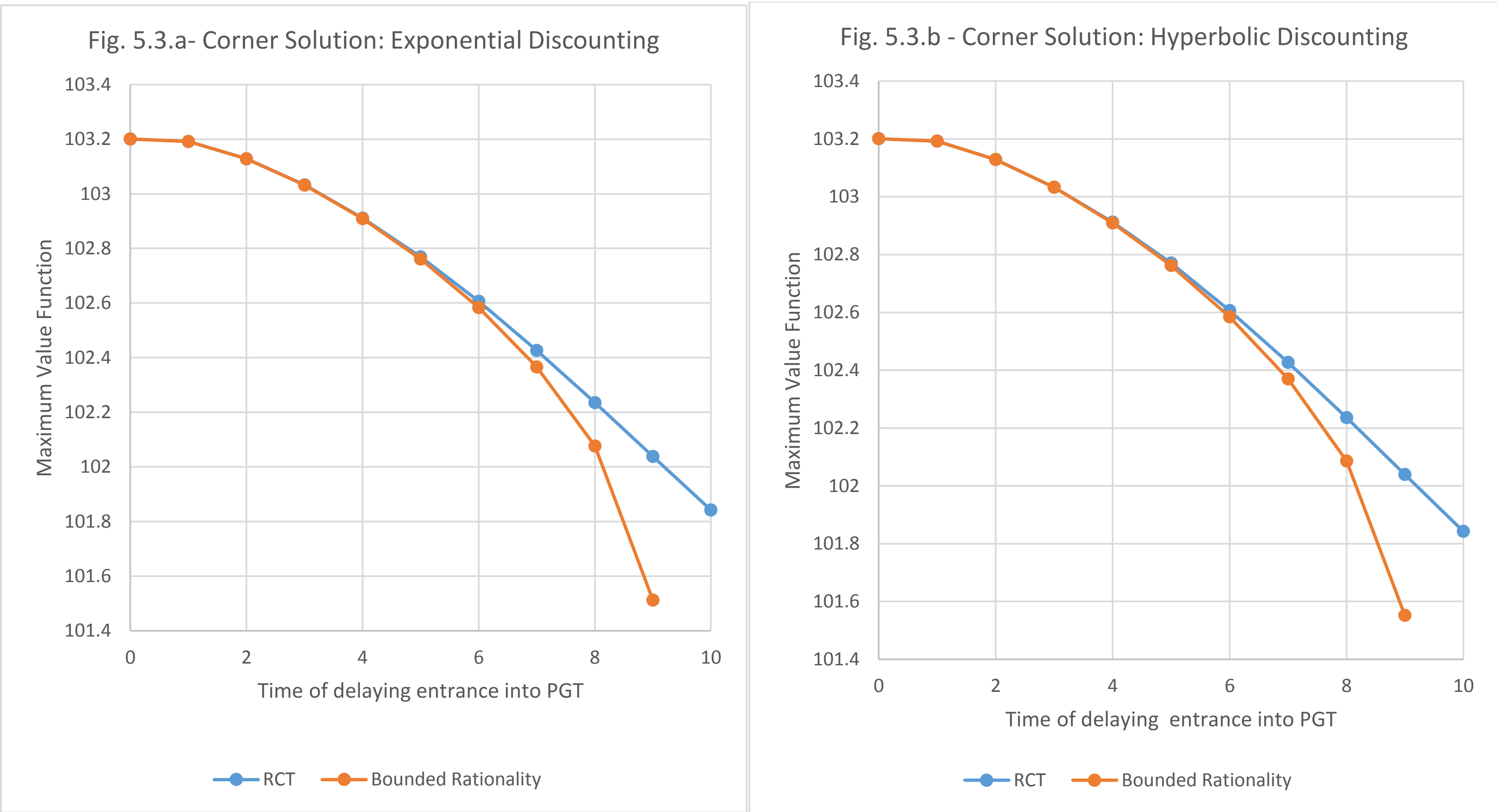
Table 5.3.a. Special Case of Baseline Solution: (No fear of debt: Exponential Discounting)

Observing across time discounting patterns in Figures 5.3.a and 5.3.b, we observe a corner solution for the rational choice agent for both the hyperbolic and exponential discounting patterns. It is noted that failure to consider the benefit of saving on an individual's identity leads to a corner solution for the rational decision-maker occurring at Year 0. This means that the best time to proceed into PGT education is immediately after graduating from undergraduate studies. Thus, the individual will find no incentive to proceed into PGT education if it does not improve her identity from an economic standpoint. For the bounded rational case, the solution is indicated in Year 0. Removing fear of debt from the identity index (or reducing it) would lead to putting forward the decision to go into PG by three years in comparison to earlier solutions in Section 5.2, as saving reassurance is not considered as important as before. For all agents, the optimal solution is to transit immediately into a PG degree.

Table 5.3.b: Special Case of Baseline Solution: No fear of debt- Fully repaid debt (UG and PG) Hyperbolic Discounting. Same identity factor			
No PG		**Rational – Hyperbolic**	**Bounded – Hyperbolic**
103.2008	**Year 0 (UG grad) delay**	**103.2008**	**103.2008**
	Year 1 delay	103.1919	103.1919
	Year 2 delay	103.1283	103.1283
	Year 3 delay	103.0331	103.0326
	Year 4 delay	102.9119	102.9095
	Year 5 delay	102.7701	102.7623
	Year 6 delay	102.6065	102.5846
	Year 7 delay	102.4266	102.3694
	Year 8 delay	102.2356	102.0854
	Year 9 delay	102.0392	101.5522
	Year 10 delay	101.8429	-

Table 5.3.b: Special Case of Baseline Solution (No fear of debt: Hyperbolic Discounting)

FINDING 1: *The prediction of the baseline scenario, which does not account for a wage premium, is that only those agents who do not suffer from fear of debt would choose to transit immediately into postgraduate education. All other types of agents would postpone their decision of transiting into PGT. For both exponential and hyperbolic discounting process, the optimal delay depends on rational choice versus bounded rational behaviour: the latter tends to wait longer before they transit into PGT studies.*



Figures 5.3.a & 5.3.b: Comparing between rational choice agents and bounded rational agents when savings are not factored to Identity Index.

5.4 Sensitivity Analyses: Changing the Borrowing Behaviour under Fear of Debt

5.4.1 The Case of using accumulated saving to reduce PG borrowing

The case we work on in the baseline scenario assumes crucially that the individual borrows a total of £20,000 to cover both tuition fees and living expenses regardless of her economic situation. This implies that the individual has more disposable income the longer she stays in employment through accumulated savings. But this creates a precedent for more debt to be paid in the future. Furthermore, this would seem not compatible with the fear of debt characteristic in the identity function. To remove this issue of internal inconsistency, we allow the agent to use accumulated saving to reduce the borrowing for leaving expenses while still taking advantages of the £10,000 government loans for PG fees. This sensitivity analysis will assess the extent to which the optimal solution depends on borrowing behaviour and resources, leaving all other parameters and assumptions unchanged.

This subsection deals with the case where the individual seeks to reduce her overall debt by using her accumulated savings to subsidise her sustenance. Thus, the individual will borrow strictly for tuition (£10,000 loan) and will obtain living expenses of £10,000 through combinations of a loan and her accumulated savings up to the point of her transition. Thus, it is expected that the longer the individual spends in full-time employment, the more she will have in savings. The information on Table 5.2 shows the overall utility (over the course of 10 years) an individual obtains should she decide to proceed to PGT education at any year between Year 0 and Year 10. This table observes what happens when the individual considers the impact of the presence of debt consideration on the decision to proceed into PGT education.

Table 5.4.a: £10,000 borrowed under the government scheme. Use of accumulated saving to reduce PG borrowing for living expenses.			
	No PG	**Rational – Exponential**	**Bounded – Exponential**
Year 0 (UG grad) delay	103.2005	103.2005	103.2005
Year 1 delay		103.3620843	103.3861875
Year 2 delay		**103.410735**	103.4669257
Year 3 delay		103.399984	**103.4712253**
Year 4 delay		103.3474932	103.4089613
Year 5 delay		103.2603269	103.2904593
Year 6 delay		103.149847	103.1231504
Year 7 delay		103.0041969	102.8985507
Year 8 delay		102.8150603	102.5993383
Year 9 delay		102.5642033	102.1146369
Year 10 delay		102.2132992	-

Table 5.4.a: The Case for Less Borrowing Value function (optimization under IBC) – Exponential Discounting

Table 5.4.b £10,000 borrowed under the government scheme. Use of accumulated saving to reduce PG borrowing for living expenses.			
	No PG	**Rational – Hyperbolic**	**Bounded – Hyperbolic**
Year 0 (UG grad) delay	103.2008	103.2008	103.2008
Year 1 delay		103.3620483	103.3861705
Year 2 delay		103.4535342	103.5347201
Year 3 delay		**103.464365**	**103.5571589**
Year 4 delay		103.4189361	103.5198429
Year 5 delay		103.336534	103.4022513
Year 6 delay		103.2172389	103.2255609
Year 7 delay		103.0580934	102.9845219
Year 8 delay		102.8529129	102.6671672
Year 9 delay		102.585553	102.1778525
Year 10 delay		102.2205772	-

Table 5.4.b: The Case for Less Borrowing Value function (optimization under IBC) – Hyperbolic Discounting

From Table 5.4.a and 5.4.b as well as Figures 5.4.a and 5.4.b, it can be identified that at Year 0, both the rational choice and bounded rational utility maximising solutions have the same values as the previous case when borrowing was £20,000 and saving was not used. The reason is that, if the agent entered PG immediately, she would not have any accumulated saving, and this would lead to the same solution as the baseline solution above. Similar to the implication in the baseline scenario, this means that the individual is indifferent between going immediately into PGT and going into full time job at Year 0. After Year 0, the situation changes to indicate various solutions as reflected through the formulaic implications of the exponential and hyperbolic discounting functions. These solutions are derived from maximizing the value function of the individual at each point in line with their associated inter-temporal budgets. All curves in Figures 5.4.a and 5.4.b show quasi-parabolic behaviour akin to what is observed in the baseline scenario. It is clear that delaying the entry into PG is the best choice for both types of individuals in this baseline scenario. However, the exact point is still the same as in the baseline scenario. In time where it is most feasible to make such transition is based on the theoretical assumption defining each individual's decision-making behaviour.

From Figure 5.4.a below, it is observed that the optimal stopping time for the rational choice agent following an exponential discounting time preference is two years after graduation while the optimal stopping time for the bounded rational individual is 3 years. In other words, the rational choice agent will achieve a maximum lifetime utility when she makes transition to PGT education if she chooses to transition 2 years after graduation from undergraduate studies. The bounded rational agent will have her best utility when she chooses to make transition 3 years after graduating from undergraduate studies. In comparison with the rational choice agent, the bounded rational agent begins to obtain lesser lifetime utility from 6 years after graduating from UG studies. This is indicated by the intersection between the orange and blue lines.

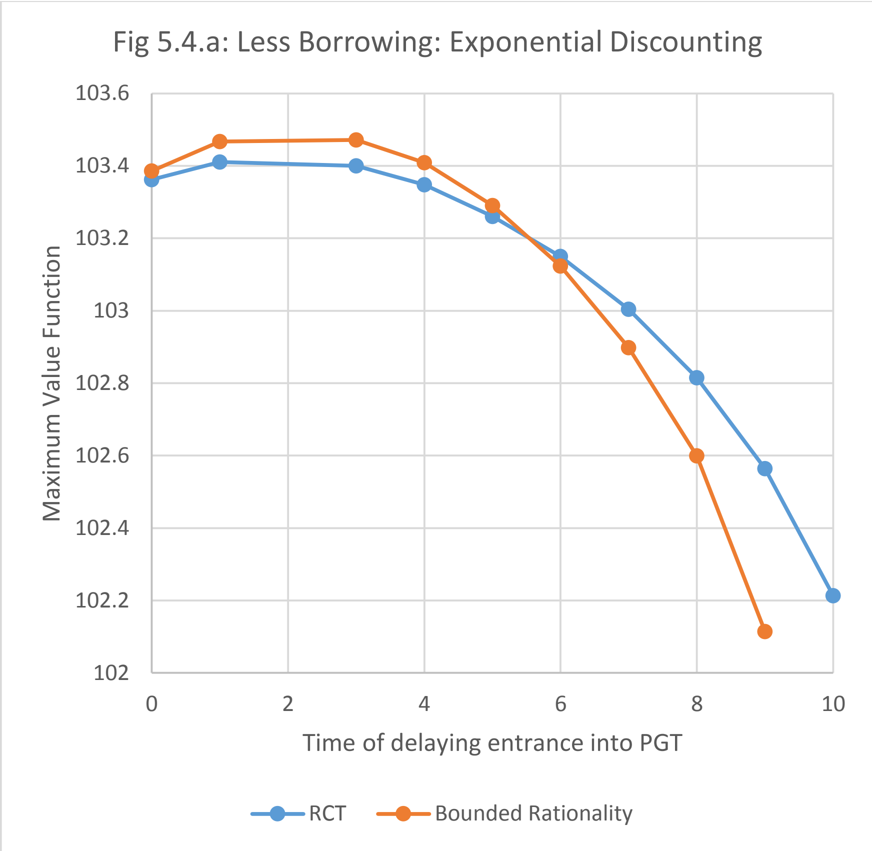


Figure 5.4.a: The Case for Less Borrowing Value function (optimization under IBC) – Exponential Discounting

Under hyperbolic discounting in Figure 5.4.b, we observe a postponement of one year for the rational agent and a waiting time of 3 years for the bounded rational agent. We observe it in the quick ascent of utility values between Years 0 and 3. This maintains consistency with the baseline scenario where the optimal stopping points for the hyperbolic agents are at 3 years for both rational choice and bounded rational agents. Figure 5.4.b is represented below.

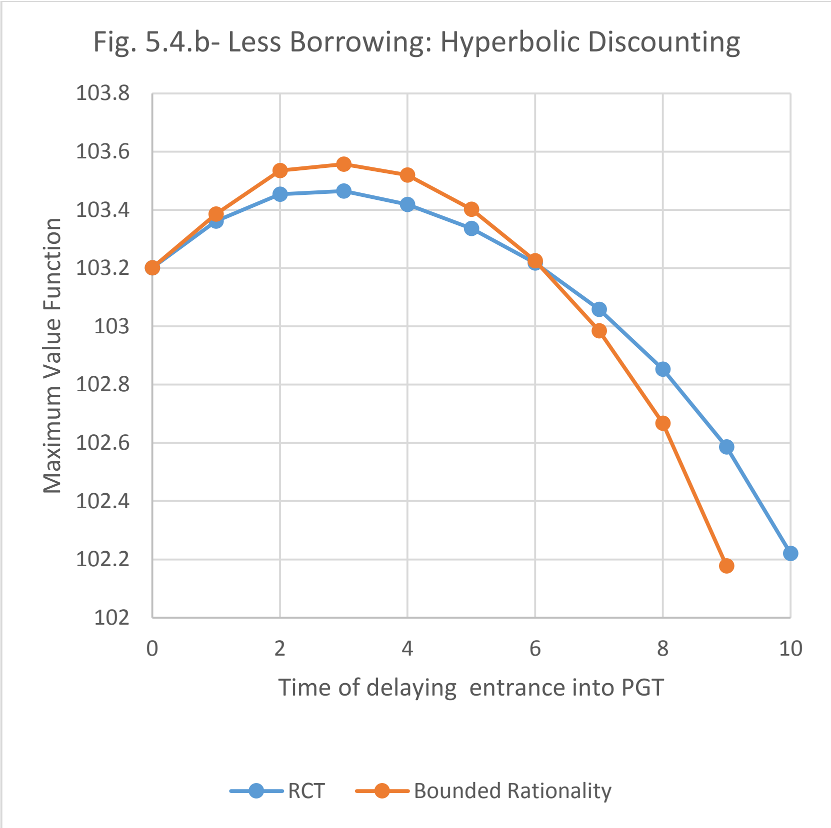


Figure 5.4.b: The Case for Less Borrowing Value function (optimization under IBC) – Hyperbolic Discounting

In both Figures 5.4.a and 5.4.b, the curves of the bounded rational agent lie above the curve of the rational choice agent until the point of intersection. This means that the behavioural bias observed in the bounded rational agent leads to a small differential gain in well-being. The reason for this gap resides in the fact that the bounded rational agent- by not planning to go until the status quo is changed- can enjoy higher levels of consumption prior to going into PG. This behaviour and result are made possible by the fact that in the model, PGT students can borrow £20,000 and repay it within 5 years without any interest. The bounded rational agent, however, is worse off at later stages when the orange curve falls below the blue one. This is because this bounded rational individual would need to repay more, having not saved as much as the rational prior to enter PGT education due to a myopic view of the future.

When comparing the effect of time discounting based on decision-making strategies, we notice that exponential discounting leads to an overall lower level of utility over time. This is expressed in Figures 5.4.a and 5.4.b as expressed overleaf. As seen in the figures, the exponential discounting curves both show a consistent choice pattern over time as compared to a quicker reaction to the option of proceeding to PGT as expressed in the hyperbolic case between Year 0 and Year 3 in both the rational choice and bounded rational agents. We also observe that despite their decision-making pattern, there is a convergence to parity at year 10 for the rational agent. However, we do not witness a similar development for the bounded rational agent as there is no utility to transition at year 10.

For the rational choice agent, we observe that the optimal stopping time is at Year 2 (i.e. 2 years after graduation from undergraduate studies) under both exponential and hyperbolic discounting time preferences. Furthermore, it is observed that the utility at Year 10 shows an (almost) equal utility between both discounting preferences. Unlike the rational choice agent, the bounded rational agent achieves her best utility from transition into PGT at Year 3 regardless of the discounting patterns. Although there is a similar behaviour in the curves as the utility profiles approach Year 10, it can still be noted that the student will have a better overall utility if her time preference pattern were hyperbolic as we observe the orange line staying consistently above the blue (exponential discounting) line.

Finding 2: *The optimal stopping time does not change when a different behaviour of borrowing is assumed. The baseline scenario results in terms of delays do not depend on the level of borrowing which is assumed will always be repaid in full. This implies that what changes is the level of utility due to a lower availability of resources.*

Summarising our findings so far:

The bounded rational agent tends to wait longer than the fully rational individual before proceeding into postgraduate studies, independently of its discounting behaviour. However the rational agent tend to postpone PGT of one year when she is affected by hyperbolic discounting bias. The amount of PG borrowing (£20,000 or £10), under the strict requirement to have enough saving at Year 10 to repay all remaining debt (UG and PG), does not affect the optimal stopping time. It only affects the level of utility (with higher borrowing leading to higher utility).

We proceed now by focusing only on the bounded rational agent who takes fully advantage of the government policy to borrow 10k to cover university fees but who makes use of accumulated savings to reduce the amount of PG borrowing needed to cover leaving expenses. We think that this type of behaviour is more consistent with the assumption on the presence of fear of debt, and it is also more realistic because normally young people face borrowing constraints and may not be able to borrow the full amount of the 10k – in addition to the 10k loan from the government- assumed to be needed for PG education. We extend this case to the scenario when the government does not offer the 10k loans for PG studies and the individual faces a credit constraint (so she cannot replace the government 10k loans for fees with a bank loans).

5.4.2 The case of conditional repayment of PG

In this section we propose another exercise in sensitivity analysis by changing the requirement for how prospective PG students may have to pay for their tuition fees after graduating from their studies. The baseline scenario assumes that at the end of year 10, the individual has accumulated enough saving to be able to repay all outstanding debt (i.e. both UG and PG **debt**). This assumption is rather strict and guarantees that the agent has the resources to honour its debt commitments. We depart from this restrictive assumption by allowing this constraint to become progressively less strict. We start by assuming that the agent who chooses to enter into PG studies with a delay of 6 years or longer after graduation would have to have enough saving in year 10 to be able to repay all remaining UG debt and PG debt based on a quota system. The quota system is designed such that the individual pays off an equal and fixed proportion of her debt in each time period out of a total tuition fee debt of £10,000. This debt repayment value to determine the quota is calculated based on the assumption that the individual has a maximum of 5 periods left (i.e. from year 6 – 10) within which she can proceed to PGT education. Thus the quota expected to be paid per period after graduating from PG studies is £2000 per year (i.e. £10,000/5). For instance, a person who proceeds into PG education at Year 7 will only be required to make £6000 payment (thus the individual makes a payment of £2000*3). This assumption means that we remove the constraint on year 10 of having enough resources to guarantee repayment of all debts, and we assume instead that the PG degree would enable him to repay in the future its remaining PG debt. The individual who enters PG studies within 5 years from graduation would not be affected by this relaxed constrain on saving in year 10, because he would have repaid all PG debt.

Furthermore, we continue by focusing on the Bounded rational agent; thus there will be no further analysis of the rational choice agent henceforth. This is because, upon careful investigation, we observe that the rational choice agent fails to perform as well as her bounded rational counterpart. Thus, Table 5.4.c and Figure 5.4.c below express the optimal stopping point for the bounded rational agent under different time discounting patterns.

£10,000 borrowed fully repaid UG Conditional repayment P (quota after 6 years) – identity = 131.52		Identity and Debt effects under the government scheme and use of saving (some PG debt left)	
	No PG	**BR– Exponential**	**BR –Hyperbolic**
Year 0 (UG grad) delay	103.200475	103.2005	103.2008
Year 1 delay		103.3862	103.3862
Year 2 delay		103.4669	103.5347
Year 3 delay		**103.4712**	**103.5572**
Year 4 delay		103.4089	103.5137
Year 5 delay		103.2905	103.4023
Year 6 delay		103.1232	103.2256
Year 7 delay		102.9863	103.0701
Year 8 delay		102.7958	102.8577
Year 9 delay		102.5133	102.5584
Year 10 delay		101.3531	101.5533

Table 5.4.c: The Case Repaying PG loans based on a quota repayment

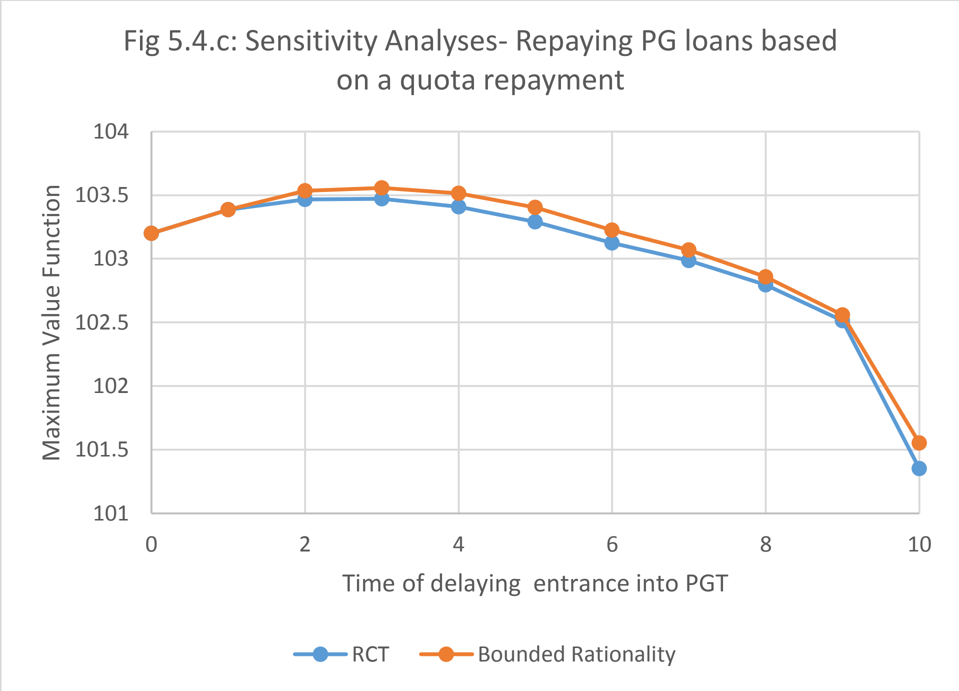


Figure 5.4.c: Comparing between exponential and hyperbolic discounting functions of the bounded rational choice when the student repays PG debt by quota form.

From what is observed from the table and graph, the individual will have an optimal stopping point of 3 years regardless of the time discounting pattern she chooses. In comparison to the prior sensitivity analysis where she is faced with having to borrow less, we notice that the individual will have an overall less utility when she has to repay based on a quota.

5.4.3 Case of no availability of government loans for PGT studies.

So far in the illustrations of the model, analysis has been made under the assumption that there is a government loan available to students seeking to study for a PGT degree. The aim of a government loan is to provide an incentive for people (particularly those from lower socio-economic backgrounds) to transition into PGT after their graduation from UG studies. Prior analysis in the baseline and earlier sensitivity analyses have shown that, when there is an indifference between transitioning immediately into PG and not transitioning at all, agents prefer to go into PGT course, even in the absence of a wage premium, and to delay the transition by 3 years, rather than not going at all. This is because they stand the prospect of gaining more utility by transitioning into PGT study. With the absence of a government loan, what is the possibility that an individual would be willing to transition into PGT? With the absence of a government loan, the only way an individual would have ventured to study at PGT level would be through bank loans and individual savings to pay for the fees.

Before we explain this new scenario, we remind the reader of what the borrowing assumptions were in the original (baseline) scenario. In the baseline scenario, we assumed that the agent could borrow £10,000 from the government for PG fees; and that she could borrow from the bank up to a maximum of £10,000 for living expenses. When there was no fear of debt, the individual borrowed the maximum amount for living expenses and tuition fees. However, because of the assumption of fear of debt, the agent would only borrow from the bank the amount not covered by her saving, whilst maintaining her loan for tuition fees.

We now change this scenario by assuming that the agent cannot borrow £10,000 from the government and that she faces a borrowing constraint for that amount. This assumption implies that she cannot start a PG Masters programme unless she has enough to pay for her £10,000 tuition fees. In other words we assume that she cannot replace the government's £10,000 loan for tuition fees with an equivalent £10,000 bank loan to cover her tuition fees. If she could do so our analysis would lead to the same results as if she could borrow from the government. We retain the assumption that she can still borrow from a bank up to a maximum of £10,000 for living expenses.

5.4.3.1 Credit Constraint (absence of a 10k government loans for widening PG participation)

The credit constraint is defined as a situation where an individual ought to have enough saved resources to pay the fees to transition into PGT education by herself. This possibility arises only after few years of working, when the individual shows an ability to pay for the tuitions to proceed into PGT. The criteria to establish that the individual has sufficient savings to proceed into PGT is that the individual can indicate that she has saved at least £10,000 which will be used for her PG tuition fees. This is reflected in Table 5.4.d.1 below. From the findings highlighted in bold in Table 5.4.d.1, the solutions of the non PG and of PG delayed choices, show that the rational choice agent will have to wait 5 years (which is reflected in Table 5.4.d.2) before she can go into PG study. Therefore, the utility from NOT transitioning into PGT will be compared to the optimal solutions of delaying 5 years and longer.

Table 5.4.d.1: The Accumulated Savings for individual under Credit Constraint: Bounded Rationality		
Waiting Time	Exponential Discounting	Hyperbolic Discounting
Year 0	£0	£0
Year 1	£1781.95	£2457.31
Year 2	£3583.61	£4848.78
Year 3	£5266.83	£7006.25
Year 4	£6687.80	£8763.72
Year 5	£7696.80	£9950.69
Year 6	**£12137.97**	**£14390.42**
Year 7	£16005.07	£18054.94
Year 8	£19135.27	£20758.59
Year 9	£21359.08	£22307.67
Year 10	£22500	£22500

Table 5.4.d.3: The Accumulated Savings for individual under Credit Constraint: Bounded Rationality

Table 5.4.d.2: The Utility Maximising values for individual under Credit Constraint: Bounded Rationality		
Waiting Time	Exponential Discounting	Hyperbolic Discounting
No PG	103.2005	103.2008
Year 3	-	-
Year 4	-	103.3764
Year 5	**103.2881**	**103.3891**
Year 6	103.1113	103.2030
Year 7	102.9300	102.9857
Year 8	102.6548	102.6728
Year 9	102.1847	102.1711
Year 10	-	-

Table 5.4.d.4: The Utility Maximising values for individual under Credit Constraint: Bounded Rationality

When comparing the effect of credit constraint (i.e. not availability of government loans) for the individual, it can be observed for the exponentially discounting individual that she can only proceed into PGT education after 5 years of saving upon graduating from UG studies. The optimal stopping point which indicates the best time to proceed into PGT would be on the 5th year after graduating from UG studies. This is later than prior assumptions where government loan support has been a critical assumption. Also, the lifetime utility as noted in year 5 (103.2881) is the only time where the prospect of transitioning into PGT can be preferred for the individual in comparison to the lifetime utility of not proceeding into PGT (103.2005). On the other hand, the individual who has discounts hyperbolically is able to save enough to proceed into PGT education after 4 years (1 year earlier than her counterpart who discounts exponentially). However, similarly to the individual who discounts exponentially, her optimal stopping point is also at Year 5. Nonetheless, she has a higher lifetime utility at this point (103.3891) than the individual who discounts exponentially (103.2881).

5.4.3.2 Credit Constraint and a Slow Repayment of UG Debt (absence of a 10k government loans for widening PG participation)

We change this new scenario by assuming that the repayment of the UG debt is lower than the original baseline model. This will enable the agent to have more saving by repaying each year less UG debt. We call this scenario" slow repayment of the UG debt and it is a relaxation of the assumption of total repayment of the UG debt by the end of 20 years from graduating from UG studies. By relaxing the assumption, the individual is required to pay a tenth of the initial amount of money that the individual paid. Thus, initially, the individual had a yearly payment of £2,250. But with the slow repayment criterion, the individual is expected to pay £225 towards her UG student loan. This measure is applied to the credit constraint analysis to observe the benefit of a less strict measure on UG loan repayment on the likelihood of proceeding into PGT. Table 5.4.e.1 shows the accumulated savings that individual compiles through time while Table 5.4.e.2 below shows a comparison between the case of the Credit Constraint and the Credit Constraint with a Slow Repayment of UG Debt for both the Exponential discounting and hyperbolic discounting individuals under the bounded rationality decision-making process.

Table 5.4.e.1: The Accumulated Savings for individual under Credit Constraint with a Slow Repayment of UG Debt: Bounded Rationality		
Waiting Time	Exponential Discounting	Hyperbolic Discounting
Year 0	£0	£0
Year 1	£3514.20	£4200.86
Year 2	£7107.28	£8393.62
Year 3	**£10643.17**	**£12411.71**
Year 4	£13980.2	£16090.87
Year 5	£16970.88	£19262.5
Year 6	£23461.64	£25751.79
Year 7	£29448.61	£31532.79
Year 8	£34771.44	£36421.94
Year 9	£39263.18	£40227.66
Year 10	£42750	£42750

Table 5.4.e.3: The Accumulated Savings for individual under Credit Constraint with a Slow Repayment of UG Debt: Bounded Rationality

Table 5.4.e.2: The Utility Maximising Values for individual under Credit Constraint with a Slow Repayment of UG Debt: Bounded Rationality		
Waiting Time	Exponential Discounting	Hyperbolic Discounting
No PG	103.3990	103.3990
Year 3	103.9941	103.7607
Year 4	**103.9889**	**103.8485**
Year 5	103.8989	103.2611
Year 6	103.7336	103.6153
Year 7	103.4359	103.223
Year 8	102.0830	102.6977
Year 9	101.7936	101.558
Year 10	-	-

Table 5.4.e. 4: The Utility Maximising Values for individual under Credit Constraint with a Slow Repayment of UG Debt: Bounded Rationality

When the requirement of a slow repayment of UG is added to the credit constraint condition, overall it is observed that the individual would be able to save enough to proceed into PGT at an earlier time regardless of the discounting process that the individual employs in comparison to the condition of only credit constraint. For both the exponentially and hyperbolically discounting individuals in this case, the individual is able to proceed into PGT after 3 years of saving. The optimal stopping time for both individuals would be in the 4th year after UG graduation. Contrary to the condition where there is only a credit constraint to consider, this condition shows that the exponentially discounting individual has a higher lifetime utility (103.9889) in comparison with the hyperbolically discounting individual (103.8485) at the optimal stopping point.

Overall, these analyses show that, in the absence of a government loan and of an alternative private loan scheme (or of other borrowing opportunity to help with fees), the agent would need to wait longer and miss the OPTIMAL waiting time to enter into PG study in comparison to prior cases where there was a government loan to support transition into PGT. This presence of binding credit constraints would lead to suboptimal dynamic equilibria.

5.5 Conclusion

In this chapter, we have explored how the theory functions given a baseline scenario and a sensitivity analysis. In the baseline scenario, we assumed a case where the individual has access to the maximum available loan for a student and chooses to use it all- knowing that she will not have any interest to pay on those loans. We then ascertain that a lack of a fear of debt raises a risk loving situation where a corner solution exists. This implies that the individual will be best benefitted if she has to proceed into PG immediately after graduation from UG. Such result goes against empirical evidence as outlined in the literature review chapter that shows individuals to possess some fear of debt which is influenced by personal and environmental circumstances. Thus, the chapter concludes by testing the baseline scenario under two sensitivity analyses; one shows what happens when individuals choose to lower their debt (only relying on savings), while the other applies both a motive to reduce money borrowed and a quota on PG payments. Furthermore, a sensitivity analysis is conducted considering what would happen if the government withdrew its loan scheme. If the agent were able to borrow from a bank what she had previously borrowed from the government, then there would not be any change to the optimal stopping point equilibrium, unless the two schemes had different interest rates. However, if the agent faced a credit constraint, then the absence of a government scheme (and of an alternative private scheme) would require her to wait longer before entering PG study until she had enough of her own resources to pay for fees. Thus, the agent misses, in this way, the OPTIMAL equilibrium stopping point and well-being she would have reached if she had been offered the possibility of borrowing for fees. Having to wait too long (5 years before entering PG) in order to accumulate enough saving to pay for fees, may possibly deter people from entering PG studies. Empirical evidence from Whitty and Mullan (2013) shows that people from lower income backgrounds are less likely than their more affluent counterparts to proceed into PGT after 3 years of graduating from UG studies. Therefore, by using a £10,000 Masters loan scheme (or by having possibility of borrowing), the government indeed widened the participation into PG by providing resources to enable people to proceed into PG studies who may have been deterred by waiting for a long period while saving their own resources to transit into PG.

In the next chapter, we apply alternate scenarios testing for the effects of interest rates and wages on the individual's optimal stopping time.

Chapter 6 Simulation results: Alternative Scenarios

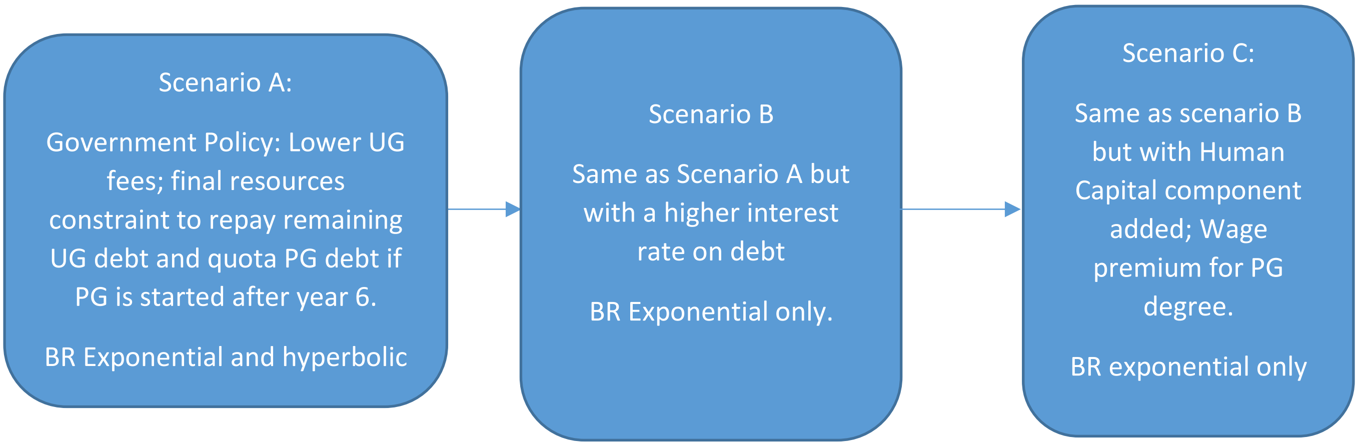
6.1. Introduction

In this section, we simulate alternate scenarios of the model presented in chapter 4: bounded rational agent with fear of debt, repayment of PG debt (or of a quota of it PG study start after 5 years). The simulations are intended to check the effects of alternative level of UG debt, of the cost of PG debt, and of the wage premia gained by PG graduates on the of the optimal stopping point solution.

We simulate alternate scenarios and we build them in a nested way: we start by allowing a different UG fee regime with reduced fees, then we introduce a higher interest rate on the PG debt and finally we introduce two wage premia. Any changes that represent a reduction of a constraint or an increased gain has a beneficial effect and it would alter the indifferent position between going immediately into PG and not going at all. Clearly going immediately into a PG can become better than not going at all. However, preferring to go now rather than never does not imply choosing to go now. Indeed, depending on the level of the wage premium, the individual is better off delaying and postponing the decision to go into PGT at a later time. The change in the optimal stopping point depends on these new conditions related to government policy and Human Capital prospects.

This chapter commences with observing a government policy whereby tuition fees for UG study is reduced, thus reducing the amount a student is required to borrow for UG study. This is followed up with an introduction of an interest rate on the amount of money an individual is required to pay in PG debt. The final inclusion to the nested process is the introduction of the wage premia. We present this result in different potential wage brackets comparing between the exponential and the hyperbolic bounded rational individuals. These brackets are: £23,000 and £25,000. Furthermore, we will also be looking at the effects of identity on the individual's utility.

Figure 6.1 overview of the chapter



6.2 Comparing reduced UG fees or less stringent requirements of repayment of the UG debt under the Bounded Rationality approach.

We start with assuming that the government fees for UG studies decrease from £9,000 per annum to £5,625 per annum and that the borrowing for UG is reduced from £45,000 to £34,875. Compared to the baseline scenario, this assumption is equivalent to assuming that the final saving constraint for the UG part is now half of what it used to be under the baseline scenario. It can be seen either as a reduction in government fees (and hence as a lower debt) or as a less stringent constraint on the final saving (requiring the individual to have resources that would to be enough to repay the high UG debt when the fees are £9,000).

The reduction of fees leads to an increase in utility, as indicated in Table 5.2.a. It is clear that all types of agents in Year 0 have higher utility than in the scenario with higher UG fees (previous chapter 4). The increase in utility due to lower fees is more beneficial for those who go immediately into PG than for those not going at all. So a reduction in fees, ceteris paribus conditions, would remove the indifference between going into PG immediately after graduating from UG studies or not transitioning to a PG course at all. To re-establish the indifference we need to reduce the identity factor, so as to make the pursuing of a PG degree less important for the identity of an individual.

Table 6.2.a Reduction in UG debt; £10,000 borrowed for PG tuition fees and use of saving to reduce borrowing for living expenses (quota for remaining PG debt)			
	No PG	**BR– Exponential**	**BR –Hyperbolic**
Year 0 (UG grad) delay	103.6065	103.6414 Identity factor 131.52	103.6416 Identity factor 131.52
Year 1 delay		103.7693291	103.4785
Year 2 delay		**103.7994627**	103.5483177
Year 3 delay		103.7675177	**103.9119524**
Year 4 delay		103.68243	103.4349
Year 5 delay		103.5515402	103.2692
Year 6 delay		103.39603	103.4717263
Year 7 delay		103.2702422	103.0349237
Year 8 delay		103.0944376	102.651314
Year 9 delay		102.833261	102.5905955
Year 10 delay		101.6821703	101.1850308

Table 6.2.a : Alternate Scenario: The Case of a Reduction in UG debt using old identity factor

Table 6.2.a explores the effect of a reduction of UG debt on the optimal stopping time given the initial identity factor value of 131.52. From the table above, we firstly observe that there is a significant difference between the utility values where there is no willingness to transition into PGT (No PG) and the options to transition immediately after graduating from UG studies (Year 0) under both hyperbolic and exponential discounting measures. The bounded rational exponential discounting optimal solution is now two years while the hyperbolic discounting optimal solution is three years. To start again from an indifference position between the exponential discounting and hyperbolic discounting utility maximising values at the point of immediate transition into PGT, we recalibrated the identity factors for both discounting, thereby reducing the identity variables. This means that a PG degree is perceived to be less important for someone's identity. Table 6.2.b and Figure 6.2 report the results.

Table 6.2.b Reduction in UG debt; 10k borrowed for PG tuition fees and use of saving to reduce borrowing for living expenses (quota for remaining PG debt)			
	No PG	**BR– Exponential**	**BR –Hyperbolic**
Year 0 (UG grad) delay	103.6065	103.6065 Identity 128.751	103.6067 Identity – 128.751
Year 1 delay		103.7366293	102.9838
Year 2 delay		**103.7689324**	103.5168747
Year 3 delay		103.7395326	**103.884498**
Year 4 delay		103.6783663	103.4087
Year 5 delay		103.5293236	103.2458
Year 6 delay		103.3567291	103.4529157
Year 7 delay		103.2410949	102.9299169
Year 8 delay		103.0742685	102.4100861
Year 9 delay		102.8207511	102.0938881
Year 10 delay		101.6724533	101.6907474

Table 6.2.b : Alternate Scenario: The Case of a Reduction in UG debt using new identity factor

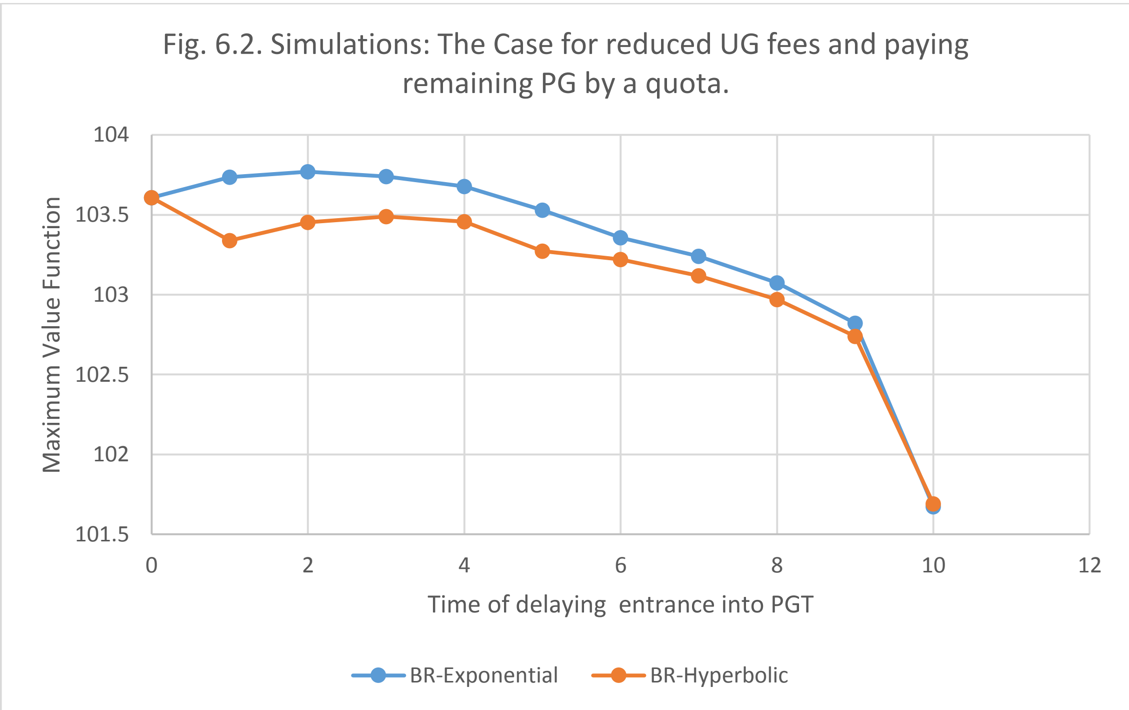


Fig. 6.2. Simulations: The Case for reduced UG fees and paying remaining PG by a quota.

Starting from an indifference position we return to the conditions set at the baseline scenario. Here, we can see still, that the optimal stopping point is 2 years from UG graduation, but the value function for each year reduces (as a result of the reduction in the identity factor). Interestingly, the hyperbolic discounting still presents the same delay despite the recalibration. Since the hyperbolic discounting time preference yields an overall postponement of the decision to transition into PGT study, for this reason, we decide to carry on using the exponential discounting case.

Finding 3: *A reduction in the UG fees (or in the constraint of the UG debt repayment) affects the optimal stopping time solution for only the exponential preference reducing the time the agent wants to wait to move into PG by 1 year.*

6.3 Comparing Reduced Fees and Higher Interest Rate on PG Debt: Bounded Rationality Approach and Exponential Discounting only.

We focus on the bounded rational exponential discounting case because this is the type of agent who, in the absence of a wage premium, has shown "resistance" in transiting immediately into PG study and preferring to wait before going into PG even when going immediately was preferred than not going at all. We increase the interest rate on the PG debt from 0 (baseline) to a 5% (we use a simple interest rate rule). So the interest rate was computed on the PG debt and then the total was divided into 5 repayment quotas. Table 5.3.a shows the results of the simulation. As expected, an increase in the interest rate reduces the utility maximising values function of each year. This means that overall satisfaction reduces for the individual. It also makes the decision of not going into PG at all preferred to the decision of going immediately. However, the increased rate does not change the optimal stopping time: after 2 years the utility of going into PG study is higher than the utility of not going.

TABLE 6.3 Reduction in UG debt; 10k borrowed for PG tuition fees and use of saving to reduce borrowing for living expenses (quota for remaining PG debt) Higher interest rate.			
	No PG	**0% Interest Rate**	**5% Interest Rate**
Year 0 (UG grad) delay	103.6064532	103.6065	103.556044
Year 1 delay		103.7366293	103.691219
Year 2 delay		**103.7689324**	**103.7287366**
Year 3 delay		103.7395326	103.7037727
Year 4 delay		103.6783663	103.6464135
Year 5 delay		103.5293236	103.5002412
Year 6 delay		103.3567291	103.3296005
Year 7 delay		103.2410949	103.2203987
Year 8 delay		103.0742685	103.0585856
Year 9 delay		102.8207511	102.8083868
Year 10 delay		101.6724533	102.2147252

Table 6.3: Alternate Scenario: The Case of a Reduction in UG debt and interest rates using new identity factor

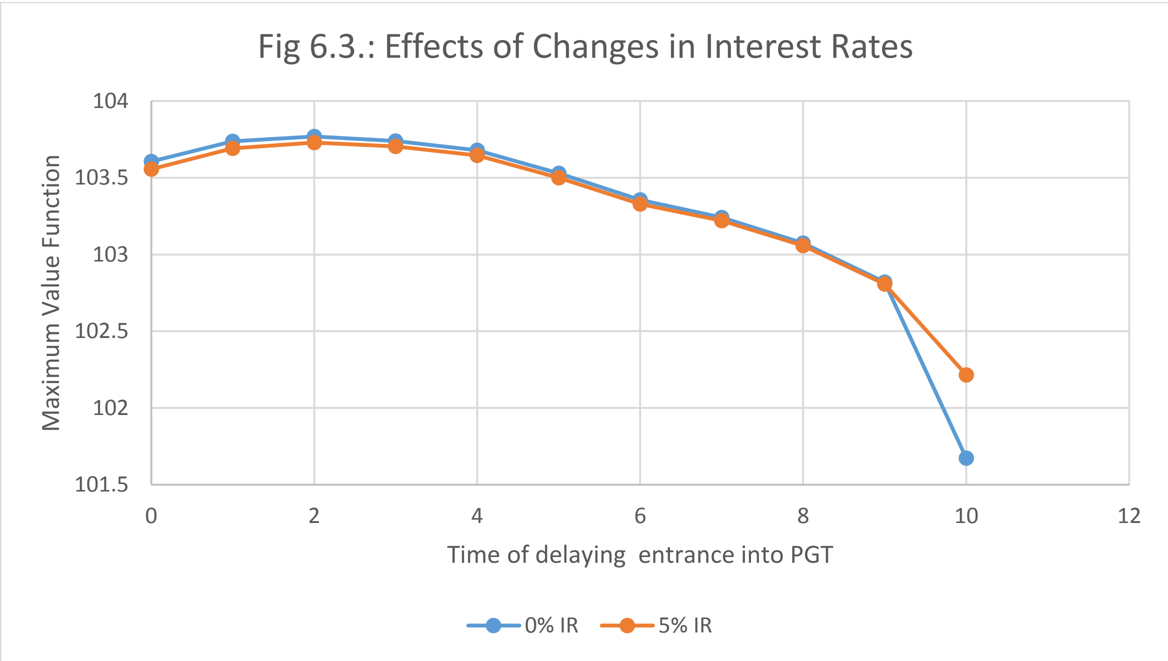


Figure 6.3: Alternate Scenario: The Case of a Reduction in UG debt and interest rates using new identity factor

6.4 Comparing Reduced Fees on UG, Higher Interest Rate on PG Debt and Wage Premium: Bounded Rationality Approach and Exponential Discounting Only

Human Capital Scenario: Introducing wage premium into the previous model, makes the individual strictly prefer PGT education to non PG. As expected, the maximum utility at Year 0 is higher under the human capital scenario (wage premium gained by having a PG qualification). The justification of the wage premium stems from the primary notion in Human Capital Theory which claims that education is a pivotal tool that indicates an individual's ability to perform a particular job, and to be able to gain higher wage. This theory asserts that the more education a person possesses, the better chance he/she is to attain more specialist jobs. As a result, the benefit associated with an extra year of higher education (in the form of a PGT qualification) will yield an individual a higher utility via higher wage (more resources). We made the following hypothesis:

Hypothesis 1: The higher the expected income, the earlier the individual will transition into PGT.

Table 6.4 and Figure 6.4 show interesting results. As expected, the presence of wage premium, added to the modified baseline model, leads to reduce the waiting time before entering PG education. Those who go attribute intrinsic value to the PG and, when the Human Capital is introduced, the financial gains of the degree prompts the individual to move forward the optimal stopping time and hence the individual is best advantaged if she studies earlier for her degree despite the presence of an interest rate of 5%. If the wage premium is high enough, the optimal stopping point is to go immediately. This is exemplified when the wage is £25,000 after completing PGT studies as indicated in Table 6.4 below. From the table also, we notice that as expected income after completion of PG studies increases, the overall utility of the individual through time increases too. Thus, in the presence of a fear of debt through the impact of higher interest rates on PG debt payment, the individual is confident that she can pay it off as she expects a better standard of living after PGT course is completed.

TABLE 6.4 Reduction in UG debt; £10,000 borrowed for PG tuition fees and use of saving to reduce borrowing for living expenses (quota for remaining PG debt). Higher interest rate. Wage premia				
	No PG	**Wage = £21,000 BR– Exponential**	**Wage = £23,000 BR– Exponential**	**Wage = £25,000 BR– Exponential**
Year 0 (UG grad) delay	103.6064532	103.556044	104.5190486	**105.3930686**
Year 1 delay		103.691219	**104.5612543**	105.3580123
Year 2 delay		**103.7287366**	104.4906259	105.1896444
Year 3 delay		103.7037727	104.364998	104.9725955
Year 4 delay		103.6464135	104.2116133	104.7317389
Year 5 delay		103.5002412	103.9784335	104.4187684
Year 6 delay		103.3296005	103.724107	104.0875244
Year 7 delay		103.2203987	103.5270622	103.8100815
Year 8 delay		103.0585856	103.2813048	103.4872771
Year 9 delay		102.8083868	102.9486721	103.078903
Year 10 delay		102.2147252	102.2147252	102.2147252

Table 6 4: Alternate Scenario: The Case of (Wage Premia) Human Capital

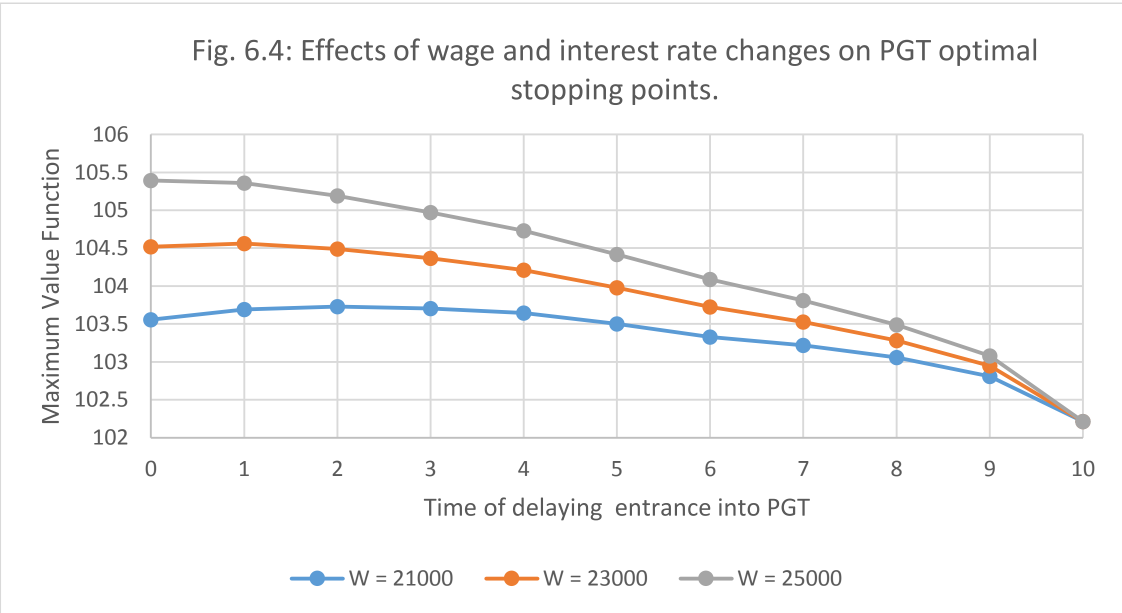


Figure. 6.4: Effects of wage and interest rate changes on PGT optimal stopping points.

6.5. Conclusions

Observing through this chapter, we observe firstly that a reduction in tuition fees alters the indifference balance between both the exponential and hyperbolic discounting perspectives in favour of going rather than not going. We recalibrated it and we observed that the hyperbolic case presents still a delay relative to the exponential discounting. To this end, we use the exponential case for the remainder of this analysis. When an interest rate is included to the PG fee, we observe that the optimal stopping time is shifted by 1 year into the future. This connotes the effects of a financial constraint on the willingness to proceed into PG. In other words, with the expectation of an added interest rate, an individual becomes hesitant to proceed into PG study. Finally, we use the new interest rate of 5% and test the impact of human capital prospects by improving the expected wage from £21,000 to £23,000 and £25,000. We find that as the expected wage increases, the optimal stopping point improves by 1 year, so that with an expected income of £25,000, the individual will be best willing to proceed into PG immediately after graduating from UG study. This implies that the idea of an improvement on a person's concept of self – as illustrated through potential increases in human capital- surpasses the impact an increase in PG debt will have on an individual's perception of debt. Thus, it can be alluded that although financial constraints impede an individual from making a decision to proceed into PG, the benefits to an individual's identity when perceived through an improvement in expected wages has an impact on an individual's willingness to proceed into PG which surpasses the negative impact of financial constraints.

Chapter 7 Empirical Tests on Duration of Waiting Time.

7.1 Introduction

The previous chapter of this thesis sought to establish the optimal time an individual would choose to transition from UG to PG study given various constraints and enablers. Following those findings, this section of the thesis seeks to provide more context regarding drivers, motivating factors as well as individual characteristics that play a role in individuals' decisions about the timing to proceed into PG education.

7.2 Research Design

The overall empirical research of which this thesis is based on is a case study as intensive analysis in form. It is a case study in the sense that it is primarily concerned with the motives that encourage people to study PGT using Masters Students in the University of Greenwich as the case in point. The empirical analysis conducted in this thesis is a part of an overarching study conducted by Dr Gabriella Cagliesi and Prof. Denise Hawkes that consists of:

1. STEP 1: Before PGT enrolment: - A study of Third Year students who are bound for UG graduation; investigating the drivers and enablers that may encourage them to apply to study at PGT level. Here, data was gathered through a series of questionnaires.
2. STEP 2: During PGT: - A study of Masters Students to investigate the motives for them studying at PGT level. Data was collated through questionnaires to Masters' students
3. STEP 3: After PGT: - A follow-up of Alumni of the University of Greenwich to observe their pathways in life. This was done through observations from administrative records:

The procedure can be presented diagrammatically in Table 7.1 below:

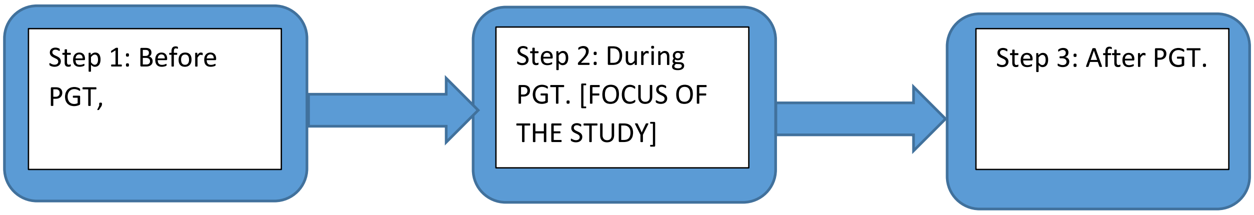


Table 7. 2: Overarching Case Study design

From the diagram above, the aspect of core interest in this thesis is the analysis on students who have decided to proceed into PGT. Crucially, it is important to emphasise that this chapter does not explore the issue to do with how to encourage students to proceed into PGT (i.e. the supply-side of the equation on transition into PGT). It focuses on the students who have already made the decision to explore why they decided to proceed into PGT. The analysis will be conducted based on a conditional probability on the choice of having proceeded into PGT. What is being studied in this chapter ultimately are the factors that influence the timing of proceeding into PGT. We do not study the factors that determine the choices of transitioning into PGT as we do not study those who chose not to proceed into PGT.

Thus, the empirical analysis in this chapter is based a case study of Masters students at the University of Greenwich using pooled survey data collected from three consecutive waves for a total of 358 PG students across all three campuses of the University of Greenwich. This is conducted as part of an overarching research into the efficacy of the Fast Forward Masters' Programme scheme as expressed in the diagram above. These surveys were part of research funded by HEFCE aimed a widening participation into PG study.

The University of Greenwich used the fund to create a scheme called the Fast Forward (FF) Masters Programme which offered financial and non-financial incentives to high performing home Greenwich graduates to advance into postgraduate taught degrees. The FF programme started in the 2014/2015 academic session, with 150 places available to eligible home applicants with first and upper second degree from lower socioeconomic backgrounds, subject to a simple financial means threshold of a household income of £40,000. Applications were also welcomed from final year undergraduates who were predicted to achieve same quality of degrees, with acceptance on the scheme conditional on achieving it.

The university's FF Master's Scheme offered a discount of 60% off normal tuition fees, a voucher of **£500** towards study expenses such as books and IT, the support of a senior career mentor. Places were allocated to a specific set of Master's programmes that in addition to the STEM subjects, included also Architecture, Design and Construction, Business, Education Heath and Social Care, Humanity and Social Sciences.

This format was repeated for the 2015/16 academic session using the same format except the need for a career mentor. This was conducted to focus on the core impact of financial aid as an incentive to encourage people to consider transition into PGT programmes. Following the success of the programme, and in light of PSS2, in 2016/2017 and 2017/2018 academic sessions, the university provided an investment of £400,000 annually to continue the Fast Forward programme (University of Greenwich, 2017). In the scheme as it stands, 80 students who are either longstanding alumni or recent graduates are provided with a £5,000 scholarship which can either be used the students can disburse[57] with as they see fit. As at the 2017/2018, the tuition fee scholarship will accompany the new government approved loan arrangement for people looking to study a master's degree in the UK. Currently the key requirements for eligibility and beneficence of obtain the Fast Forward fund are:

- Applicants have to be current third-year students at the University of Greenwich at the time of their application.
- Applicants will have to declare a household income less than £43,000 to be considered for the fund.
- Applicants will need to show a predicted upper-second class degree or a first class degree to apply.

7.3 Data

With data collected from FF recipients and non-recipients of the scheme, this section seeks to measure a range of factors that capture postgraduate students' experience about Higher Education. Fundamentally, we seek to unravel the differences in motives that drive people to transition into PG whilst asking key questions about the effect of financial incentives and

[57] Students can either use it to pay a part of their tuition or have it as a cash bursary.

identity differences (i.e. socioeconomic status, personal information) on individuals' reasons to proceed into PG education.

Data were obtained in 3 waves collected annually between 2015 and 2017. The participants included in these surveys were questioned on their sociobiological demographics, financial situation and expectations from PG education. Full samples of the questionnaires can be found in the Appendix section of the thesis. The analysis below will seek to provide key details on how financial constraints and personal socio-demographic identity may influence an individual's decision to proceed into PG education. In the following subsections, the data will be analysed based on information that span collectively across all waves, as well as information unique to survey 1 and surveys 2 and 3.

7.4 Descriptive Statistics

In this subsection, the aim is to explore key representations across all waves. Topic areas of interest here will include biographical information (e.g. age group, gender and ethnicity), information on individual financial constraints (e.g. eligibility for FF scheme, UG tuition fee) and matters concerning individual characteristics (e.g. time of transition into PGS, UG Degree classification). A full description of each variable and the scaling process can be observed through the Appendix section of this thesis.

7.4.1 All Data Collected[58] Across all Waves.

Across all waves, there were a total of 358 participants. Out of a population of students who were part of the PGT programme at the University of Greenwich over the three years the survey was conducted (6,043 students), the sample is approximately 6% of the total population. The table below shows a proportional distribution of the participants given certain criteria. These criteria represent demographical information on age, gender, ethnicity and age group. Also, there are status variables on the time the individual made transition into

[58] Here, the data analysed in this subsection only refers to information that was synonymously obtained across all waves of the survey.

PG education, changes in tuition fees, beneficence for the Fast Forward Masters' Programme and prior undergraduate degree classification.

Regarding the response rates, the table below shows compares between the overall number of students across the waves and across different categories. The data for the university student numbers were acquired from the University of Greenwich's Planning and Statistics Department. For each wave of the study, all students were contacted to participate in the survey through the University's Office of the Director for Learning Experience. Thus, the overall population of students who were expected to participate were all the current PG students at the university at the time of the respective waves. The results below are cumulative across all waves.

Table 7.4.1 – Comparison between Fast Forward Sample and the Population of University of Greenwich Students Across all Waves				
Classification		Greenwich PGT	FF PGT	Response Rate
Gender	Female	3422	217	6%
	Male	3168	141	4%
Ethnicity	Asian/ Asian British	1410	181	12.8%
	Black/ Black British	989	13	1.3%
	Mixed Heritage	303	67	22%
	White	3079	77	2.5%

Table 7.4. 1 – Comparison between Fast Forward Sample and the Population of University of Greenwich Students Across all Waves

Participants in this study were Masters Students who were studying at the time the study was conducted. Thus it is emphasised that Alumni (i.e. those who had concluded their Master's studies and were no longer a part of the university were not a part of the population from which he sample was drawn from. It is important to note that from the data above, it can be noted that the possibility of a selection (selectivity) bias may exist in the nature of the non-response rate. The non-response rate is the proportion of those who did not respond to the call to participate in the survey. The selectivity bias with regards to the nature of the non-respond rate arises from the notion that there is a possibility that some non-respondents systematically chose not to engage in the survey; hence making the sample size not randomly selected. Thereby, this means that the sample that participates is not an accurate representation of the population of PG students at the University of Greenwich. This is largely due to the likelihood that people who had chosen to participate in the study could also have been those who were more likely to transition into PGT immediately after graduation from UG education. Thus, it could be inferred that those who were less likely to participate could also have been those who may have taken longer to transition into PG study. To verify this inference through data sample matching is difficult because the University of Greenwich's Planning and Statistics department (PAS) does not have the data on the graduation dates of those who are not alumni of the university. Also, for those who replied to the call to participate in the survey, we were able to possess the data for when the lapsed time between when they graduated from their UG studies and when they chose to transition into PGT courses. However, we do not possess data for lapsed time between UG graduation and PGT enrolment for all Master's students over the course of our study.

In Table 7.4.1, we observe that nearly half of all participants were in the 2015 wave (44.97%). Amongst those who were more represented in their groups include females (60.61%), Asians/ Asian British (53.55%), those in the 18-24 age group (31.01%), and individuals who decided to transition into PG immediately after their UG studies (38.34%). Considering that a majority of the participants are within the 2015 wave, it explains the fact that the tuition fee bracket with the highest representation is the £3,000 cap: which was in place between the 2006/2007 to 2011/2012 academic session. Students who obtained a Merit (i.e. Upper Second class and Lower Second Class degrees) in their undergraduate degree were also the highest represented as is in line with research (see HESA 2017).

This data will be further analysed through viewing variables as they are represented across the dataset.

Table 7.4. 2: Pooled Sample: General Descriptive Statistics.

Variable		*Count*	*Proportion*
Wave	2015	161	44.97%
	2016	97	27.1%
	2017	100	27.93%
Gender	Female	217	60.61%
	Male	141	39.39%
Ethnicity	Asian or Asian British	181	53.55%
	Black or Black British	13	3.85%
	Mixed Heritage	67	19.82%
	White	77	22.78%
Age Group	18-24	111	31.01%
	25-29 years old	103	28.77%
	30-30 years old	83	23.18%
	Older than 39 years old	61	17.04%
Transition Paths	Immediate Continuer	97	38.34%
	Returner (1 – 3 years)	75	29.64%
	Returner (4 – 6 years)	29	11.46%
	Returner (> 6 years)	52	20.55%
Tuition Fee Changes	Pre-£3,000 cap	49	19.37%
	£3,000 cap	132	52.17%
	Post-£9,000 cap	72	28.46%
Fast Forward	Beneficiary	84	29.17%
	Non-Beneficiary	204	70.83%
UG Degree Class.	Distinction	52	31.71%
	Merit	86	52.44%
	Pass	26	15.85%

a) <u>Descriptive Statistics based on Age Group (Row percentages)</u>

Table 7.4.2.a above represents a re-categorisation of each variable listed based on age groups. Thus, we identify how each demographic is presented according to their age groups. As is the case in HESA (2017), we observe firstly that most of the participants who were immediate continuers were between the 18 – 24 age group, most of those that chose to return after between 1 – 6 years are between the 25 – 29 age group and those who choose to return after 6 years are from the "above 39" age group. This is reflective of a simple dynamic in the distribution of participants over time: the younger an individual is, the more likely (s)he will commence PGT immediately after UG studies (Universities UK; 2015, 2017). Most continuers are within the 18 – 24 age group as 18 years is the minimum age for an individual to commence undergraduate study; thus, the likelihood that the individual who proceeds into PGT is within this age group is high. Also, a majority of Black/Black British participants are within the 25 – 29 age group. Possible explanation for this information include the likelihood that these students surveyed may have thought the need to earn an income for personal and family sustenance to be more important than going to PGT immediately after graduating from UG. Thus, the need to venture back to PGT can be explained as a strategy to change careers or to climb the corporate ladder.

Table 7.4.2.a: Descriptive Statistics based on Age Groups

		18-24	25-29	30-39	Above 39
Wave	2015	37.89%	26.08%	22.98%	13.05%
	2016	25.76%	39.15%	23.69%	11.33%
	2017	24.99%	22.97%	6.42%	29.00%
Gender	Female	31.79%	30.42%	20.74%	17.06%
	Male	29.78%	26.25%	26.94%	17.01%
Ethnicity	Asian/ Asian British	27.07%	31.49%	21.55%	19.89%
	Black/ Black British	15.33%	76.88%	7.92%	0%
	Mixed Heritage	47.78%	35.82%	11.96%	4.49%
	White	32.49%	10.40%	33.36%	23.40%
Transition Paths	Immediate Returner	55.66%	21.65%	12.36%	10.30%
	Returner (1 – 3 years)	33.33%	34.68%	20%	12.01%
	Returner (4 – 6 years)	3.49%	69.02%	24.17%	3.49%
	Returner (> 6 years)	0%	11.53%	38.49%	50.02%
Tuition Fee Changes	Pre-£3,000 cap	0%	6.14%	40.84%	53.07%
	£3,000 cap	34.85%	43.93%	12.11%	9.09%
	Post-£9,000 cap	47.22%	16.65%	24.98%	11.10%
Fast Forward	Beneficiary	38.09%	17.86%	33.32%	10.73%
	Non-Beneficiary	25.98%	32.84%	21.08%	20.10%
UG Degree Class.	Distinction	28.86%	36.55%	25.01%	9.62%
	Merit	39.53%	29.06%	18.61%	12.80%
	Pass	42.33%	7.70%	26.94%	23.09%

b) *Descriptive Statistics based on Gender (Row percentages)*

As established in Table 7.4.2.b, female participants surpass male participants by approximately 1.5:1 across all years, thus it clearly explains why there are more females represented in each variable comparison. Interestingly, in Table 7.2.2.b, the distribution of white female to males is approximately 50:50, which suggests that white males are more advantaged to proceed into PGT in comparison to males from other ethnic groups. The only other group with a similar distribution are those who had a Pass (Third) UG degree classification.

Table 7.4.2.b - Descriptive statistics based on Gender

		Female	Male
Ethnicity	Asian/ Asian British	68.52%	31.48%
	Black/ Black British	61.56%	38.44%
	Mixed Heritage	56.71%	43.29%
	White	50.66%	49.34%
Transition Paths	Immediate Returner	52.58%	47.42%
	Returner (1 – 3 years	64%	36%
	Returner (4 – 6 years)	65.53%	34.47%
	Returner (> 6 years)	71.14%	28.86%
Tuition Fee Changes	Pre-£3,000 cap	69.39%	30.61%
	£3,000 cap	58.33%	41.67%
	Post-£9,000 cap	61.10%	38.90%
Fast Forward	Beneficiary	54.75%	45.22%
	Non-Beneficiary	64.22%	35.79%
UG Degree Class.	Distinction	16.46%	15.24%
	Merit	62.80%	37.20%
	Pass	50.03%	50.03%

c) *Descriptive Statistics based on Ethnicity*

Looking at the different ethnic groupings in Table 7.2.1.c below, it is observed that most Black/Black British participants return to PGT education between 1 – 3 years after graduating from UG education. They also represented the least amount of recipients of the Fast Forward Masters programme; with their Asian counterparts being the major recipients of the fund. A conjecture to place here is that, an incentive such as the £10,000 FF fund is not a lucrative incentive to study for a PGT.

Table 7.4.2.c Descriptive Statistics based on Ethnicity

		Asian/ Asian British	Black/ Black British	Mixed Heritage	White
Transition Paths	Immediate Returner	47.63%	4.33%	23.81%	27.05%
	Returner (1 – 3 years	47.61%	6.98%	16.80%	25.20%
	Returner (4 – 6 years)	68.76%	3.58%	14.49%	18.06%
	Returner (> 6 years)	74.70%	0%	12.12%	10.07%
Tuition Fee Changes	Pre-£3,000 cap	74.96%	0%	10.69%	10.69%
	£3,000 cap	27.8%	3.73%	9.96%	53.53%
	Post-£9,000 cap	13.28%	0.41%	6.22%	27.8%
Fast Forward	Beneficiary	11.44%	0.74%	6.27%	9.59%
	Non-Beneficiary	47.6%	2.58%	9.59%	12.18%
UG Degree Class.	Distinction	17.31%	1.92%	0.64%	0.61%
	Merit	23.72%	2.56%	12.18%	14.1%
	Pass	4.49%	0.64%	5.13%	5.13%

d) *Descriptive Statistics based on Time of Transition into PGT*

The Transition variable observes those who have moved from UG to PGT between the year of their graduation and some point in the future. Crucially, this variable seeks to question how different demographics behave when given the choice to proceed to PGT at timeframes given constraints. Thus, we observe that those who studied for their UG pre-£9,000 tuition fee was most represented amongst those who chose to come back to university after 4 years from graduating with their UG degrees. Thus, such individuals are more likely to have less financial constraints from tuition fee debt burden.

Table 7.4.2.d Descriptive Statistics based on Transition[59] into PGT

		Immediate Returner	*Returner (1 – 3 years*	*Returner (4 – 6 years)*	*Returner (> 6 years)*
Tuition Fee Changes	Pre-£3,000 cap	0%	0%	2.07%	97.93%
	£3,000 cap	31.07%	44.70%	21.22%	3.03%
	Post-£9,000 cap	77.76%	22.21%	0%	0%
Fast Forward	Beneficiary	56.11%	29.62%	7.75%	4.68%
	Non-Beneficiary	26.15%	30.72%	14.39%	28.76%
UG Degree Class.	Distinction	52.07%	23.15%	8.67%	20.25%
	Merit	55.99%	24.49%	3.49%	7.00%
	Pass	52.11%	23.15%	5.80%	40.50%

[59] when students decided to proceed into PGT education

e) *Descriptive Statistics based on Beneficiary of Fast Forward Programme.*

The general observation made from investigating the Fast Forward variable in Table 7.4.2.e is that there are more participants who are non-beneficiaries of the Fast Forward Masters Programme, than there are regardless of demographical differences. This alludes to the primary criteria for receipt of the funding opportunity: which is derived purely from an equality of opportunity standpoint.

Table 7.4.2.e Descriptive Statistics based on Fast Forward[60] recipients

		Beneficiary	*Non-Beneficiary*
Tuition Fee Changes	Pre-£3,000 cap	0.72%	97.99%
	£3,000 cap	31.95%	64.79%
	Post-£9,000 cap	39.44%	45.79%
UG Degree Class.	Distinction	13.82%	20.33%
	Merit	43.02%	55.82%
	Pass	15.39%	73.94%

7.4.3 Testing for Independence

As a first step in making analyses of the data, we proceed to test for independence by obtaining the chi-squared statistics through cross-tabulating key variables. The Chi-Squared test is conducted on categorical variables to assess the existence of an association between two variables. This association is performed by comparing between the arrangements of observed responses across both variables against that of expected responses assuming both variables in a cross-tabulation were truly independent. To this end, we define our Chi-Squared formula in equation 6.1 as:

$$\chi^2 = \sum (O - E)^2 / E \qquad (7.1)$$

[60] The Fast Forward programme is an initiative designed by the University of Greenwich to encourage academically exceptional students from disadvantaged backgrounds to proceed into PGT education.

Where:

"O" refers to observed frequency and "E" is a representation of the expected frequency of a variable. This analysis is conducted under the following hypotheses:

H_0= Both variables are independent of one another (i.e. $\chi^2_{calc} < \chi^2_{crit}$)

H_1= Both variables are not independent of one another (i.e. $\chi^2_{calc} > \chi^2_{crit}$)

Where χ^2_{calc} represents the test statistic and χ^2_{crit} is the chi-squared critical value. All critical values are conducted under a p-value of 0.05 and a table expressing this is located in Appendix 6.2.2. From this perspective, we make a cross-tabulation to compare key variables as seen in Tables 7.4.3.a and 7.4.3.b. Table 7.4.3.a shows the cross tabulation with the test statistic, degree of freedom and the p-value for the test statistic. This information is used to derive the nature of association between each pair of comparison and this is expressed in Table 7.4.3.b.

As indicated in the expression of the null and alternate hypotheses, we reject the null hypothesis when the test statistic is greater than the critical value. By rejecting the null, this means that the variables show some sort of relation, because they are not statistically independent. We observe this when assessing the association between the Tuition Fees (representing the categories of different levels of tuition fees that has been paid as a result of different government policies[61].) with all other variables, except for the Gender variable. On the contrary, when the null hypothesis is not rejected then the two variables can be assumed to be statistically independent and therefore they do not show a systematic relation. In the Table 7.4.3.a, for instance, a person's gender is independent of all other variables except the ethnicity variable, and similarly for Degree Classification is only related to Tuition Fees. Furthermore, ethnicity, age group, Transition, and recipients of the Fast Forward grants are all related across themselves. All other associations not identified in this analysis are observed to be dependent on each other, hence implying the null hypothesis is rejected.

[61] We start from the policy of no tuition fee (represented as 0), then we have the policy of £3000, and finally we end with the £9,000 tuition fee policy.

Table 7.4.3.a: Pooled Data: Chi-squared[62] test statistics across selected variables.

	Gender	Ethnicity	Age Group	Transition	Tuition Fee	Fast Forward	UG Degree Class
Gender	NA	**8.242 (3) (0.041)***	2.052 (3) (0.562)	5.685 (3) (0.128)	1.841 (2) (0.398)	2.245 (1) (0.134)	2.241 (2) (0.326)
Ethnicity	**8.242 (3) (0.041)***	NA	**48.853 (9) (0.000)***	**17.110 (9) (0.040)***	**16.089 (6) (0.013)***	**16.431 (3) (0.001)***	4.787 (6) (0.556)
Age Group	2.052 (3) (0.562)	**48.853 (9) (0.0000)***	NA	**113.998 (9) (0.000)***	**99.546 (6) (0.000)***	**14.295 (3) (0.002)***	0.844 (6) (0.122)
Transition	5.685 (3) (0.128)	**17.110 (9) (0.040)***	**113.998 (9) (0.000)***	NA	**276.129 (6) (0.000)***	**25.483 (3) (0.000)***	8.622 (6) (0.186)
Tuition Fee	1.841 (2) (0.398)	**16.089 (6) (0.013)***	**99.546 (6) (0.000)***	**276.129 (6) (0.0000)***	NA	**13.855 (2) (0.001)***	**11.360 (4) (0.023)***
Fast Forward	2.245 (1) (0.134)	**16.431 (3) (0.001)***	**14.295 (3) (0.003)***	**25.483 (3) (0.0000)***	**13.855 (2) (0.0009)***	NA	3.903 (2) (0.142)
UG Degree Class	2.241 (2) (0.326)	4.787 (6) (0.556)	9.844 (6) (0.131)	8.622 (6) (0.186)	**11.360 (4) (0.023)***	3.903 (2) (0.142)	NA

Table 7.4.3.b: Pooled Data: Chi-squared test[63] of independence across selected variables (Nature of association)

	Gender	Ethnicity	Age Group	Transition	Tuition Fee	Fast Forward	UG Degree Class
Gender	NA	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$
Ethnicity	$\chi^2_{calc} >$	NA	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$
Age Group	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	NA	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$
Transition	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	NA	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$
Tuition Fee	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	NA	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$
Fast Forward	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	NA	$\chi^2_{calc} < \chi^2_{crit}$
UG Degree Class	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	$\chi^2_{calc} > \chi^2_{crit}$	$\chi^2_{calc} < \chi^2_{crit}$	NA

[62] Values in the bracket besides the test statistic represent degrees of freedom, while the value in brackets below the test statistic in each cell refers to the p-value of the test statistic. The values in **bold** are those which are statistically significant under a p-value of 0.05.

7.4.4 Testing for Monotonicity (Spearman Test)

Unlike the Chi-square conducted in the prior section, the Spearman test checks for the strength of association between two ordinal variables. This measure works as a better test for the existence of a monotonic relationship between categorical variables as represented in the structure of survey data similar. We represent the data derived from this survey is tied, the Spearman rank correlation is calculated based on:

$$\rho = \frac{\sum_i (x_i - \bar{x})(y_i - \bar{y})}{\sqrt{\sum_i (x_i - \bar{x})^2 \sum_i (y_i - \bar{y})^2}} \qquad (7.2)$$

Where *i* is the paired score of both variables, with both variables represented as x and y. The hypotheses arguments are represented as:

$$H_0: \rho_s = 0 \qquad (7.3.a)$$

$$H_1: \rho_s \neq 0 \qquad (7.3.b)$$

Thus, the null hypothesis posits that there is no monotonic relationship within the sample; while the alternate hypothesis indicates that a relationship exists between variables in the sample.

Looking through the Table 7.4.4., we notice that the strongest linear relation (correlation) exists between the time an individual transitions and the tuition fee changes over time. With a strong negative correlation (-0.75), it shows that the longer an individual wait to transition into PGT, the less likely she would have been a part of the later increases in tuition fees. As expected, we also notice a significant moderate positive correlation between the time an individual proceeds into PGT and the individual's age group (0.5), indicating that longer delaying time is associated with older respondents. Interestingly, the type of degree classification an individual achieves does not appear to be statistically correlated with any of the selected variables in the table. These results is also confirmed in our estimation of the Ordered Logit below.

Table 7.4.4: Cross-tabulation based on Spearman's Test

	Age Group	Transition	Tuition Fee	UG Degree Class
Age Group	**1.000 (0.0000)***	**0.507 (0.0000)***	**-0.395 (0.0000)***	-0.004 (0.9599)
Transition	**0.507 (0.0000)***	**1.000 (0.0000)***	**-0.748 (0.0000)***	0.027 (0.7840)
Tuition Fee	**-0.395 (0.0000)***	**-0.748 (0.0000)***	**1.000 (0.0000)***	0.074 (0.4423)
UG Degree Class	-0.004 (0.9599)	0.027 (0.7840)	0.074 (0.4423)	**1.000 (0.0000)***

Note: The variables chosen here are those identified as ordinal in nature.

7.4.5 Polychoric Correlation

Similar to the Spearman's test, polychoric correlation is a viable measure of the relationship between two ordinal variables. Unlike the Spearman's test, however, the polychoric correlation does not imply the existence of a monotonic relationship. It instead assumes that the continuous measure underlying the ordinal variable is normally distributed; thus making its measure of ordinal variables to be more accurate (Homer, P and O'Brien, R. (1988)). In other words, it is used when variables are continuous and linearly related but are divided into categories. Also, given the small sample size used in data analysis in this work, the polychoric correlations have been proven to be a more reliable and robust estimator (see Joreskog and Sorbom, 1996). The equation below shows the maximum likelihood estimate of the polychoric correlation ρ:

$$\log L\,(\rho, \alpha; X) = \sum_{i=1}^{n} \log \pi(x_{i1}, x_{i2}; \rho, \alpha) \qquad (6.4)$$

In Table 7.4.5 below, we observe that a majority of the variables maintain a moderate (positive or negative) relationship between one another. Of particular interest is the moderate positive relationship (0.6 approx.) between the amount of UG tuition fee an individual paid and the nature of degree classification an individual attains. This result is also expressed in the Spearman's correlation above. We also observe a moderate negative relationship between a person's degree classification and her age.

Table 7.4.5: Polychoric Correlation Test

	Age Group	Transition	Tuition Fee	UG Degree Class
Age Group	1			
Transition	0.093	1		
Tuition Fee	-0.215	-0.028	1	
UG Degree Class	-0.480	0.0468	0.606	1

7.5 Regression Analysis

To estimate the impact of individual identity and financial constraints on one's willingness to proceed into PGT, we use the data derived from our estimated sample of PGT students between the 2015/2016 – 2017/2018 academic sessions. We take into account individual idiosyncrasies as well as socio-economic constraints to explore the motive for individuals to proceed into PGT education. To do this, an ordered logit model is used to conduct a regression analysis. Logit models are used to solve regressions with a single dependent variable and various independent variables. The motive to use the ordered logit model stems from the fact that our dependent variable[64], "Lapsed Time", is a categorical variable with categories that are ordinally arranged, as indicated in Table 7.5.1. This model allows for a better interpretation of probabilities in comparison to linear probability models (LPMs) as LPMs predictive values may be greater than 1 or less than 0 (Ai and Norton, 2003). This model was also chosen as opposed to the ordered probit firstly because unlike the ordered probit, the ordered logit does not assume its underlying distribution is a normal one. Instead, it assumes that the distribution is a logistic one: a student either transitions into PGT at a given time period or she does not. Furthermore, in logit models the natural logarithm of odds which belongs to ordinal dependent variable is expressed as a linear function of the independent variables, therefore logit model is a member of "generalized linear models" family and logit transformation (the natural logarithm of the independent variable's odds) is used as a link function. This feature enables to convert coefficients into odds ratios through exponentiation- which aids interpretative purposes.

[64] This will be explained further in the next section.

On the other hand, a major critique of the ordered logit model is one to do with the proportional odds, which is criticised as being unrealistic depending on the scenario (Borooah, 2002). According to this assumption parameters should not change for different categories, and the correlation between independent variable and dependent variable does not change for dependent variable's categories. In other words, the proportional odds assumption notes that coefficients that describe the lowest category against all higher categories of the dependent variable are the same as those that describe the relationship between the next lowest category and all higher categories, e.t.c. This is considered to be unrealistic in the sense that a one-unit increase in an independent variable (IV) does not have the same effect on the probability of a response being in a higher category regardless of category.

Borooah (2002) also argues that estimates may be biased if strictly ordered outcomes do not hold. To solve this issue, he recommends that outcomes be treated as "non-ordered" unless there are good reasons for making outcomes ordered. In our model the dependent variable is a clear ordered variable (time) and it is not unrealistic to assume proportionality assumption for many of the IV. We tested it using the omodel[65] command in Stata and we cannot reject the null that there is proportionality. Therefore, we do not need a stereotype logit regression analysis because we are sure that our categories can be ranked (ordered) as exemplified in our Lapsed Time variable to be discussed in Section 7.5.1.

7.5.1 Ordered Logit

We define an ordered logit model as a regression model used when the dependent variable is ordinal in nature. This model is based on the cumulative probabilities of the dependent variables. Mainly, the model functions such that the logit of the cumulative probabilities is assumed to be a linear function of the covariates with the coefficients being constant across the various categories in the dependent variable. The ***Lapsed Time***$_i$ ordinal variable is a function of a continuous and unmeasured latent variable LT*. The values from LT* determine what our ordinal LT is, as indicated in Table 7.5.1 below. LT is divided into 4 categories to explain the time it takes to make a transition into PGT, as follows:

[65] As the omodel command does not allow interaction terms, we had to delete all interactions.

Table 7.5.1: The order of Lapsed Time between UG graduation and start of PG study

Lapsed Time	*Years to transition to a PG programme.*
0	Choose to study for a PGT immediately
1	Transitions between 1 – 3 years after UG
2	Transitions between 4 – 6 years after UG
3	Transitions after 6 years from UG studies

Understanding the ordered nature of the dependent variable, this implied that an ordered logit model would be an ideal estimator of the impact of personal characteristics and financial constraints on the time an individual transitions into a PGT course.

In an ordered logit model, the latent dependent variable (say LT*) has a number of threshold, in this case we have 4 thresholds (represented as τ). So, the observed LT is defined based on which threshold the latent LT* falls, as follows:

$$LT_i = 0 \text{ if } LT_i^* \text{ is} \leq \tau_0 \qquad (7.5)$$

$$LT_i = 1 \text{ if } \tau_0 \leq LT_i^* \leq \tau_1 \qquad (7.6)$$

$$LT_i = 2 \text{ if } \tau_1 \leq LT_i^* \leq \tau_2 \qquad (7.7)$$

$$LT_i = 3 \text{ if } LT_i^* \geq \tau_2 \qquad (7.8)$$

With the nature of the thresholds established above, we know what our ordinal LT would equal at various thresholds. To define the population of the continuous latent LT*, the following model is estimated:

$$LT_i^* = \sum_{\tau=0}^{T} \beta_\tau X_{\tau i} + \varepsilon_i = LT_i + \varepsilon_i \qquad (7.9)$$

Here, β is a vector of coefficients that correspond with various independent variables (represented by X). Thus, the LT can be represented in an Ordered Logit estimate as:

$$LT_i = \sum_{\tau=0}^{T} \beta_\tau X_{\tau i} = E(LT_i^*) \qquad (7.10)$$

We further define an estimate for LT at sample level (LT_i^+) following an estimate for the thresholds as:

$$LT_i^+ = \sum_{\tau=0}^{T} \beta_\tau X_\tau \qquad (7.11)$$

With LT clearly defined, an estimate of each threshold (expressed in 6.5 – 6.8) can be defined as the follows:

$$P(LT = 0) = \frac{1}{1+exp(LT_i^+ - \tau_0)} \qquad (7.12)$$

$$P(LT = 1) = \frac{1}{1+exp(LT_i^+ - \tau_1)} - \frac{1}{1+exp(LT_i^+ - \tau_0)} \qquad (7.13)$$

$$P(LT = 2) = \frac{1}{1+exp(LT_i^+ - \tau_2)} - \frac{1}{1+exp(LT_i^+ - \tau_1)} \qquad (7.14)$$

$$P(LT = 3) = 1 - \frac{1}{1+exp(LT_i^+ - \tau_2)} \qquad (7.15)$$

We use the above approach to estimate the following equation:

$$Lapsed\ Time_i = f(\ \beta_0 Age_i,\ \ \beta_1(Age_i * Gender_i),\ \beta_2 STEM_i,\ \beta_3 FF_i,\ \beta_4 Fee\ Regimes_i,\ \beta_5(Exp.Income_i * BME_i)\ \ ,\ \ \beta_6 Agreeable_i,\ \beta_7 Newpol_i) \quad (7.16)$$

Where:

Lapsed Time $_i$ is our dependent variable, a categorical ordered variable which represents the length of time an UG graduate i takes to make transition to study for a PGT degree;

Age*i* is an ordinal variable segmented by age groups. These age groups are marked as 1 if the individual is between 18 – 24 years old, 2 if the individual is aged 25 – 29 years old, 3 if she is aged between 30 – 39 years old, and 4 if she is over 39 years.

STEM*i* is a binary dummy variable which is equal to one for students studying STEM-related degrees and zero otherwise.

$\boldsymbol{Fee\ Regimes_i}$ is a categorical variable that differentiates people based on the amount of tuition fee they had to pay when they were in their UG study. Here, we explore students who studied prior to when the £3,000 tuition fee was introduced in 2004 based on the HE Act of 2004 and implemented at 2006/2007 academic session (identified as 0 for those who studied prior to 2006). Then we also have those who were subject to the £3000 tuition fee (identified as 1) and we also look at students who were subject to the recent increase in tuition fees to £9,000 (identified as 2).

$\boldsymbol{Agreeable_i}$ is also a binary dummy variable which is one when the individual states that she has the agreeableness psychological trait, zero otherwise; this was created through asking the respondents to identify on a Likert scale basis, how they relate to these statements:

- I see myself as someone who is generally trusting
- I see myself as someone who tends to find fault with others

The Likert scale goes from Disagree strongly = -2; Disagree a little = -1; neither agree nor disagree = 0; Agree a little = 1 and Agree strongly = 2. For values less than and equal to zero, these were rescaled to 0; while for values greater than zero, we rescale to 1.

$\boldsymbol{Newpol_i}$ is a binary dummy variable that depicts the effects of the most recent legislation (2017) on tuition fee loans for Post graduate education. It assumes the value of one if the individual falls within the period of the new legislation, and zero otherwise. This legislation suggests that the government will be making provisional loans available for students wishing to study a PGT course.

$\boldsymbol{BME_i}$**:** This is a binary variable used to identify students who are of Black and Minority Ethnic backgrounds. We characterise a respondent as 1 if she is of a BME background, and 0 otherwise.

$\boldsymbol{Exp.Income_i}$**:** This is an ordered categorical variable that expresses what the respondents expect to earn upon graduating from their PG studies**.** These expected incomes are marked as 1 if the individual expects to earn an annual income less than £21,000, 2 if the individual expects an annual income between £21,001 and £29,999; 3 if the expected income is between £30,000 and £39,999; and 4 if she expects to earn above £40,000.

$\boldsymbol{Gender_i}$**:** The gender variable is a binary variable identifying students who identify themselves as male or female. Male is defined as 1 if the respondent identified as Male, and 2 if the person is female.

There are two interaction terms. The first one is an interaction between age group and gender. Here, we are exploring the transition behaviour of people of different genders based on their gender. The second one is between ethnic groups and expected income. Here, we seek to observe the effect of expected income on the likelihood an individual would proceed into PG immediately- or at a later time.

We analyse the estimating function in 6.5 as depicted in Table 6.3.1 below. As seen below, through a list-wise deletion of incomplete cases, we have total number of observations of 200, as against the pooled sample of 358. Looking at the Likelihood Ratio Chi-Squared test checking for the probability that at least one of the regressor coefficients is not equal to zero is valued at 253.26. Comparing our p-value against a significance level (α) of 0.05, it is evident that it is < 0.000. Thus, we cannot reject the null that the coefficient of at least one of the predictor variables is not equal to zero.

Table 7.5.2: Ordered Logit Model

Variables	Ordered Logit	
	β	SE
Age group	**0.981*** **	0.281
Agegroup x Gender		
1. Agegroup x 1. Gender	1.182	0.719
2. Agegroup x 0. Gender	0.733	0.698
2. Agegroup x 1. Gender	**1.482** **	0.568
3. Agegroup x 0. Gender	**2.018** **	0.748
3. Agegroup x 1. Gender	**1.553* **	0.761
4. Agegroup x 0. Gender	-0.932	0.862
4. Agegroup x 1. Gender	0	-
UG Fee Regimes	**-0.399*** **	0.046
STEM	**-0.895** **	0.392
Fast Forward	**-1.465*** **	0.435
Exp. Income x BME		
1. Exp. Income x 1. BME	**-1.777** **	0.752
2. Exp. Income x 0. BME	**-1.891** **	0.908
2. Exp. Income x 1. BME	-1.269	0.791
3. Exp. Income x 0. BME	**-2.068* **	1.210
3. Exp. Income x 1. BME	**-1.800** **	0.896
4. Exp. Income x 0. BME	**-2.041* **	1.160
4. Exp. Income x 1. BME	-0.899	0.860
Agreeableness	**-0.694* **	0.420
Newpol	-0.091	0.619
Constant Cut 1	**-5.812*** **	1.380
Constant Cut 2	**-2.634* **	1.342
Constant Cut 3	-0.579	1.324
Observations	200	
Log-Likelihood	-138.168	
LR chi^2(19)	253.26	
Prob>chi^2	0.000	
Pseudo R-squared	0.478	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Observing the estimates for each predictor variable, some interesting results are derived. We focus our interpretation on coefficients – and we can interpret them the same way as we interpreted binary logit coefficients. So we can interpret the sign and the significance but not the size of the coefficients in the table above: a positive coefficient means an increase in the probability of waiting longer before entering a PG degree. To gain an understanding of the magnitude of the effects, we would need to convert the coefficients into odds ratios (Table 7.4.3).

As expressed in the appendix, the Age group variable is an ordinal one that represents an ordered log-odds estimate for a one unit increase in Age group on the expected Lapse Time the individual may experience before proceeding into PGT. When all other variables are held constant, we observe that higher categories of the IV Age, increase the probability to wait longer. This means that if an increase in one unit of the age category (going from category (18 – 24), for instance into category (25 – 29)) would lead to an increase in the delay entry into PG. This is not surprising, and as expected as younger respondents tend to enter sooner into PG study and that the older an individual get, irrespective of gender, the more likely that such individual will proceed at a later time. However when we interact with gender, we can see that this effect of gender is different across categories of age groups.

Reflecting similar results we have in the simulations chapter, enhanced human capital prospects (Exp.Income) have a positive impact on encouraging individuals to proceed into PG. Most interestingly, this is observed as we interact the expected income after graduating from PG with the BME variable. In general, when considering the prospects of better income, the interaction terms suggest that there are differences at different level of Exp.Income and BME respondents. Individuals from a BME background would be more inclined to proceed immediately particularly at higher categories of expected income. As expressed in HESA (2017), this implies that the presumption of a reduction in future financial constraints may have an impact on BME person's intention to proceed into PG sooner.

The UG Fee Regime variable is a categorical variable that highlights the various changes in government policy that has had an impact on the tuition fees students have paid over time. This variable is particularly important as it looks at the burden of debt for students who commenced UG studies at different times over the past 3 decades. From what is observed, as the burden of debt increases, the student is less likely to proceed into PG at a later time. This can be explained by observing. This result would seem not in line with our simulation in chapter 5 where we found that a policy of reduced UG fees and debt would make the agent prefer a PG solution to a non PG one and would also reduce the waiting time to enter a PG degree. In those simulations we compared the effect of debt on the same agent (hence the effect on the same person of facing two different scenario) and we concluded that, given the ceteris paribus condition on all other variables, lower UG debt would imply widen PG participation.

In these estimates however, the different levels of UG debt are associated to respondents of different age and hence the variable UG fees captures a time effect rather than policy effect. Lower UG fees and lower debt is most likely chronologically associated with those Master respondents who are also older and who have waited longer before entering the PG degree.

STEM is a variable that catches the impact of proceeding to PG as a student studying a STEM-related course. As observed above, the ordered logit for a STEM inclined student proceeding into PG after 6 years is -0.895 less than students who studied a non-STEM related course in their undergraduate degree. This inversely implies that STEM students are more likely to proceed into PG earlier than other students.

Beneficiaries of the Fast Forward scheme are expected to proceed into PG soon after they graduate from UG due to the criteria for being a recipient of this scheme. Through looking at the ordered logit for the impact of this scheme, it is observed that being a beneficiary of this scheme motivates you to study earlier than 6 years after graduating from UG. Thus, it can be inferred that the Fast Forward Masters Scheme is a good incentive to encourage individuals to proceed into PGT.

The motive to test the Agreeableness personality trait stems from the notion that people who are considered to be agreeable tend to be considerate and welcoming to new ideas in comparison to others who did not share this characteristic. As explained earlier, we measured agreeableness under the notion that individuals who may be more willing to proceed into PGT sooner would tend to be trusting and tend not to find faults with others. For a one unit increase in agreeableness (i.e. going from 0 to 1), we expect a -0.69 fall in the log odds of proceeding into PG at a later time periods in comparison with those who are not agreeable in character. In other words, the ordered logit for people who tend to be agreeable proceeding into PG at a later time is -0.69 less than those who tend to not be agreeable when all other variables are held constant.

Although we notice that the new government policy on tuition fee loans has a positive impact on encouraging individuals to proceed immediately into PGT, it is not statistically significant in both the 1% and 5% significance levels.

From the various cut-points, we know that our thresholds lie between -5.812 and -0.579. Knowing that we have 4 thresholds, we can express the values of LT as:

$$LT_i = 0 \text{ if } LT_i^* \text{ is } \leq -5.812 \quad (7.16)$$

$$LT_i = 1 \text{ if } -5.812 \leq LT_i^* \leq -2.634 \quad (7.17)$$

$$LT_i = 2 \text{ if } -2.634 \leq LT_i^* \leq -0.579 \quad (7.18)$$

$$LT_i = 3 \text{ if } LT_i^* \geq -0.579 \quad (7.19)$$

Equation 6.16 represents the estimated threshold point on LT_i^* used to differentiate those who choose to transition into PGT immediately after graduating from UG and those who chose to make this progression within 1 – 3 years after UG graduation when all the regressors are evaluated at zero. Subjects who had a LT_i^* of ≤ -5.812 would be classified as those who proceeded into PG immediately after UG graduation. In a similar vein, we look at equations 6.17 and 6.18 as estimated mid-level thresholds. Subjects that have a value between -5.812 and -0.579 are classified as those who proceeded to PG within 1 – 6 years after UG graduation.

7.5.2 Odds Ratio

Understanding that the dependent variable (Lapsed time) is an ordinal variable, an odds ratio has been employed to observe how much the need to make a transition into PGT (at various transition times) is dependent on respective independent variables. We derive these odds by taking the exponential values of the ordered logit coefficients to each independent variable. This is performed by using e^{coeff} as pertains to each variable. Typically, the ordered logit model estimates a single equation over different levels of the dependent variable as established by the threshold nature of the dependent variable. By using the odds ratio, we are changing the levels of the dependent variable in a cumulative sense such that we can compare people within a threshold level against others in other threshold levels all within the dependent variable. This can be interpreted in this way:

If the odds ratio is greater than one, then the presence of a quality (if the regressor is a dummy) or an increase of one unit change (if the regressor is a categorical variable) would increase the odds of waiting longer before entering a PG degree relative to waiting shorter (or to going immediately).

If the odds ratio is smaller than one, then the presence of a quality (if the regressor is a dummy) or an increase of one unit change (if the regressor is a categorical variable) would increase the odds of waiting shorter or (going immediately) relative to waiting longer.

Older people (when we move from one age category to the next) have higher odds (**2.6**) to wait longer before entering PG than younger people. This is not a surprise because in older respondents in our sample have most likely completed their UG degree when they were young and waited before entering the PG degree.

Looking at the interaction term, we explored the odds of an individual proceeding into PG studies given gender and age effects. Here, the base reference point (1. Age group x 0. Gender)[66] refers to people within 18 – 24 years old who are male. Of the various combinations between gender and age group, only these combinations below have statistical significance:

- 2. Age group x 1. Gender: This shows that for a female making transition into PG within the age of 25 – 29, the odds of waiting longer versus transitioning immediately into PG is **4.40** greater than would be the case for men within the 18 – 24 age bracket.
- 3. Age group x 0. Gender: For men aged 30 – 39 years old, the odds of making a transition into PGT at a later period in comparison to a decision to study for a PG degree immediately after UG graduation is **7.52** times greater than the odds than would be the case for men who are aged 18 – 24 years old.
- 3. Age group x 1. Gender: Finally, for women in their 30s, the prospect of studying at a later period in comparison to making an immediate decision to do so after UG graduation is **4.72** times greater than would be the case for our base reference group (males within 18 – 24 years old). In comparison to men (with 7.5 odds of making a later transition into PG in their 30s), women (at 4.72 odds) were less likely to make a later transition into PG in their 30s.

[66] As noticed in the table, this is the only group within the range of interactions that is not represented.

In general, this interaction term shows that the older an individual is implies that the individual is more likely to have waited a longer period of time before making a transition intoPG study. Thus, an individual's age is not a defining motive to accelerate an individual's decision to proceed into PGT.

Table 7.5.3 Ordered Logit Model (Odds Ratio)

Variables	**Ordered Logit (Odds Ratio)**	
	β	SE
Age group	**2.666*** **	0.748
Agegroup x Gender		
1. Agegroup x 1. Gender	3.261	2.345
2. Agegroup x 0. Gender	2.067	1.442
2. Agegroup x 1. Gender	**4.400*** **	2.480
3. Agegroup x 0. Gender	**7.522*** **	5.624
3. Agegroup x 1. Gender	**4.724***	3.594
4. Agegroup x 0. Gender	0.394	0.339
4. Agegroup x 1. Gender	1	-
UG Fee Regimes	**0.671*** **	.0311
STEM	**0.408** **	.160
Fast Forward	**0.231*** **	.101
Exp. Income x BME		
1. Exp. Income x 1. BME	**0.170** **	.127
2. Exp. Income x 0. BME	**0.151** **	.137
2. Exp. Income x 1. BME	0.281	.222
3. Exp. Income x 0. BME	**0.126***	.153
3. Exp. Income x 1. BME	**0.165** **	.148
4. Exp. Income x 0. BME	**0.130***	.151
4. Exp. Income x 1. BME	0.407	.350
Agreeableness	**0.499***	.210
Newpol	0.914	.565
Constant Cut 1	**-5.812*** **	1.378
Constant Cut 2	**-2.634***	1.341
Constant Cut 3	-0.579	1.324
Observations	200	
Log-Likelihood	-138.168	
LR chi^2(19)	253.26	
Prob>chi^2	0.000	
Pseudo R-squared	0.478	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

For students who study a STEM-related subject in their PGT we note that for a unit increase in STEM[67] (i.e. moving from 0 to 1), the odds of proceeding immediately or at earlier stages are 2.45 bigger than those to proceed at a later time (i.e. after 6 years). This shows that a student who aims to study a STEM-related course is at least 2.45 times more likely to proceed immediately into PGT as opposed to those who do not study a STEM-related course.

Another interaction term that we analyse are the odds of an individual proceeding into PG studies given expected income and BME effects. In this case, the base reference (1. Exp. Income x 0. BME) refers to non-BMEs who expect an annual income less than £21,000. Of the various combinations between BME and expected income, only these combinations below have statistical significance:

- 1. Expected Income x 1. BME: Here, we see that people of BME groups are 5.88 times more likely to proceed into PG earlier (i.e. immediately after graduating from UG) versus going later in comparison to non-BME UG graduates. Given that £21,000 was the average income at the time the study commenced, this observation questions the perceptions BMEs have about their opportunities in the labour market. It alludes to the common phrase that people of BME backgrounds are expected to work harder to attain the same opportunities as those of non-BME backgrounds.
- These expected incomes are marked as 1 if the individual expects to earn an annual income less than £21,000, 2 if the individual expects an annual income between £21,001 and £29,999; 3 if the expected income is between £30,000 and £39,999; and 4 if she expects to earn above £40,000.
- 2. Expected Income x 0. BME: Those who are non-BME but expect an annual income within the range of £21,000 - £29,999 have odds of 6.62 times to proceed into PG immediately versus going into PG at a later time in comparison to non-BME expecting an income less than £21,000.
- 3. Expected Income x 0. BME: For those who are not of a BME background but expect an annual income within the range of £20,000 - £39,999, the odds of making a transition into UG immediately versus transitioning at a later time is 7.94 times that

[67] As earlier stated, a student is registered as 0 if she did not enrol to study a STEM-related degree, and 1 if she was studying a STEM related PG course.

of a non-BME expecting an income less than £21,000. We also observe that the odds of transitioning immediately versus a later transition time given an expected income within this range has better odds (7.94) in comparison with the proceeding into PG (6.62) when expected income is less than £21,000 for the non-BME respondent.

- 3. Expected Income x 1. BME: We observe that for BME respondents expecting an income within £30,000 - £39,999, the odds of making a transition into UG immediately versus transitioning at a later time is 6.06 times that of a non-BME expecting an annual income less than £21,000. When comparing against the BME individual expecting an annual income less than £21,000, we observe that the individual expecting an annual income within the range of £30,000 – 39,999 has greater odds of transitioning into PG as would her counterpart (at
- 4. Expected Income x 0. BME: For those who are not of a BME background but expect an annual income greater than £39,999, the odds of making a transition into UG immediately versus transitioning at a later time is 7.69 times that of a non-BME expecting an income less than £21,000. This shows that the non-BME individual is a little less likely to proceed into PG given an expected income greater than £39,999 in comparison with the individual who expects an income in the range of £30,000 - £39,999 (7.94).

Overall, from the interaction between BME and expected income, we find that for people who are not of a BME background, the odds of making the move into PG study gets stronger as the expected income increases. This shows that the expectation of a better financial future is a positive motive to encourage people of non-BME backgrounds to make transition to PG sooner. This is also the case for the individual from a BME background. Here, we notice that, for statistically significant interactions, the higher the expected income for a BME individual, the more likely will it be a motive for her to make an immediate transition into PG studies.

When observing the UG Fee regime variable, we notice that for a one unit increase in UG Fee regime, the odds of proceeding later versus proceeding in intermediary time periods and immediately after UG studies combined are **0.671** times lesser, given the other variables are held constant in the model. This implies that as government-endorsed UG tuition fees increase, students are more likely to proceed into PG.

With a unit increase in Fast Forward (i.e. moving from 0 – 1)- in other words, for an individual who is a beneficiary of the Fast Forward scheme, the odds of proceeding immediately after UG versus going at a later time is 4.32 times greater, all variables held constant.

Finally, for those with an agreeable trait, the odds of advancing immediately into PG increases versus any future time period by 2 times when increasing the likelihood that an individual is agreeable by a unit of one. This means that an individual with the agreeableness trait is twice as likely to proceed immediately into PG as an individual who is does not possess the agreeableness characteristic.

7.5.3 Macroeconomic Effects

Moving further from the primary model, this subsection considers the effects of macroeconomic events on the transition time for various PGT students. To this effect, we consider two different macroeconomic effects within the context of the United Kingdom: the real Gross Domestic Product (GDP) per capita and the Youth Unemployment. These variables were chosen because by definition, they provide a lot of emphasis that can give an extra layer of understanding on why people choose to transition into PGT. These would be further discussed in the next subsection.

We could not use these variables in their continuous form because our data is largely ordinal in nature due to the primary research nature of the core data gathering process. Thus, for instance, the value of real GDP per capita in 2014 was paired with those who transitioned into PGT in 2014/2015 academic session. It is important to note here that a limitation to using these macroeconomic variables is due to the continuous nature of their data can cause misrepresentation.

Due thought[68] was given to pairing average nominal GDP per capita with various "blocks" of the Lapsed time variable (e.g. if a student transitioned into PGT in 2014 after graduating within 1-3 years before 2014, then the student could have been paired with an average of GDP per capita between 2012 and 2014). However, this move creates an over-specification bias because there will be a creation of many variables to address the various combinations of the Lapsed Time (between UG graduation and PGT enrolment) and various average GDP per capita values. Thus, we focus on using the current GDP per capita values within the three waves of the study because it allows us to study how individual economic output may (or may not) impact the motives for transitioning into PGT.

7.5.3.1 <u>Gross Domestic Product (GDP) Per Capita</u>

The Real Gross Domestic Product (GDP) per capita measures the total economic output of a country whilst making an account for the number of people in it with consideration to inflationary effects. Thus, it is the best measure of the standard of living of people within a country. Unlike average incomes which was used in the model section of this study, the real GDP per capita provides an account of the amount of output produced by each working individual within an economy whilst adjusting for inflation. Expected income- a variable in this model- only provides perceptions of the income people have of their likely future earnings. Thus, with real GDP per capita, we can estimate the effect of current individual economic output on the likelihood of individuals deciding to proceed into PGT.

To study this effect, we decided to use real GDP per capita as a dummy variable which represented the value of GDP per capita of the UK at a period ahead of each year the data was gathered through data from the World Bank. The values were derived as levels (i.e. the actual monetary values of the real GDP per capita). Thus, students who transitioned into PGT were paired with the real GDP per capita that was the case a year before they transitioned into PGT. This comes from the intuition that current economic decisions are largely influenced

[68] A similar line of thought was considered for the calculation of Youth Unemployment, but it arrived at the same conclusion. That it leads to over-specification bias.

by prior economic events. The table below shows the additional effect of GDP per capita on the likelihood of transiting into PGT education.

Table 7.5.4: Ordered Logit Model with GDP Per Capita

Variables	Ordered Logit	
	β	SE
Age group	**0.915*****	**0.284**
Agegroup x Gender		
1. Agegroup x 1. Gender	1.17	0.717
2. Agegroup x 0. Gender	0.893	0.707
2. Agegroup x 1. Gender	**1.469***	**0.568**
3. Agegroup x 0. Gender	**2.149*****	**0.763**
3. Agegroup x 1. Gender	**1.588****	**0.762**
4. Agegroup x 0. Gender	-0.810	0.865
4. Agegroup x 1. Gender	0	(omitted)
UG Fee Regimes	**-0.412*****	**0.048**
STEM	**-0.922****	**0.394**
Fast Forward	**-1.500*****	**0.439**
Exp. Income x BME		
1. Exp. Income x 1. BME	**-1.908****	**0.757**
2. Exp. Income x 0. BME	**-1.947****	**0.909**
2. Exp. Income x 1. BME	**-1.391***	**0.794**
3. Exp. Income x 0. BME	**-2.348***	**1.23**
3. Exp. Income x 1. BME	**-1.950****	**.909**
4. Exp. Income x 0. BME	**-2.062***	**1.155**
4. Exp. Income x 1. BME	-0.974	0.863
Agreeableness	**-0.709***	**0.425**
Newpol	-0.416	0.655
GDP (Per Capita)	0.0003	0.0002
Constant Cut 1	.652	4.493
Constant Cut 2	3.829	4.493
Constant Cut 3	5.937	4.528
Observations	200	
Log-Likelihood	-137.03	
LR chi^2(19)	255.54	
Prob>chi^2	0.000	
Pseudo R-squared	0.4825	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

We observe firstly that prior real GDP per capita does not have any statistically significant effect on the decision to transition into PGT. Furthermore, it shows that standards of living increases has no effect on the waiting time to transition into PGT.

Given that prior analysis on real GDP per capita used levels, we decided to observe the effect when growth rates are used instead. To this effect, the Table 6.4.5 depicts the impact of GDP growth rates on the waiting time to transition into PGT.

Table 7.5.57: Ordered Logit Model with GDP Growth Rate.

Variables	Ordered Logit	
	β	SE
Age group	**0.985*** **	**0.283**
Agegroup x Gender		
1. Agegroup x 1. Gender	1.043	0.729
2. Agegroup x 0. Gender	0.5	0.712
2. Agegroup x 1. Gender	**1.395***	**0.574**
3. Agegroup x 0. Gender	**1.882***	**0.746**
3. Agegroup x 1. Gender	**1.464***	**0.769**
4. Agegroup x 0. Gender	-1.06	0.874
4. Agegroup x 1. Gender	0	(omitted)
UG Fee Regimes	**-0.403*** **	**0.047**
STEM	**-0.857***	**0.392**
Fast Forward	**-1.273*** **	**0.446**
Exp. Income x BME		
5. Exp. Income x 1. BME	**-1.589***	**0.764**
6. Exp. Income x 0. BME	**-1.682***	**0.921**
2. Exp. Income x 1. BME	**-1.106**	**0.801**
7. Exp. Income x 0. BME	**-1.646**	**1.244**
3. Exp. Income x 1. BME	**-1.644***	**0.896**
8. Exp. Income x 0. BME	-1.890	1.178
4. Exp. Income x 1. BME	-0.758	0.871
Agreeableness	-0.635	0.421
Newpol	0.189	0.643
GDP (Growth Rate)	**0.929***	**0.521**
Constant Cut 1	-3.345	1.932
Constant Cut 2	-0.086	1.951
Constant Cut 3	1.977	1.947
Observations	200	
Log-Likelihood	-136.571	
LR chi^2(20)	256.46	
Prob>chi^2	0.000	
Pseudo R-squared	0.484	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Unlike the case of the real GDP per capita, in the case of the GDP growth rate, we observe that there is statistically significance at the 10% level. This goes to indicate that as economic output increases, people are less likely to transition early to PGT when they finish UG study.

7.5.3.2 Youth Unemployment

Considering that a majority of the sample used in this analysis are classified as youths (i.e. they age between ages 18-24), it is only important to observe whether the event of youth unemployment advances the need to proceed into PGT study. Data for this variable were acquired from the UK Office for National Statistics (ONS) and was derived in a dummy manner representing the three years of the survey. The values were represented as percentages of the total youth labour force. This means that the youth unemployment figures are annual averages. From the table below, we observe that an individual is more likely to proceed into PGT at an earlier time as youth unemployment increases. This reflects similar trends where periods of higher unemployment encourage people to improve their skill-sets through studying advanced degrees including PGTs.

Table 7.5.6: Ordered Logit Model with Youth Unemployment

Variables	**Ordered Logit**	
	β	SE
Age group	0.481	0.309
Agegroup x Gender		
1. Agegroup x 1. Gender	0.296	0.766
2. Agegroup x 0. Gender	0.779	0.734
2. Agegroup x 1. Gender	0.933	0.618
3. Agegroup x 0. Gender	**2.255*****	**0.803**
3. Agegroup x 1. Gender	1.239	0.832
4. Agegroup x 0. Gender	-0.746	0.951
4. Agegroup x 1. Gender	0	(omitted)
UG Fee Regimes	**-0.527*****	**0.059**
STEM	**-0.796*****	**0.405**
Fast Forward	-0.443	0.486
Exp. Income x BME		
1. Exp. Income x 1. BME	**-1.531*****	**0.763**
2. Exp. Income x 0. BME	-0.977	0.925
2. Exp. Income x 1. BME	-1.074	0.795
3. Exp. Income x 0. BME	-1.297	1.38
3. Exp. Income x 1. BME	**-1.792****	**.916**
4. Exp. Income x 0. BME	-1.170	1.214
4. Exp. Income x 1. BME	-.5687	0.9
Agreeableness	-0.371	0.452
Newpol	-0.933	0.661
Youth Unemployment	**-3.134*****	**0.561**
Constant Cut 1	-25.12	3.861
Constant Cut 2	-21.278	3.644315
Constant Cut 3	-18.724	3.539651
Observations	200	
Log-Likelihood	-119.137	
LR chi^2(20)	291.33	
Prob>chi^2	0.0000	
Pseudo R-squared	0.550	

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

7.6 Conclusions

In this chapter of the thesis, we proceeded to identify the effects of financial constraints and individual identity differences on transitions into PG study. After various tests, we identify the structure of the model to be used and the nature of the various variables. Identifying our dependent variable as Lapsed time as an ordered categorical variable, we decide to use an ordered logit estimation process. Lapsed time shows an order to which individuals may transition to PG study: from 0 if she chooses to transition immediately to 3 if she considers transitioning after 6 years. The ordered logit estimation process is applied in both a standard format (where the basis of comparison is on the nature of the coefficient given other variables as constant) and an odds ratio (where the basis for comparison is on the odds it takes to transition into PG when other variables are constant). We find that individual identity (e.g. age group, gender, ethnic group, STEM, agreeableness) as well as financial constraints (Fast Forward, UG Fee regime and expected income) statistically significantly influence the individual's decision to proceed into PG sooner. We notice that both non-BME and BME students were more likely to proceed into PG sooner as their expectations of future income increased. Furthermore, we also observe that a new government policy to provide loans for students has no statistical significance. This can be explained by the logic that the policy only impacted one out of the three waves of study. It may be interesting to understand the lifetime impact of studying for a PGT degree, as well as the extent to which it has impact on an individual's career and financial projection. Furthermore, by including macroeconomic factors to our regression analysis, we observe that an improved standard of living on a per capita standpoint, does not have a statistically significant effect on the waiting time to transition into PGT. However, when GDP is observed from the growth rate perspective, we observe that such statistical significance exists and it also suggests that people are less likely to transition sooner into PGT as living standards improve over time. On the other hand, increases in youth unemployment increase the likelihood that an individual transitions into PGT at an earlier time.

Chapter 8 Conclusion

8.1. Introduction

The thesis included in this document focuses on two facets of graduate behaviour in relation to differences in individual, social and economic features. By simulating a model using information from theory and empiric sources, this thesis studies graduate behaviour in three forms. Firstly, it develops two theoretical models based on two different theories (i.e rational versus bounded rational) to explore how these theoretical paradigms affect individual decision-making outcomes in relation to PG studies. Within each of these model, the study considers two ways of inter-temporal utility discounting (i.e., exponential and hyperbolic) and derives an optimal solution about if and when to enter into PGT programme. Secondly, it carries out sensitivity analysis exercises to determine to which degree the optimal solution would depend on some of the underlying assumptions about borrowing for PG degree and repayment of accumulated debt. Thirdly, it carries out simulation exercises about government policy on undergraduate fees, cost of borrowing and different wage premia. Finally, it offers an empirical analysis into factors that affect the decision of how long to wait before entering a Master programme. This is done by using 3 waves of data, collected via online questionnaires, from Masters Students at the University of Greenwich. The empirical analysis corroborates some of the theoretical findings derived in the first part of the study.

In this section, we provide an overall review of the key findings and the main contributions of the study. This is accompanied by a critical assessment of the model and research approach which is discussed in the limitations section. To close this section, we make recommendations for future research.

8.2. Overall Findings

This thesis inspects how individuals make decisions to proceed to PGT education and the underlying constraints and enablers that could inhibit or promote such processes. These constraints are principally identified as repayment of accumulated pre-existing debt and new borrowing, and fear of debt. The enablers are mainly availability for resource (possibility of borrowing), educational identity, and pre-existing saving to reduce the fear of debt, in addition to HC factor (wage premia). To explore the effects of these factors on the decision to proceed into PGT, I develop a model which is then further tested through simulations to explore the effect of policies and nudges. On the theoretical front, we consider the effects of time preference and decision-making approaches on the individual's choice.

On the empirical perspective, we explore how the role of different variables (personal/economic background and expectations of future income) impact the likelihood that an individual chooses to proceed into PGT immediately as opposed to transitioning at a later time period. In this section, we focus on the key findings of the theoretical analysis and I seek to relate such findings to the search questions and information gathered through the literature review conducted.

Through observing the theory, we derive (1) the optimal point at which PGT education is beneficial towards an individual's potential first 10 years of earnings, (2) the effects of identity idiosyncrasies, (3) a comparison between various decision-making approaches and the effects of time preference structures on an individual's decision-making, and finally (4) the impact of various government policies on the decision to make a transition into PGT.

Regarding the optimal point, it was established that the individual benefited from proceeding to a PGT programme until three years after completing undergraduate studies in the baseline scenario. The baseline scenario is modelled to understand the role of identity utility, while keeping monetary incentive constant at the level of UG degree (so removing the Human Capital factor). Adding a HC factor change the optimal waiting time, as reported in the simulation.

This finding is synonymous to the observations by HEFCE (2016) which found that graduates were more likely to proceed to PGT within 3 years of graduating from undergraduate studies. A postulation to explain the finding by HEFCE (2016) - which is corroborated with findings in this paper- is that, the individual may proceed to PGT education as a means to further gain skills, after a working experience, are deemed to be important for the workplace. However, when students show hyperbolic discounting or absence of fear of debt (in the exponential discounting) an individual only benefits from proceeding to a PGT education if she proceeds immediately. When we consider the effects of less borrowing for PG studies, we observe that it does not imply that an individual would choose to proceed into PG sooner. In other words, the optimal stopping point remains the same. When we apply a government policy to include interest rates payments on PG loans, we observe that individuals transition into PGT at a later time. However, we observe the opposite: the prospect for increased wages as a result of PG study implies that an individual would proceed into PG at an earlier time. Thus, as time elapses, an individual feels that the PGT programme will be of no benefit to her. Debt from a tuition and maintenance ascribed to PGT study acts as a disincentive to study. All these findings answer fully and comprehensively research question number 1 in the introduction which motivated the study.

The identity utility effects were also crucial towards the willingness to proceed to PGT education. When identity utility is used and when the fear of debt becomes part of this identity, the individual deferring transition to PGT due to the fact that pre-existing saving can reduce the fear of debt. On the other hand, a pure identity utility (not affected by factors leading to fear of debt) would prompt the agent to start immediately a PG degree rather than to wait to gain saving that would reduce the fear of debt. This finding answer research question number 2.

When theoretical approaches are considered, individuals expressing a bounded rational decision-making approach were expected to derive a higher degree present value of inter-temporal discounted utility. This is to be expected because the BR approach used in this model is a time-inconsistent solution and thus it leads to higher utility. As a minor finding attached to this phenomenon, I also find that the individual that expresses a hyperbolic discounting time preference structure also obtained a higher potential lifetime utility in comparison to her purely exponential discounting time preference structure. A reason for this behaviour relates to the primary premise of hyperbolic discounting that the individual discounts in favour for small rewards that will arrive sooner than larger rewards that will be obtained at a later date. An individual considering her options in an exponential discounting manner confers does not factor in the effect of time differences on her preference behaviour. Hence, she will only focus on choosing the option that yields the optimal lifetime utility. This finding answer the research question 3

Progressively higher wage premia would reduce the waiting time before entering the PG degree. A reduction in UG fees would also prompt to enter PG degrees earlier rather than to wait. These finding research question 4.

Finally the empirical findings and insights on demographic, social and economic factors that would affect the timing of entering PG programmes, answer research question 5.

8.3. Contributions

Through the various theoretical approaches utilised, estimation processes and analysis of literature, this thesis presents a series of contributions to academic research. Firstly, through a unifying approach, we contribute to ongoing literature on bridging the gap between conventional economic theory and behavioural economics (Rabin, 2013). We do this through using exponential discounting in bounded rationality functions and hyperbolic discounting in rational choice utility functions.

This aids our second contribution where we bring empirical evidence into theory through the modelling process. We do this through using real-life evidence from economic data regarding average wages, wage rates and interest rates and combine them with various theoretical values on hyperbolic discounting (Laibson, 1997) and exponential discounting (Samuelson, 1937) amongst others.

8.4. Limitations

The first of the major limitations in this thesis relates to the issue of unobserved heterogeneity. As is the case with making a model with a typified representative agent, the individual lacks any key attribute unless those ascribed to her by the nature of the research process. For instance, the representative agent in the model can represent either the continuer or the potential returner as the case may be. In addition, the identity variable is a constant that is derived which is supposed to impart characteristics on the individual, strictly acts as a placeholder that represents the benefit of proceeding into a PGT programme. Thus, the model does not study how different demographic groups relate to the decision of proceeding into PGT studies. To address this issue, the forthcoming work in the thesis will use an empirical data consisting of PGT students who proceeded to their programmes; either as continuers or potential returners. It is expected that these issues will be covered through the background information that respondents provide which will feed into elaborating the definition of the representative agent.

A second key limitation of the paper relate to the use of empirical data to represent variables in the model. Variables such as expected income were used with the assumption that the individual's undergraduate degree programme was of little consequence in her potential starting salary after graduation. The information, however, represents an average expected income regardless of the programme the graduate studied at university. The interest rate variable- designed to reflect how much the rate of loan repayment was- was assumed to be static over time as income increased. It can be noted that although the alternate scenarios tries to remedy this through comparing different interest rates against the initial average income. This is not a representation of the reality of student loan repayment, as graduates' repayment structure increases as her income increases from one tax bracket to another.

8.5. Future research

Following the observations from the previous section, there are possible extensions to the research, which will be conducted toward completing my PhD programme. To address the stylised nature of the modelling process, I will rely on data that has been collected from a sample of 1,005 respondents over two waves of study. The aim of this research is to ask some fundamental questions of why students from low-income backgrounds choose to study for a PGT programme. In this study, there will be an emphasis on decision-making processes across various demographics with the aim of establishing the link between theory and evidence.

This approach offers a key opportunity namely that it creates an empirical context to the phenomena observed in the model. Through the data generation process, we will be able to identify some unobservable heterogeneity, which could not be made due to the nature of the theoretical model. Examples of such unobservable phenomena include class differences, ethnic groupings and gender disparities. We will also make a cross-combination of the alternate scenarios in the results section; exploring how the individual reacts to variations of income profiles and interest rate values. Some further ideas include taking into account the impact of tuition fee loans on part-time transitions into PGT. Research on this front would have to consider the nature of the course duration and the impact that may have on transition into PGT. From a modelling standpoint, this will involve addressing of the way the time period in which an individual studies for a PT PGT course is calculated and interpreted. The empirical perspective would have to consider issues that are pertinent to part-time students that make them uniquely different from full-time students.

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APPENDICES

Appendix A: Stata Do-Files

$$$Descriptive Stats and Variable Derivations$$$

```
des
svyset Wave, strata(Agegroup) vce(linearized) singleunit(missing)
svy linearized : proportion Agegroup Gender Ethnicity Transition FastForward,
stdize(Agegroup) stdweight(Wave)
generate weight_srs=11469.6/358
drop weight_srs
generate weight_srs=11470/358
generate fpc=358/11470
gen id = _n
svyset id (pweight=weight=srs),fpc(fpc)
svyset id (pweight=weight_srs),fpc(fpc)
svyset id (pweight= weight_srs),fpc(fpc)
svyset id (pweight = weight_srs),fpc(fpc)
svyset id [pweight = weight_srs],fpc(fpc)
svy linearized : proportion Agegroup Gender Ethnicity Transition FastForward,
stdize(Agegroup) stdweight(Wave)
svy linearized : proportion Agegroup
svy linearized : proportion Gender
svy linearized : proportion Ethnicity
svy linearized : proportion Transition
svy linearized : proportion UGDegClass
svy linearized : proportion UGFeeregime
svy linearized : proportion FastForward
svy linearized : proportion Wave
svy linearized : tabulate Wave Wave
svy linearized : tabulate Wave Agegroup
svy linearized : tabulate Wave
svy linearized : tabulate Wave Agegroup
svy linearized : tabulate Agegroup Gender
svy linearized : tabulate Agegroup Ethnicity
svy linearized : tabulate Agegroup Transition
svy linearized : tabulate Agegroup UGFeeregime
svy linearized : tabulate Agegroup FastForward
svy linearized : tabulate Agegroup UGDegClass
svy linearized : tabulate Agegroup Wave
svy linearized : tabulate Wave Gender
svy linearized : tabulate Ethnicity Gender
svy linearized : tabulate Transition Gender
svy linearized : tabulate Agegroup Gender
svy linearized : tabulate Agegroup Gender UGFeeregime
svy linearized : tabulate UGFeeregime Gender
svy linearized : tabulate FastForward Gender
svy linearized : tabulate UGDegClass Gender
```

```
svy:tabulate Agegroup Ethnicity , row col chi2
svy linearized : tabulate Wave Agegroup
svy linearized : tabulate Gender Agegroup
svy linearized : tabulate Ethnicity Agegroup
svy linearized : tabulate Transition Agegroup
svy linearized : tabulate UGFeeregime Agegroup
svy linearized : tabulate FastForward Agegroup
svy linearized : tabulate UGDegClass Agegroup
svy linearized : tabulate Agegroup Wave
svy linearized : tabulate Gender Wave
svy linearized : tabulate Ethnicity Wave
svy linearized : tabulate Transition Wave
svy linearized : tabulate UGFeeregime Wave
svy linearized : tabulate FastForward Wave
svy linearized : tabulate UGDegClass Wave
svy linearized : tabulate UGDegClass Gender
svy linearized : tabulate Ethnicity Gender
svy linearized : tabulate Wave Gender
svy linearized : tabulate Transition Gender
svy linearized : tabulate UGFeeregime Gender
svy linearized : tabulate FastForward Gender
svy linearized : tabulate FastForward Ethnicity
svy linearized : tabulate UGDegClass Ethnicity
svy linearized : tabulate UGFeeregime Ethnicity
svy linearized : tabulate Transition Ethnicity
svy linearized : tabulate UGFeeregime Transition
svy linearized : tabulate FastForward Transition
svy linearized : tabulate UGDegClass Transition
svy linearized : tabulate Transition UGFeeregime
svy linearized : tabulate FastForward UGFeeregime
svy linearized : tabulate UGDegClass UGFeeregime
svy linearized : tabulate UGDegClass FastForward
spearman Gender Ethnicity , stats(rho p)
svy: spearman Gender Ethnicity , stats(rho p)
spearman Wave Ethnicity , stats(rho p)
spearman Agegroup Ethnicity , stats(rho p)
spearman Transition Ethnicity , stats(rho p)
spearman UGFeeregime Ethnicity , stats(rho p)
spearman FastForward Ethnicity , stats(rho p)
spearman UGDegClass Ethnicity , stats(rho p)
spearman Gender Wave , stats(rho p)
spearman Agegroup Wave , stats(rho p)
spearman Transition Wave , stats(rho p)
spearman UGFeeregime Wave , stats(rho p)
spearman FastForward Wave , stats(rho p)
spearman UGDegClass Wave , stats(rho p)
spearman Agegroup Gender , stats(rho p)
spearman Transition Gender , stats(rho p)
spearman UGFeeregime Gender , stats(rho p)
spearman Transition Gender , stats(rho p)
```

```
spearman UGFeeregime Gender , stats(rho p)
spearman FastForward Gender , stats(rho p)
spearman UGDegClass Gender , stats(rho p)
spearman Transition Agegroup , stats(rho p)
spearman UGFeeregime Agegroup , stats(rho p)
spearman FastForward Agegroup , stats(rho p)
spearman UGDegClass Agegroup , stats(rho p)
spearman UGFeeregime Transition , stats(rho p)
spearman FastForward Transition , stats(rho p)
spearman UGDegClass Transition , stats(rho p)
spearman Transition Transition , stats(rho p)
spearman FastForward UGFeeregime , stats(rho p)
spearman UGDegClass UGFeeregime , stats(rho p)
spearman UGFeeregime UGDegClass, stats(rho p)
spearman FastForward UGDegClass, stats(rho p)


tab Transition
ologit Transition Agegroup Gender UGFeeregime FastForward Parentdegree01
ologit Transition Agegroup Gender Ethnicity UGFeeregime FastForward
Parentdegree01
gen ParentUG = 0
replace ParentUG = 1 if Parentdegree01
tab ParentUG
drop ParentUG
gen ParentUG = 0
replace ParentUG = 1 if Parentdegree01 = 1
replace ParentUG = 1 if Parentdegree01 == 1
tab ParentUG
ologit Transition Agegroup Gender Ethnicity UGFeeregime FastForward ParentUG
gen FirstGen = 1-ParentUG
ologit Transition Agegroup Gender Ethnicity UGFeeregime FastForward FirstGen
Tab Transition UGFeeregime
tab Transition UGFeeregime
gen FF = 0
replace FF = 1 if FastForward ==1
ologit Transition Agegroup Gender Ethnicity UGFeeregime FF FirstGen
gen age = agegroup - 1
gen age = Agegroup - 1
tab age
gen FGender = 0
replace FGender = 1 if Gender ==2
tab FGender
gen Rasian = 0
replace Rasian = 1 if r_asian ==1
gen Rblack = 0
replace Rblack = 1 if r_black ==1
gen Rmixed = 0
replace Rmixed = 1 if r_mixed ==1
gen Rwhite = 0
replace Rwhite = 1 if r_white ==1
```

```
ologit Transition Agegroup FGender Rasian FirstGen UGFeeregime FF
slogit Transition Agegroup FGender Rasian FirstGen UGFeeregime FF
slogit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF
ologit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF
gen MGender = 0
replace MGender = 1 if Gender ==1
ologit Transition Agegroup Agegroup#FGender FGender Rasian
UGFeeregime#FirstGen FirstGen UGFeeregime FF
ologit Transition Agegroup Agegroup#FGender FGender Rasian
UGFeeregime#FirstGen FirstGen UGFeeregime FF#FGender
ologit Transition Agegroup Agegroup#FGender FGender Rasian
FirstGen#UGFeeregime FirstGen UGFeeregime FF#FGender
oprobit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF
slogit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF
slogit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF FF#FGender
slogit Transition Agegroup Agegroup#FGender FGender Rasian FirstGen
UGFeeregime FF
ologit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF
oprobit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF
gen bank = 0
gen seffund = 0
drop seffund
gen selffund = 0
replace selffund=1 if FeeFund6==1
gen self = 0
replace self = 1 if selffund==1|FeeFund5==1
ologit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF self
gen work = 0
replace work = 1 if FeeFund4==1
drop bank
gen bank = 0
replace bank=1 if FeeFund1==1
ologit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF self bank
ologit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender  UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ssc install estout, replace
slogit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
estout
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
esttab
ologit Transition c.Agegroup Agegroup#FGender UGFeeregime FF bank
ssc install gologit, replace
```

```
ologit Transition c.Agegroup Agegroup#FGender UGFeeregime FF bank UGDegClass
ologit Transition c.Agegroup Agegroup#FGender UGFeeregime FF bank UGDegClass
bank#self
ologit Transition c.Agegroup Agegroup#FGender UGFeeregime FF UGDegClass
bank#self
ologit Transition c.Agegroup Agegroup#FGender UGFeeregime FF UGDegClass bank
```

$$$$$MODEL DRAFT$$$$$

```
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank stem


ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF self
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF self stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank#FeeFund2
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ologit Transition Agegroup FGender UGFeeregime FF bank
ologit Transition Agegroup FGender UGFeeregime FF bank stem
ologit Transition Agegroup FGender UGFeeregime FF bank ocean_ext
ologit Transition Agegroup FGender UGFeeregime FF bank ocean_op
ologit Transition Agegroup FGender UGFeeregime FF bank ocean_ag
ologit Transition Agegroup FGender UGFeeregime FF bank ocean_neu
ologit Transition Agegroup FGender UGFeeregime FF bank ocean_con
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank stem
ologit Transition Agegroup FGender UGFeeregime FF exp_income
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF exp_income
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF exp_income stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF exp_income
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF self
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF self
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF self#bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF exp_income stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF stem


ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank FirstGen
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF exp_income
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF bank
ologit Transition Agegroup Agegroup#FGender UGFeeregime FF stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF self
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FeeFund5
tab FeeFund5
generate parent = 0
replace parent = 1 if FeeFund5==1
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF parent
```

```
tab self
generate selfund = 0
tab FeeFund3 FeeFund4
tab FeeFund3
tab FeeFund4
drop self
generate self = 0
replace self = 1 if FeeFund3==1
generate self1 = 0
replace self1 = 1 if FeeFund4==1
drop selfund
generate selfund = 0
replace selfund = 1 if self ==1|self1==1
tab selfund
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF selfund
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF selfund
parent
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF selfund
parent ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF selfund
parent ocean_op
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF parent
ocean_op
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF parent
FirstGen ocean_op
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
parent#FirstGen ocean_op
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
parent#FirstGen ocean_con
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
parent#FirstGen ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
ocean_con
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
parent ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF parent
ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
ocean_ext

drop above
generate catincome = exp_income
replace catincome = 1 if exp_income==2
tab catincome
```

```
replace catincome = 2 if exp_income==3
replace catincome = 3 if exp_income==4
tab catincome
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
catincome ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
catincome#bme ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
exp_income#bme ocean_ext
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
exp_income#bme ocean_op
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
exp_income#bme ocean_con
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF FirstGen
exp_income#bme ocean_ag
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
```

$$$Final model$$$$
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF exp_income#bme ocean_ag

```
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
svyset id [pweight = weight_srs ], strata(Transition)
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag#
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
estat
estout
esttab
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
esttab
slogit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
slogit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag, iter(20)
esttab
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
outreg2 using myreg.doc, replace ctitle (Linear Reg.)
install outreg2
ssc install outreg2
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
```

```
outreg2 using myreg.doc, replace ctitle (Linear Reg.)
outreg2 using myreg.doc, replace ctitle (Linear Reg.)
outreg2 using myresult.doc, replace ctitle (Linear Reg.)
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
cd "F:\Compilation\Student Progress\PhD Conclusion\Estimations"
svy: regress Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
outreg2 using mydoc.doc, replace ctitle (Linear Reg.)
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag
outreg2 using mydoc.doc, append ctitle(oLogit) label
slogit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag, iter(20)
outreg2 using mydoc.doc, append ctitle(sLogit) label
shellout using `"mydoc.doc"'
cc Transition Gender
ologit Transition Gender
Logistic Transition Gender
Logistic Transition Gender Ethnicity UGDegClass
ssc install Logistic
search logistic
Logistic Gender Ethnicity
logistic Transition Agegroup
save "F:\Compilation\Student Progress\PhD Conclusion\Estimations\DTA
files\Refined Datasets\AllYears Modified.dta", replace
outreg2 using mydoc.doc, append ctitle(oLogit) label
```

$$$$Macroeconomic $Effects$$$

```
gen gdp_pc=46783.47 if Wave==1
replace gdp_pc=44305.56 if Wave==2
replace gdp_pc=40412.03 if Wave==3
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag gdp_pc
gen youth_umemp=6.2 if Wave==1
replace youth_umemp=5.4 if Wave==2
replace youth_umemp=4.9 if Wave==3
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag youth_umemp
gen gdp_gr=2.05 if Wave==1
replace gdp_gr=2.95 if Wave==2
replace gdp_gr=2.35 if Wave==3
ologit Transition Agegroup Agegroup#FGender UGFeeregime stem FF
exp_income#bme ocean_ag newpol gdp_gr
```

Appendix B: Fast Forward Questionnaires

The University of Greenwich has been the recipient of a fund from the Higher Education Funding Council for England (HEFCE) to implement the Greenwich Fast Forward Masters' Programme Scheme. As part of the project, we are conducting a survey intended to measure a range of factors that capture postgraduate students' experience about Higher Education. The survey is expected to last for a maximum of 30 minutes.

By voluntarily participating in this study, you will be asked to complete an online questionnaire that will include questions about your aspirations and experience of postgraduate education. Also, you will be offered the opportunity to participate in the lottery TO WIN one of the TEN £50 prizes made available to all respondents in the study. As you are a current postgraduate student at the University of Greenwich, please kindly notice that participation in the study, or withdrawal from it, will not affect grades of any course. Please also notice that recipients of the Greenwich Fast Forward Scheme funds are expected to participate fully in this study.

The information you provide will ONLY be accessible to the research team. It will NOT be shared with anyone outside of the research team. If you have any questions about the study, or if you would like to withdraw your response at a later fate, please contact the survey Principal Investigator.

We would like to thank you in advance for taking part in this study.

Jon Sibson.

Pro Vice-Chancellor (Faculty of Business).

Survey Principal Investigator: Dr. Gabriella Cagliesi.

Email: **cm55@gre.ac.uk**

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Fast Forward Wave 2 Survey

Personal Background.

In this page, questions are asked regarding your personal background. These are generalised questions pertaining you as the respondent.

1. Please write your University of Greenwich student identification (ID) number in full, including the initial three zeroes of the identification number.

2. What is your date of birth?

Date of Birth.

DD/MM/YYYY

3. Please indicate your gender by ticking the appropriate box below.

Female.

Male.

4. Do you describe your ethnicity as?...

White.

Mixed Heritage.

Asian or Asian British.

Black or Black British.

Other Ethnic Group (please specify).

5. Do any of your parents have a university degree? [Multiple selection allowed]

No, neither of my parents have an undergraduate degree.

One of my parents has an undergraduate degree.

Both of my parents have undergraduate degrees.

At least one of my parents also has a postgraduate degree.

I am from a lone parent family

6. What is the current employment status of your parent(s)? (Multiple selection allowed).

Both are employed.

At least one is employed.

Both are currently not working.

At least one is currently not working.

Both are retired.

At least one is retired.

Fast Forward Wave 2 Survey

Career Prospects & Educational Development.

In this section of the questionnaire, your questions regarding your ambitions and the perceptions you have about your ambitions are asked.

7. What is your current programme of study at the University of Greenwich?

M.Sc. in ...

MBA in ...

MA in ...

Other (Please Specify).

8. What is your most recently completed programme of study?

B.Sc. in ...

BA in ...

Other (Please Specify).

9. How do you fund your fees and living expenses whilst you study at university (multiple responses allowed)?

Borrowing money from a bank or similar organization.

Sponsorship or financial support from an employer.

Doing paid work during term-time.

Doing paid work during the holidays.

Supported by parents or other family members.

Personal savings.

Grants, bursaries and/or scholarships.

10. Apart from full-time education, did you undertake any other training schemes or courses during your undergraduate programme or just afterward? (Example of training schemes or courses include, Open University courses, employer provided training courses, evening classes, government training schemes and work placements).

Yes.

No.

11. Please describe the job you aspire to obtain upon completion of your postgraduate programme?

12. Upon attaining the job you aspire for, how much do you expect your income to be (per annum)?

13. Do you intend on proceeding onto further Higher Education (undergraduate or postgraduate) following the completion of your current postgraduate programme?

- Yes.
- No.
- Unsure.

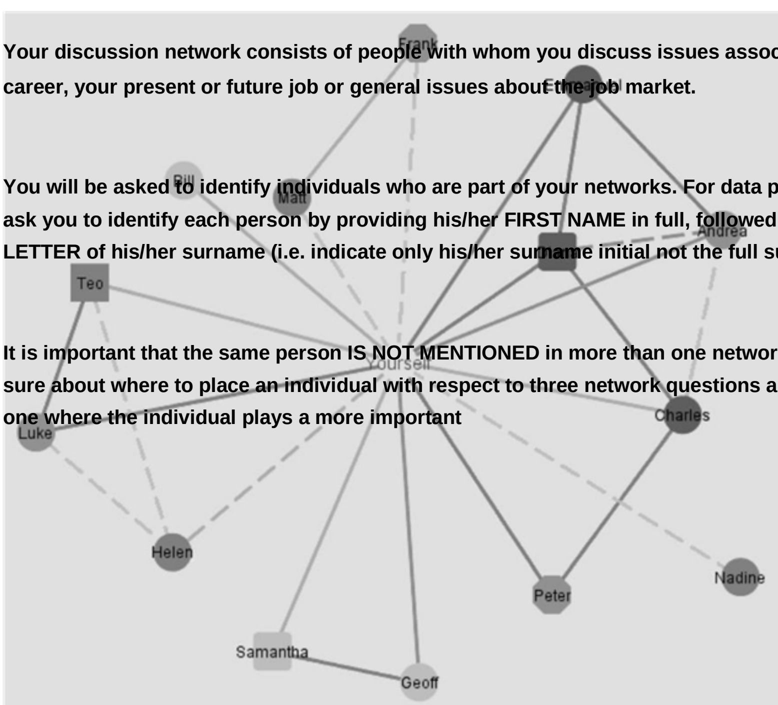
Your Personal Network

In this section of the questionnaire we would like to collect some information about your personal network with relation to your career prospects. Specifically, we are interested in different types of networks you might rely on for career related issues. The information provided would help the research team to visualize your network and to measure some of its properties. An example of the visualization of a personal network is provided below. (If you are interested in obtaining a visualization of your own personal network, please tick the relevant box at the end of this section).

This section (Your Personal Network) consists of three components explored in separate pages to discuss your support network, advice network and discussion network.

Your support network consists of people who have a strong interest in your career development and supported you in facilitating your career plans.

Your advice network consists of those people who can provide specific information and advice to help improve your employability and/or job effectiveness.



Your discussion network consists of people with whom you discuss issues associated with your career, your present or future job or general issues about the job market.

You will be asked to identify individuals who are part of your networks. For data privacy reason we ask you to identify each person by providing his/her FIRST NAME in full, followed by the FIRST LETTER of his/her surname (i.e. indicate only his/her surname initial not the full surname).

It is important that the same person IS NOT MENTIONED in more than one network. If you are not sure about where to place an individual with respect to three network questions above, choose the one where the individual plays a more important

Fast Forward Wave 2 Survey

Support Networks

Firstly we would like to ask you something about your "support network".

In the following boxes, and thinking about the last 6 months, please write the first name (in full) and the surname initial of up to 4 people who took a strong interest in your professional development, by providing you with opportunities to facilitate your career.

Please note that there is no need to identify exactly 4 individuals and there are no “right” or “wrong” answers.

If you feel you have no one matching this description please tick NOT APPLICABLE below.

14. Please indicate here, if applicable, the first name and the surname initial of a person who took a strong interest in your professional development.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

15. Please indicate here, if applicable, the first name and the surname initial of another person who took a strong interest in your professional development.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

16. Please indicate here, if applicable, the first name and the surname initial of another person who took a strong interest in your professional development.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

17. Please indicate here, if applicable, the first name and the surname initial of another person who took a strong interest in your professional development.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

Fast Forward Wave 2 Survey

Advice Networks.

The questions in this page inquire about your "advice network".

In the following boxes, and thinking about the last 6 months, please write the first name and the surname initial of up to 4 people who provided you with advice to help improve your employability and/or job effectiveness.

Please note that there is no need to identify exactly 4 individuals and there are no “right” or “wrong” answers. If you feel you have no one matching this description please tick NOT APPLICABLE below.

Please in answering the questions in this page DO NOT include people already listed before.

18. Please indicate here, if applicable, the first name and the surname initial of a person who provided you with advice to improve your employability and/or job effectiveness.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

19. Please indicate here, if applicable, the first name and the surname initial of another person who provided you with advice to improve your employability and/or job effectiveness.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

20. Please indicate here, if applicable, the first name and the surname initial of another person who provided you with advice to improve your employability and/or job effectiveness.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

21. Please indicate here, if applicable, the first name and the surname initial of another person who provided you with advice to improve your employability and/or job effectiveness.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

Discussion Networks.

Finally we would like to know about your "discussion network" when it comes to job-related issues.

In the following boxes, and thinking about the last 6 months, please write the first name and the surname initial of up to 4 people with whom you discussed issues associated with your career, your present or future job or general issues about the job market.

Please note that there is no need to identify exactly 4 individuals and there are no “right” or “wrong” answers. If you feel you have no one matching this description please tick NOT APPLICABLE below

Please in answering the questions in this page DO NOT include people already listed before.

22. Please indicate here, if applicable, the first name and the surname initial of a person with whom you discussed issues associated with your career, your present or future job or general issues about the job market.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

23. Please indicate here, if applicable, the first name and the surname initial of another person with whom you discussed issues associated with your career, your present or future job or general issues about the job market.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

24. Please indicate here, if applicable, the first name and the surname initial of another person with whom you discussed issues associated with your career, your present or future job or general issues about the job market.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

25. Please indicate here, if applicable, the first name and the surname initial of another person with whom you discussed issues associated with your career, your present or future job or general issues about the job market.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

Fast Forward Wave 2 Survey

Your mentor

26. [Only if **NOT** identified through one of the previous question] Please enter here the first name and the initial of the surname of your Fast Forward mentor. If you do not have a Fast Forward mentor please tick the Not Applicable box.

NOT APPLICABLE.

Otherwise, please write here his/her first name and surname initial.

27. [Only if **NOT** identified through one of the previous questions] Please enter here the first name and the initial of the surname of your mentor (outside the Fast Forward scheme). If you do not have any mentor at all, please tick the Not Applicable box.

When clicking NEXT, please allow the software a few moments to move to the next page, your answers are being processed.

NOT APPLICABLE.

Otherwise, please write here, his/her first name and surname initial.

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Fast Forward Wave 2 Survey

Your Personal Network

Now we would like to know something about the people you identified and your relationship with them

Please ignore rows and columns that are "not applicable"

28. We now would like to know some simple information about the individuals part of your personal network.

	Gender.	Age Group.	Ethnicity.	Employment status.
[Q14]				
[Q15]				
[Q16]				
[Q17]				
[Q18]				
[Q19]				
[Q20]				
[Q21]				
[Q22]				
[Q23]				
[Q24]				

[Q25]

[Q26]

[Q27]

29. How would you describe your relationship with each person?

	Relationship.	Frequency.	Prevailing mean of communication.	How emoti you feel t
[Q14]				
[Q15]				
[Q16]				
[Q17]				
[Q18]				
[Q19]				
[Q20]				
[Q21]				
[Q22]				
[Q23]				
[Q24]				
[Q25]				
[Q26]				
[Q27]				

30. In the table below, you are presented with a matrix showing all people you have identified in your personal network. Please indicate whether they know each other by ticking the appropriate cell that links the person in the row with the person in the column of the matrix. Thus, any time that you tick a cell you will indicate that the persons in the corresponding row and column know each other.

	[Q14]	[Q15]	[Q16]	[Q17]	[Q18]	[Q19]	[Q20]	[Q21] [Q24]	[Q22] [Q25]	[Q23] [Q26] [Q27]
[Q14]										

[Q15]

[Q16]

[Q17]

[Q18]

[Q19]

[Q20]

[Q21]

[Q22]

[Q23]

[Q24]

[Q25]

[Q26]

[Q27]

31. Please tick this box **IF** you would like to receive your own network map and a comparative analysis about your personal network.

Yes.

Fast Forward Wave 2 Survey

Mentoring and the UoG FAST-FORWARD SCHEME

The questions below relate to the satisfaction with the University of Greenwich's Fast Forward Scheme. Please answer them accordingly.

32. Are you a beneficiary of the University of Greenwich's Fast Forward Masters' Programme scheme? (If you are not a beneficiary, please skip to question 36).

Yes, I am a beneficiary.

No, I am not a beneficiary.

33. If yes, how did you hear about the University of Greenwich Fast Forward Masters' Programme scheme?

The University of Greenwich website.

Through friends and colleagues.

Through staff members within the university.

Other (please specify).

34. Had you not been granted a Fast Forward Scheme, would you have still pursued a Masters' Degree?

Yes, I would have pursued a Masters' Degree because...

No, I would not have pursued a Masters'

Degree because…

I am unsure I would have

pursued a Masters'

Degree because...

35. As part of the University of Greenwich's Fast Forward Masters Programme, recipients of the discounted fees are also offered mentoring support. How often do you meet with your Fast Forward mentor?

Never.

Daily.

Weekly.

Fortnightly.

Monthly.

36. Have you participated in any mentoring programmes in the past? (within or outside the University of Greenwich)? (If no or unsure, please skip to question 39).

Yes.

No.

37. [For the University of Greenwich Fast Forward Masters Programme beneficiary] How is the University of Greenwich's Fast Forward Masters' Programme different from your previous mentoring programme?

38. If YES to Q36, did you find the mentoring programme useful?

Yes I did because…

No, I did not because…

39. What is the most helpful method for you in getting advice from your University of Greenwich Fast Forward mentor?
(Please select only one).

Telephone calls.

Email correspondence.

Face-to-face meetings.

Other (please specify).

40. The statements below explore your opinion on your mentor's role in your academic endeavours and career prospects

	To a very slight extent	To a little extent	To an extent	To a reasonable extent	To a very large extent
Mentor has encouraged me to prepare for advancement.					
I respect and admire my mentor.					
My mentor has demonstrated good listening skills in our conversations.					
My mentor has conveyed feelings of respect for me as an individual.					

Mentor helped me finish assignments/ tasks or meet deadlines that otherwise would have been difficult to complete.

Mentor gave me assignments that increased written and personal contact with school administrators.

Mentor gave me assignments that present opportunities to learn new skills.

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Fast Forward Wave 2 Survey

Personality Traits

The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

41. Personal views about Career and Working environment.

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.
A job is what you make of it.					
On most jobs, people can pretty much accomplish whatever they set out to accomplish.					
If you know what you want out of a job, you can find a job that gives it to you.					
If employees are unhappy with a decision made by their boss, they should do something about it.					
Getting the job you weant is mostly a matter of luck.					
Making money is primarily a matter of good fortune.					
Most people are capable of doing their jobs well if they make the effort.					

In order to get a really good job, you need to have family members or friends in high places.

Promotrions are given to employees who perform well on the job.

To make a lot of money you have to know the right people.

It takes a lot of luck to be an outstanding employee on most jobs.

People who perform their jobs well generally get rewarded.

Most employees have more influence on their supervisors than they think they do.

42. Feelings about Oneself.

	Strongly Agree.	Agree.	Disagree.	Strongly Disagree.
I feel that I am a person of worth, at least on an equal plane with others.				
I feel that I have a number of good qualities.				
All in all, I am inclined to feel that I am a failure.				
I am able to do things as well as most other people.				
I feel I do not have much to be proud of.				
I take a positive attitude toward myself.				
On the whole, I am satisfied with myself.				
I wish I could have more respect for myself.				
I certainly feel useless at times.				
At times I think I am no good at all.				

43. Personal views about Career and Working environment.

	Strongly Agree.	Agree.	Disagree.	Strongly Disagree.
I change my career objectives frequently.				
My career objectives are not clear.				
I know what I need to do to reach my career goals.				

I have a strategy for achieving my career goals.

I have a plan for my career.

I have not really decided what my career objective should be.

44. The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

I see myself as someone who…

	Disagree strongle	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly.
...is relaxed.					
...is generally trusting.					
...tends to be lazy.					
...is relaxed, handles stress well.					
...has few artistic interests.					
...is outgoing, sociable.					
...tends to find fault with others.					
...does a thorough job.					
...gets nervous easily.					
...has an active imagination.					

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Fast Forward Wave 2 Survey

Prize draw

45. Thank you for participating in our survey. As a reward we (the research team) have a raffle to give away £50 to TEN lucky respondents. Would you like to be entered onto our prize draw?

- Yes, I would like to be considered.
- No, I would not like to be considered for the raffle draw.

Fast Forward Wave 3 Survey 2016

Welcome to the Second Wave of the Attitude to Postgraduate Study

The University of Greenwich has been the recipient of a fund from the Higher Education Funding Council for England (HEFCE) to implement the Greenwich Fast Forward Masters' Programme Scheme. As part of the project, we are conducting a survey intended to measure a range of factors that capture postgraduate students' experience about Higher Education. The survey is expected to last for a maximum of 30 minutes.

By voluntarily participating in this study, you will be asked to complete an online questionnaire that will include questions about your aspirations and experience of postgraduate education. Also, you will be offered the opportunity to participate in the lottery TO WIN one of the TEN £50 prizes made available to all respondents who complete the survey. As you are a current postgraduate student at the University of Greenwich, please kindly notice that participation in the study, or withdrawal from it, will not affect grades of any course. Please also notice that recipients of the Greenwich Fast Forward Scheme funds are expected to participate fully in this study.

The information you provide will ONLY be accessible to the research team. It will NOT be shared with anyone outside of the research team. If you have any questions about the study, or if you would like to withdraw your response at a later fate, please contact the survey Principal Investigator. We would like to thank you in advance for taking part in this study.

Jon Sibson.

Pro Vice-Chancellor (Faculty of Business).

Survey Principal Investigator: Dr. Gabriella Cagliesi.

Email: **cm55@gre.ac.uk**

Fast Forward Wave 3 Survey 2016

Personal Background.

In this page, questions are asked regarding your personal background. These are generalised questions pertaining you as the respondent.

3. 1. Please write your University of Greenwich student identification (ID) number in full,including the initial three zeroes of the identification number. Please write it carefully as respondents who win the £50 prize will be identified via their ID.

4. 2. What is your date of birth?

Date of Birth.

DD/MM/YYYY

10. 3. Please indicate your gender by ticking the appropriate box below.

- [ ] Female.
- [ ] Male.

○ Don’t want to disclose

11. 4. What is your nationality?

(if you have dual nationality which includes UK citizenship, please answer 'British')

○ British

○ Another nationality

11. 5. Do you describe your ethnicity as?...

- White.
- Mixed Heritage.
- Asian or Asian British.
- Black or Black British.
- Other Ethnic Group (please specify).

12. 6. Are you studying

- Full time
- Part time

13. 7. What type of secondary school did you attend at age 17?

(if you left school before the age of 17, please select your last secondary school)

- Comprehensive school
- State-run Grammar school
- Independent or Private school
- Grant-maintained school
- Single-faith school (e.g. Roman Catholic, Anglican, Jewish, Islamic, etc.)
- Secondary modern school

- Sixth Form College
- City Technology College
- Community College
- Further Education College
- Overseas school/college
- Don't know
- Other (please specify)

14. 8. Did you do A-level Mathematics?

- Yes
- No
- Not applicable

13. 9. What was the Type of your Qualification before you FIRST began studying as a Postgraduate?

- First-class honours (1st)
- Second-class honours, upper division (2:1)
- Second-class honours, lower division (2:2)
- Third-class honours (3rd)
- Ordinary degree (pass)

14. 10. In which year did you graduate?

Fast Forward Wave 3 Survey 2016

Household Education Background

In this page, questions are asked regarding your household education background.

These are generalised questions pertaining you as the respondent.

14. 11. What is the HIGHEST educational qualification obtained by your MOTHER/FEMALE GUARDIAN?

15. 12. What is the HIGHEST educational qualification obtained by your FATHER/MALE GUARDIAN?

16. 13. What is the HIGHEST educational qualification obtained by your siblings?

17. 14. How many siblings do you have? if you do not have siblings write 0 please

18. 15. What is your birth order among your siblings?

Fast Forward Wave 3 Survey 2016

Household Career Background

In this page, questions are asked regarding your household career background.
These are generalised questions pertaining you as the respondent.

15. 16. Please select the appropriate category to show which best describes the MAIN occupation of your MOTHER/FEMALE GUARDIAN. If she is not working now, please tick the box to show her LAST main occupation

Managerial and professional

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxilliary, nursery nurse)

Small employer or own account worker

Lower supervisory and technical

(such as motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver)

Semi-routine and routine

(such as postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant, HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter/waitress, bar staff)

Never worked/long-term unemployed

16. 17. Please select the appropriate category to show which best describes the MAIN occupation of your FATHER/MALE GUARDIAN. If he is not working now, please tick the box to show his LAST main occupation

Managerial and professional

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxilliary, nursery nurse)

Small employer or own account worker

Lower supervisory and technical

(such as motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver)

Semi-routine and routine

(such as postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant, HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter/waitress, bar staff)

Never worked/long-term unemployed

Fast Forward Wave 3 Survey 2016

Educational Development.

In this section of the questionnaire, your questions regarding your ambitions and the perceptions you have about your ambitions are asked.

* 18. What is your current programme of study at the University of Greenwich?

M.Sc. in ...

MBA in ...

MA in ...

Other (Please Specify).

* 19. What is your most recently completed programme of study?

B.Sc. in ...

BA in ...

Other (Please Specify).

* 20. Why did you decide to begin your current programme? (Multiple answers allowed)

- [ ] Because it was a requirement of my employment, a master's degree is replacing a bachelor's as the minimum requirement for employment.
- [ ] To develop a broader or more specialist range of skills or knowledge
- [ ] To change or improve my career options
- [ ] Because I was interested in the content of the course
- [ ] Because I had enjoyed my first course and wanted to continue studying
- [ ] To prepare for graduate study at the doctoral level
- [ ] I wanted to go on being a student/I wanted to postpone job hunting
- [ ] I had been unable to find a suitable job
- [ ] To study a field they love and to explore future employment in a related area
- [ ] To acquire skills in new technologies and methods that have been developed in my field
- [ ] To improve my relative standing in a competitive field and a challenging job market
- [ ] To prepare for entrepreneurial projects that require expertise in a specific field of study
- [ ] To increase my start-up salary
- [ ] To gain recognition and credibility
- [ ] To get out from behind the desk
- [ ] My family wants me to do it
- [ ] Other (please specify)

17. 21. What sort of skills/information you think you will benefit from pursuing a postgraduate degree? (Multiple answers allowed)

- ☐ Excellent critical thinking skills
- ☐ Ability to integrate data and information from multiple sources, and to develop and test hypotheses rigorously
- ☐ Excellent oral and written communication skills
- ☐ Skills in a range of analytical techniques using sophisticated instrumentation
- ☐ Ability to work with equipment and instruments at tasks requiring precision
- ☐ Ability to coordinate or co-supervise the work of others
- ☐ Ability to identify problems and to develop and implement innovative solutions
- ☐ Ability to work independently and in teams
- ☐ Curiosity and an open and enquiring mind
- ☐ Sound work ethic, integrity and moral standards
- ☐ Collegiality
- ☐ Perseverance and patience
- ☐ Maturity and reliability
- ☐ Become an expert in the field
- ☐ Other (please specify)

18. 22. Do you intend proceeding onto further Higher Education (undergraduate or postgraduate) following the completion of your current postgraduate programme?

- Yes.
- No.
- Unsure.

* 23. What was your main activity immediately before you started your current programme?

- I was studying
- I was in paid employment
- I was looking after the home
- I was unemployed
- I had retired
- I was unable to work through illness
- I took a gap year or time off
- Other (please specify)

Fast Forward Wave 3 Survey 2016

Career Prospects

In this section of the questionnaire, questions regarding your career prospects and the expectations you have about your future career are asked.

19. 24. Upon attaining the job you aspire for, how much do you expect your income before tax to be in British pound (per annum)? Insert a whole number with no comma (1000 rather than 1,000)

20. 25. If you have indicated that you were in paid employment before enrolment in postgraduate study in

Q23.Upon attaining the job you aspire for, how much do you expect the increase of your income before tax will be in British pound (per annum)? Insert a whole number with no comma (1000 rather than 1,000)

21. 26. After finishing your postgraduate degree, how hard will it be to get the job you want?

- Very easy
- Should be achievable
- A challenge

- Almost impossible
- Don’t know

* 27. What is the level of job you expect to get after finishing your postgraduate degree?

Traditional professional occupations

(such as university lecturer, accountant, solicitor, medical practitioner, scientist, civil/mechanical engineer)

Senior managers or administrators

(usually responsible for planning, organising and co-ordinating work and for finance; such as finance manager, chief executive)

Modern professional occupations

(such as teacher, nurse, physiotherapist, social worker, welfare officer, artist, musician, police sergeant or above, software designer)

Middle or junior managers

(such as office manager, retail manager, bank manager, restaurant manager, warehouse manager, publican)

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxiliary, nursery nurse)

Self-employed / start my own business

Fast Forward Wave 3 Survey 2016

The UoG FAST-FORWARD SCHEME and postgraduate program

The questions below relate to the University of Greenwich's Fast Forward Scheme and postgraduate program. Please answer them accordingly.

20. 28. Are you a beneficiary of the University of Greenwich's Fast Forward Masters' Programme scheme?

Yes, I am a beneficiary.

No, I am not a beneficiary.

21. 29. How did you hear about the University of Greenwich Fast Forward Masters' Programme scheme?

The University of Greenwich website.

Through friends and colleagues.

Through staff members within the university.

Didn't hear about it

Other (please specify).

* 30. How did you hear about the University of Greenwich postgraduate Programme?

The University of Greenwich website

Through friends and colleagues

Through staff members within the university

Through family member(s) who studied in the university of Greenwich

Other (please specify)

* 31. What do you think is the best source of information regarding postgraduate courses?

- The University of Greenwich website
- Friends and colleagues
- Staff members within the university
- Other (please specify)

Fast Forward Wave 3 Survey 2016

Finance

In this section of the questionnaire, your questions regarding your finance are asked.

* 32. Had you not been granted a Fast Forward Scheme, would you have still pursued a Masters' Degree?

Yes, I would have pursued a Masters' Degree because...

No, I would not have pursued a Masters' Degree because…

I am unsure I would have pursued a Masters' Degree because...

21. 33. To what extent has the cost of a Master's degree affected any of your decisions or ideas about the following? Because of the cost … (Multiple answers allowed)

I applied to universities nearer my home.

I am taking a subject with better employment prospects.

I am living at home with my parents while at university.

I applied to universities in areas where there are good opportunities for term-time employment.

I applied to universities in areas where the cost of living is lower.

I am doing a vocational job-related course rather than an academic course.

I am applying to a ‘new’ university rather than an ‘old’ university.

I am doing a part-time course.

22. 34. Is the available finance sufficient to cover your living cost?

- Yes
- No
- Unsure

23. 35. What concerns you more financially?

- Payment of course fees
- Living expenses
- Hidden course fees (e.g. internet access, library expenses)
- Travel expenses
- Other (please specify)

24. 36. How do you fund your fees and living expenses whilst you study at university? (multiple responses allowed)

- Savings
- Family (spouse, partner, parents, other) or friends
- Tuition fee loan
- Scholarship (e.g. from an employer, institution)
- Full time work
- Part time work
- Research grant
- Career development loan
- Maintenance loan
- Bank overdrafts

Payday loan / doorstep cash / Cash-a-cheque

Credit cards

Other bank loan

Institutional hardship funds

Disabled students allowance

Other grant (e.g. Adult dependents, childcare, travel)

Other (please specify)

24. 37. Do you use payday loans, credit cards, and/or overdraft to cover living expenses?

- Yes
- No
- Don't want to disclose

25. 38. Do you consider payday loans, credit cards, and overdrafts as:

- Aid to cash flow
- Income
- Both
- Other (please specify)

26. 39. Do you plan to use payday loans, credit cards and/or overdrafts during your period of study?

- Yes
- No
- Unsure
- Don't want to disclose

27. 40. How many credit cards do you have?

28. 41. Did your parents/guardians borrow to finance your tuition fees and/or living expenses?

- Yes
- No
- Don't want to disclose

29. 42. What is your total outstanding student debt?

(in calculating your debt, please include student loans, bank overdrafts, credit card debts and personal loans if accumulated while studying. Please exclude mortgage debt)

* 43. What is your position regarding debt (loans, overdrafts, payday loans, credit cards)

- I have taken on more debt than I expected to
- I have taken on as much debt as I expected to
- I have taken on less debt than I expected to
- I have not taken on any debt
- Don't want to disclose

Fast Forward Wave 3 Survey 2016

Perception of Debt

In this section of the questionnaire, your questions regarding the perceptions you have about debt are asked.

25. 44. What concerns you most about students' loans?

- I won't be able to secure high income job to pay it back
- It might go on credit files which might affect my future need for loans/mortgage
- Long repayment period
- Don't have a student loan
- Other (please specify)

26. 45. How do you feel about debt

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.

Debt is something I wish students could avoid

It is difficult not to get into debt as a student

Debt is a normal part of student life

Debt is a necessary burden of being at university

Debt is an investment for my future

I want to manage my debt

Debt is an easy to manage long term loan

I don’t see debt as an issue

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.
Owing money is basically wrong.					
There is no excuse for borrowing money.					
You should always save up first before buying something.					
Borrowing money to pay for a Master's degree is a good investment.					
Student loans are a good thing because it allows students to enjoy university life.					
Students do not worry about their debts while at university because they will get well-paid jobs when they graduate.					
It is not worth getting in debt just so you can get a Master's degree					
I feel differently about debt					

* 46. Perception of available funding scheme

Strongly disagree. Neither agree nor Disagree slightly. disagree. Agree slightly. Strongly agree.

I think that 10K government loan system in 2017 for postgraduate taught students will widen the demographic spread of those who undertake postgraduate study

I think that there should be an option for delayed payments for postgraduate taught students

I think that current 10K

grant of University of

Greenwich Fast Forward

and similar schemes for

postgraduate taught

students will increase

the numbers of students

applying for

postgraduate study

I think that labour market understands the value of taught postgraduate students

I think that the current government understands the needs of taught postgraduate students

Personality Traits

The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

26. 47. The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

I see myself as someone who…

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly.
...is reserved.					
...is generally trusting.					
...tends to be lazy.					
...is relaxed, handles stress well.					
...has few artistic interests.					

...is outgoing, sociable.

...tends to find fault with
others.

...does a thorough job.

...gets nervous easily.

...has an active

imagination.

27. 48. In general, how satisfied would you say you are with your life right now?

- Very satisfied
- Generally satisfied
- Ambivalent
- Generally dissatisfied
- Very dissatisfied

28. 49. "Finishing my postgraduate degree will help in…."

- Feeling more satisfied about my life
- Enhancing my confidence and self-esteem
- Increasing my sense of achievement
- Gaining more respect and recognition from my family, friends, and colleagues
- Reposition my social class to higher status
- Widening my social connection and network
- Other (please specify)

HIGHER EDUCATION FUNDING COUNCIL FOR ENGLAND

Fast Forward Wave 3 Survey 2016

Prize draw

28. 50. Thank you for participating in our survey. As a reward we (the research team) have a raffle to give away £50 to TEN lucky respondents who complete the survey only once . Would you like to be entered onto our prize draw?

- Yes, I completed the survey only once and would like to be considered.
- No, I would not like to be considered for the raffle draw.

Fast Forward Wave 4 Survey 2017

Welcome to the Second Wave of the Attitude to Postgraduate Study

The University of Greenwich has been the recipient of HEFCE funding to implement the Greenwich Fast Forward Masters' Programme Scheme. As part of the project, we are conducting a survey intended to measure a range of factors that capture postgraduate students' experience about Higher Education. The survey is expected to last for a maximum of 30 minutes.

By voluntarily participating in this study, you will be asked to complete an online questionnaire that will include questions about your aspirations and experience of postgraduate education. Also, you will be offered the opportunity to participate in a lottery TO WIN one of the TEN £50 prizes made available to all respondents who have completed the survey. Please notice that participation in the study, or withdrawal from it, will not affect grades of any course.

The information you provide will ONLY be accessible to the research team. It will NOT be shared with anyone outside of the research team. If you have any questions about the study, or if you would like to withdraw your response at a later date, please contact the survey Principal Investigator.

We would like to thank you in advance for taking part in this study.

Jon Sibson.

Pro Vice-Chancellor (Faculty of Business).

Survey Principal Investigator: Dr. Gabriella Cagliesi. Email: cm55@gre.ac.uk

Fast Forward Wave 4 Survey 2017

Personal Background.

In this page, questions are asked regarding your personal background. These are generalised questions pertaining you as the respondent.

5. 1. Please write your University of Greenwich student identification (ID) number in full, including the initial three zeroes of the identification number. Please write it carefully as respondents who win the £50 prize will be identified via their ID.

6. 2. What is your date of birth?

Date of Birth.

DD/MM/YYYY

12. 3. Please indicate your gender by ticking the appropriate box below.

- Female.
- Male.

Don't want to disclose

13. 4. What is your nationality?

(if you have dual nationality which includes UK citizenship, please answer 'British')

British

Another nationality

15. 5. Do you describe your ethnicity as?...

- White.
- Mixed Heritage.
- Asian or Asian British.
- Black or Black British.
- Other Ethnic Group (please specify).

16. 6. Are you studying

- Full time
- Part time

17. 7. What type of secondary school did you attend at age 17?

(if you left school before the age of 17, please select your last secondary school)

- Comprehensive school
- State-run Grammar school
- Independent or Private school
- Grant-maintained school
- Single-faith school (e.g. Roman Catholic, Anglican, Jewish, Islamic, etc.)
- Secondary modern school

- Sixth Form College
- City Technology College
- Community College
- Further Education College
- Overseas school/college
- Don't know
- Other (please specify)

18. 8. Did you do A-level Mathematics?

- Yes
- No
- Not applicable

15. 9. What was the Type of your Qualification before you FIRST began studying as a Postgraduate?

- First-class honours (1st)
- Second-class honours, upper division (2:1)
- Second-class honours, lower division (2:2)
- Third-class honours (3rd)
- Ordinary degree (pass)

16. 10. In which year did you graduate?

Fast Forward Wave 4 Survey 2017

Household Education Background

In this page, questions are asked regarding your household education background.

These are generalised questions pertaining you as the respondent.

19. 11. What is the HIGHEST educational qualification obtained by your MOTHER/FEMALE GUARDIAN?

20. 12. What is the HIGHEST educational qualification obtained by your FATHER/MALE GUARDIAN?

21. 13. What is the HIGHEST educational qualification obtained by your siblings?

22. 14. How many siblings do you have? if you do not have siblings write 0 please

23. 15. What is your birth order among your siblings?

Fast Forward Wave 4 Survey 2017

Household Career Background

In this page, questions are asked regarding your household career background.
These are generalised questions pertaining you as the respondent.

16. 16. Please select the appropriate category to show which best describes the MAIN occupation of your MOTHER/FEMALE GUARDIAN. If she is not working now, please tick the box to show her LAST main occupation

Managerial and professional

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxilliary, nursery nurse)

Small employer or own account worker

Lower supervisory and technical

(such as motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver)

Semi-routine and routine

(such as postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant, HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter/waitress, bar staff)

Never worked/long-term unemployed

17. 17. Please select the appropriate category to show which best describes the MAIN occupation of your FATHER/MALE GUARDIAN. If he is not working now, please tick the box to show his LAST main occupation

Managerial and professional

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxilliary, nursery nurse)

Small employer or own account worker

Lower supervisory and technical

(such as motor mechanic, fitter, inspector, plumber, printer, tool maker, electrician, gardener, train driver)

Semi-routine and routine

(such as postal worker, machine operative, security guard, caretaker, farm worker, catering assistant, receptionist, sales assistant, HGV driver, van driver, cleaner, porter, packer, sewing machinist, messenger, labourer, waiter/waitress, bar staff)

Never worked/long-term unemployed

Fast Forward Wave 4 Survey 2017

Educational Development.

In this section of the questionnaire, your questions regarding your ambitions and the perceptions you have about your ambitions are asked.

* 18. What is your current programme of study at the University of Greenwich?

M.Sc. in ...

MBA in ...

MA in ...

Other (Please Specify).

* 19. What is your most recently completed programme of study?

B.Sc. in ...

BA in ...

Other (Please Specify).

* 20. Why did you decide to begin your current programme? (Multiple answers allowed)

- [ ] Because it was a requirement of my employment, a master's degree is replacing a bachelor's as the minimum requirement for employment.
- [ ] To develop a broader or more specialist range of skills or knowledge
- [ ] To change or improve my career options
- [ ] Because I was interested in the content of the course
- [ ] Because I had enjoyed my first course and wanted to continue studying
- [ ] To prepare for graduate study at the doctoral level
- [ ] I wanted to go on being a student/I wanted to postpone job hunting
- [ ] I had been unable to find a suitable job
- [ ] To study a field they love and to explore future employment in a related area
- [ ] To acquire skills in new technologies and methods that have been developed in my field
- [ ] To improve my relative standing in a competitive field and a challenging job market
- [ ] To prepare for entrepreneurial projects that require expertise in a specific field of study
- [ ] To increase my start-up salary
- [ ] To gain recognition and credibility
- [ ] To get out from behind the desk
- [ ] My family wants me to do it
- [ ] Other (please specify)

18. 21. What sort of skills/information you think you will benefit from pursuing a postgraduate degree? (Multiple answers allowed)

- [ ] Excellent critical thinking skills
- [ ] Ability to integrate data and information from multiple sources, and to develop and test hypotheses rigorously
- [ ] Excellent oral and written communication skills
- [ ] Skills in a range of analytical techniques using sophisticated instrumentation
- [ ] Ability to work with equipment and instruments at tasks requiring precision
- [ ] Ability to coordinate or co-supervise the work of others
- [ ] Ability to identify problems and to develop and implement innovative solutions
- [ ] Ability to work independently and in teams
- [ ] Curiosity and an open and enquiring mind
- [ ] Sound work ethic, integrity and moral standards
- [ ] Collegiality
- [ ] Perseverance and patience
- [ ] Maturity and reliability
- [ ] Become an expert in the field
- [ ] Other (please specify)

19. 22. Do you intend proceeding onto further Higher Education (undergraduate or postgraduate) following the completion of your current postgraduate programme?

○ Yes.

○ No.

○ Unsure.

* 23. What was your main activity immediately before you started your current programme?

- I was studying
- I was in paid employment
- I was looking after the home
- I was unemployed
- I had retired
- I was unable to work through illness
- I took a gap year or time off
- Other (please specify)

Fast Forward Wave 4 Survey 2017

Career Prospects

In this section of the questionnaire, questions regarding your career prospects and the expectations you have about your future career are asked.

22. 24. Upon attaining the job you aspire for, how much do you expect your income before tax to be in British pound (per annum)? Insert a whole number with no comma (1000 rather than 1,000)

23. 25. If you have indicated that you were in paid employment before enrolment in postgraduate study in

Q23.Upon attaining the job you aspire for, how much do you expect the increase of your income before tax will be in British pound (per annum)? Insert a whole number with no comma (1000 rather than 1,000)

24. 26. After finishing your postgraduate degree, how hard will it be to get the job you want?

- Very easy
- Should be achievable
- A challenge

○ Almost impossible

○ Don't know

* 27. What is the level of job you expect to get after finishing your postgraduate degree?

Traditional professional occupations

(such as university lecturer, accountant, solicitor, medical practitioner, scientist, civil/mechanical engineer)

Senior managers or administrators

(usually responsible for planning, organising and co-ordinating work and for finance; such as finance manager, chief executive)

Modern professional occupations

(such as teacher, nurse, physiotherapist, social worker, welfare officer, artist, musician, police sergeant or above, software designer)

Middle or junior managers

(such as office manager, retail manager, bank manager, restaurant manager, warehouse manager, publican)

Clerical and intermediate occupations

(such as secretary, personal assistant, clerical worker, office clerk, call centre agent, nursing auxiliary, nursery nurse)

Self-employed / start my own business

Fast Forward Wave 4 Survey 2017

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- Yes, I am a beneficiary.
- No, I am not a beneficiary.

23. 29. How did you hear about the University of Greenwich Fast Forward Masters' Programme scheme?

- The University of Greenwich website.
- Through friends and colleagues.
- Through staff members within the university.
- Didn't hear about it
- Other (please specify).

* 30. How did you hear about the University of Greenwich postgraduate Programme?

The University of Greenwich website

Through friends and colleagues

Through staff members within the university

Through family member(s) who studied in the university of Greenwich

Other (please specify)

* 31. What do you think is the best source of information regarding postgraduate courses?

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- Friends and colleagues
- Staff members within the university
- Other (please specify)

Fast Forward Wave 4 Survey 2017

Finance

In this section of the questionnaire, your questions regarding your finance are asked.

* 32. Had you not been granted a Fast Forward Scheme, would you have still pursued a Masters' Degree?

Yes, I would have pursued

a Masters' Degree

because...

No, I would not have

pursued a Masters'

Degree because…

I am unsure I would have

pursued a Masters'

Degree because...

22. 33. To what extent has the cost of a Master's degree affected any of your decisions or ideas about the following? Because of the cost … (Multiple answers allowed)

I applied to universities nearer my home.

I am taking a subject with better employment prospects.

I am living at home with my parents while at university.

I applied to universities in areas where there are good opportunities for term-time employment.

I applied to universities in areas where the cost of living is lower.

I am doing a vocational job-related course rather than an academic course.

I am applying to a ‘new’ university rather than an ‘old’ university.

I am doing a part-time course.

23. 34. Is the available finance sufficient to cover your living cost?

- Yes
- No
- Unsure

25. 35. What concerns you more financially?

- Payment of course fees
- Living expenses
- Hidden course fees (e.g. internet access, library expenses)
- Travel expenses
- Other (please specify)

26. 36. How do you fund your fees and living expenses whilst you study at university? (multiple responses allowed)

- Savings
- Family (spouse, partner, parents, other) or friends
- Tuition fee loan
- Scholarship (e.g. from an employer, institution)
- Full time work
- Part time work
- Research grant
- Career development loan
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- Bank overdrafts

Payday loan / doorstep cash / Cash-a-cheque

Credit cards

Other bank loan

Institutional hardship funds

Disabled students allowance

Other grant (e.g. Adult dependents, childcare, travel)

Other (please specify)

30. 37. Do you use payday loans, credit cards, and/or overdraft to cover living expenses?

- Yes
- No
- Don't want to disclose

31. 38. Do you consider payday loans, credit cards, and overdrafts as:

- Aid to cash flow
- Income
- Both
- Other (please specify)

32. 39. Do you plan to use payday loans, credit cards and/or overdrafts during your period of study?

- Yes
- No
- Unsure
- Don't want to disclose

33. 40. How many credit cards do you have?

34. 41. Did your parents/guardians borrow to finance your tuition fees and/or living expenses?

- Yes
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35. 42. What is your total outstanding student debt?

(in calculating your debt, please include student loans, bank overdrafts, credit card debts and personal loans if accumulated while studying. Please exclude mortgage debt)

* 43. What is your position regarding debt (loans, overdrafts, payday loans, credit cards)

- I have taken on more debt than I expected to
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Fast Forward Wave 4 Survey 2017

Perception of Debt

In this section of the questionnaire, your questions regarding the perceptions you have about debt are asked.

27. 44. What concerns you most about students' loans?

- I won't be able to secure high income job to pay it back
- It might go on credit files which might affect my future need for loans/mortgage
- Long repayment period
- Don't have a student loan
- Other (please specify)

28. 45. How do you feel about debt

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
	○	○	○	○	○
Debt is something I wish students could avoid	○	○	○	○	○
It is difficult not to get into debt as a student	○	○	○	○	○
Debt is a normal part of student life	○	○	○	○	○

Debt is a necessary burden of being at university

Debt is an investment for my future

I want to manage my debt

Debt is an easy to manage long term loan

I don't see debt as an issue

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.
Owing money is basically wrong.					
There is no excuse for borrowing money.					
You should always save up first before buying something.					
Borrowing money to pay for a Master’s degree is a good investment.					
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Students do not worry about their debts while at university because they will get well-paid jobs when they graduate.					
It is not worth getting in debt just so you can get a Master’s degree					
I feel differently about debt					

* 46. Perception of available funding scheme

	Strongly disagree.	Disagree slightly.	Neither agree nor disagree.	Agree slightly.	Strongly agree.
I think that 10K government loan system in 2017 for postgraduate taught students will widen the demographic spread of those who undertake postgraduate study					
I think that there should be an option for delayed payments for postgraduate taught students					
I think that current 5K grant of University of Greenwich Fast Forward and similar schemes for postgraduate taught students will increase the numbers of students applying for postgraduate study					
I think that labour market understands the value of taught postgraduate students					
I think that the current government understands the needs of taught postgraduate students					

Fast Forward Wave 4 Survey 2017

Personality Traits

The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

27. 47. The questions below relate to a range of statements that establish your views, feelings and personality traits. Therefore, please note that there are no "right" or "wrong" answers. Please, provide answers which best represent your views and dispositions.

I see myself as someone who…

	Disagree strongly	Disagree a little	Neither agree nor disagree	Agree a little	Agree strongly.
...is reserved.					
...is generally trusting.					
...tends to be lazy.					
...is relaxed, handles stress well.					
...has few artistic interests.					

...is outgoing, sociable.

...tends to find fault with
others.

...does a thorough job.

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imagination.

29. 48. In general, how satisfied would you say you are with your life right now?

- Very satisfied
- Generally satisfied
- Ambivalent
- Generally dissatisfied
- Very dissatisfied

30. 49. “Finishing my postgraduate degree will help in….”

- Feeling more satisfied about my life
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- Reposition my social class to higher status
- Widening my social connection and network
- Other (please specify)

Fast Forward Wave 4 Survey 2017

Prize draw

29. 50. Thank you for participating in our survey. As a reward we (the research team) have a raffle to give away £50 to TEN lucky respondents who complete the survey only once . Would you like to be entered onto our prize draw?

- Yes, I completed the survey only once and would like to be considered.
- No, I would not like to be considered for the raffle draw.

51. And finally, we would like to access other data held by the university about you with regard to your final degree result and employment destinations. You can at any time change the response you give here by e-mailing cm55@gre.ac.uk. This data will only be accessible to the survey team for academic research purposes and in an anonymous form (linked through the banner ID you have provided). Do you give us permission for this data linkage for this purpose only?

- Yes
- No

APPENDIX C: FINAL SOLUTIONS FOR REDUCED UG FEES, INTEREST RATE OF 5% AND HUMAN CAPITAL

No PG

time	ρ^i	(1+g)^i	(1+r)^-i	(1+g)^i*(1+r)^-i	(1+r)^i	W	W*(1+g)^1/(1+r)^i	Q_UG*(1+r)^-i	s_10*(1+r)^-10	G_NPG	c_i	c-_i	V_NPG	wage	net of deb	saving	
0.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	2250.00	6906.21	181518.40	17343.34		9.76	21000.00	18750.00	1406.66	
1.00	0.99	1.02	0.96	0.98	1.04	21000.00	20575.55	2165.54	6906.21	181518.40	17839.53	17343.34	9.69	21378.00	19128.00	2749.99	
2.00	0.98	1.04	0.93	0.96	1.08	21000.00	20159.69	2084.26	6906.21	181518.40	18349.92	17839.53	9.62	21762.80	19512.80	4020.13	
3.00	0.97	1.05	0.89	0.94	1.12	21000.00	19752.22	2006.02	6906.21	181518.40	18874.91	18349.92	9.55	22154.53	19904.53	5206.54	
4.00	0.96	1.07	0.86	0.92	1.17	21000.00	19353.00	1930.72	6906.21	181518.40	19414.92	18874.91	9.48	22553.32	20303.32	6297.98	
5.00	0.95	1.09	0.83	0.90	1.21	21000.00	18961.84	1858.25	6906.21	181518.40	19970.38	19414.92	9.42	22959.28	20709.28	7282.50	
6.00	0.94	1.11	0.79	0.88	1.26	21000.00	18578.59	1788.50	6906.21	181518.40	20541.74	19970.38	9.35	23372.54	21122.54	8147.32	
7.00	0.93	1.13	0.77	0.87	1.31	21000.00	18203.08	1721.37	6906.21	181518.40	21129.43	20541.74	9.28	23793.25	21543.25	8878.88	
8.00	0.92	1.15	0.74	0.85	1.36	21000.00	17835.17	1656.75	6906.21	181518.40	21733.95	21129.43	9.22	24221.53	21971.53	9462.74	
9.00	0.91	1.17	0.71	0.83	1.41	21000.00	17474.69	1594.57	6906.21	181518.40	22355.76	21733.95	9.15	24657.51	22407.51	9883.55	
10.00	0.90	1.20	0.68	0.82	1.47	21000.00	17121.49	1534.71	6906.21	181518.40	22995.35	22355.76	9.08	25101.35	22851.35	10125.00	6906.21
Totals	10.47	12.05	9.15	9.95	1.01		209015.31	20590.70	6906.21	181518.40		22995.35	**103.61**	0.00			

Immediate PG

time=i	D_PG	(D-PG+10000)/5	W _pg	(1+r)	((1+η)/ (1+r))^i	W_PG*discounted	Quota-PG discounted	quota_UG discounted	S_PG*(1+r)^-10	G_PG	φ	φ rho*(1+R)^-1	ρ^i	*lambda*	*c_i+phi_i*	C_PG	V_PG	saving	
0.00	10000.00	0.00	0.00	1.00	1.00	0.00	0.00	0.00	7673.56	143250.74	3862.53	3862.53	1.00	0.00	13862.53	10000.00	9.54	0.00	
1.00	0.00	4200.00	21000.00	1.04	0.98	20575.55	4042.35	2165.54	0.00	143250.74	4055.66	3903.42	0.99	0.00	18169.73	14114.07	9.71	1013.93	21378.00
2.00	0.00	4200.00	21000.00	1.08	0.96	20159.69	3890.61	2084.26	0.00	143250.74	4120.03	3816.54	0.98	0.00	18689.56	14569.53	9.64	1996.75	
3.00	0.00	4200.00	21000.00	1.12	0.94	19752.22	3744.58	2006.02	0.00	143250.74	4055.66	3615.88	0.97	0.00	19224.27	15168.61	9.57	2810.54	
4.00	0.00	4200.00	21000.00	1.17	0.92	19353.00	3604.02	1930.72	0.00	143250.74	3862.53	3314.44	0.96	0.00	19774.28	15911.75	9.50	3311.72	
5.00	0.00	4200.00	21000.00	1.21	0.90	18961.84	3468.74	1858.25	0.00	143250.74	3540.65	2924.19	0.95	0.00	20340.02	16799.37	9.43	3350.79	
6.00	0.00	0.00	21000.00	1.26	0.88	18578.59	0.00	1788.50	0.00	143250.74	3090.02	2456.23	0.94	0.00	20921.95	17831.92	9.37	6772.09	
7.00	0.00	0.00	21000.00	1.31	0.87	18203.08	0.00	1721.37	0.00	143250.74	2510.64	1920.77	0.93	0.00	21520.52	19009.88	9.30	9569.57	
8.00	0.00	0.00	21000.00	1.36	0.85	17835.17	0.00	1656.75	0.00	143250.74	1802.51	1327.25	0.92	0.00	22136.23	20333.71	9.23	11580.60	
9.00	0.00	0.00	21000.00	1.41	0.83	17474.69	0.00	1594.57	0.00	143250.74	965.63	684.34	0.91	0.00	22769.54	21803.91	9.17	12635.85	
10.00	0.00	0.00	21000.00	1.47	0.82	17121.49	0.00	1534.71	0.00	143250.74	0.00	0.00	0.90	0.00	23420.98	23420.98	9.10	12559.01	8566.43
Totals					8.95	188015.31	18750.30	18340.70				23963.07	9.47			0.00	**103.56**		

Year 1

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	136487.95	17343.34	17499.34	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	0.00	0.00	0.00	0.00	0.00	8217.98	4154.83	3998.88	-2383.64		136487.95	13845.16	17499.34	13325.47	17999.99	9.70
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	3606.30		4347.96	4027.68	-1130.81		136487.95	14167.01	17499.34	13123.42	18514.97	9.63
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	3470.94		4412.34	3933.89	97.28		136487.95	14632.35	17499.34	13045.70	19044.69	9.56
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	3340.65		4347.96	3730.98	1162.79		136487.95	15241.59	17499.34	13078.81	19589.56	9.49
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	3215.26		4154.83	3431.44	1922.24		136487.95	15995.18	17499.34	13210.26	20150.01	9.43
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	3094.57		3832.96	3046.78	2226.20		136487.95	16893.55	17499.34	13428.50	20726.50	9.36
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	0.00		3382.33	2587.66	1919.11		136487.95	17937.16	17499.34	13722.87	21319.49	9.29
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	0.00		2802.95	2063.91	838.99		136487.95	19126.49	17499.34	14083.51	21929.44	9.22
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	0.00		2094.82	1484.59	-1182.80		136487.95	20462.02	17499.34	14501.36	22556.84	9.16
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	0.00		1257.94	858.03	-4321.83		136487.95	21944.26	17499.34	14968.06	23202.19	9.09
			9.47		11.72						188439.75	18425.16	16727.72		34788.92	29163.83			148483.35					**103.69**

Year 2

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	119891.27	17343.34	17595.36	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		119891.27	17839.53	17595.36	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	0.00	0.00	0.00	0.00	0.00	6616.60	4433.98	4107.36	-1325.35		119891.27	14182.59	17595.36	13137.85	18616.57	9.64
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	3209.62		4627.10	4125.37	33.25		119891.27	14522.08	17595.36	12947.39	19149.19	9.57
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	3089.14		4691.48	4025.76	1331.60		119891.27	15005.57	17595.36	12876.27	19697.05	9.50
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	2973.19		4627.10	3821.48	2431.37		119891.27	15633.47	17595.36	12911.53	20260.58	9.43
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	2861.59		4433.98	3524.52	3191.42		119891.27	16406.25	17595.36	13041.16	20840.23	9.36
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	2754.17		4112.10	3145.97	3467.74		119891.27	17324.37	17595.36	13254.05	21436.47	9.30
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	0.00		3661.47	2696.07	3113.39		119891.27	18388.30	17595.36	13539.95	22049.77	9.23
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	0.00		3082.09	2184.27	1978.43		119891.27	19598.52	17595.36	13889.40	22680.61	9.16
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	0.00		2373.96	1619.27	-90.15		119891.27	20955.54	17595.36	14293.66	23329.51	9.10
			8.48		10.69						188855.62	18506.45	14887.70		1537.08	29250.06			138208.29					**103.73**

Year 3

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	103459.24	17343.34	17569.97	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		103459.24	17839.53	17569.97	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		103459.24	18349.92	17569.97	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	0.00	0.00	0.00	0.00	0.00	5191.67	4697.91	4188.50	-246.73		103459.24	14423.64	17569.97	12859.63	19121.56	9.57
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	2851.34		4891.04	4197.00	1274.56		103459.24	14777.58	17569.97	12680.64	19668.62	9.50
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	2744.31		4955.41	4092.63	2730.85		103459.24	15275.93	17569.97	12616.24	20231.34	9.43
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	2641.30		4891.04	3887.83	3983.42		103459.24	15919.12	17569.97	12653.94	20810.16	9.36
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	2542.15		4697.91	3594.15	4890.74		103459.24	16707.63	17569.97	12782.21	21405.54	9.29
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	2446.73		4376.03	3222.23	5308.39		103459.24	17641.92	17569.97	12990.37	22017.95	9.23
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	0.00		3925.41	2781.92	5088.97		103459.24	18722.48	17569.97	13268.55	22647.89	9.16
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	0.00		3346.03	2282.31	4082.11		103459.24	19949.82	17569.97	13607.66	23295.84	9.09
			7.50		9.63						189263.08	18584.68	13225.82		35780.78	28246.56			136027.13					103.70

Year 4

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	87190.42	17343.34	17449.86	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		87190.42	17839.53	17449.86	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		87190.42	18349.92	17449.86	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		87190.42	18874.91	17449.86	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	0.00	0.00	0.00	0.00	0.00	3939.03	4944.45	4242.83	819.87		87190.42	14589.72	17449.86	12519.44	19534.17	9.49
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	2530.52		5224.80	4315.11	2675.65		87190.42	14868.25	17449.86	12279.54	20093.05	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	2435.53		5290.56	4205.41	4469.01		87190.42	15377.35	17449.86	12223.29	20667.91	9.35
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	2344.11		5224.80	3997.24	6058.28		87190.42	16034.42	17449.86	12267.17	21259.22	9.29
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	2256.12		5027.52	3701.94	7298.93		87190.42	16839.92	17449.86	12399.83	21867.44	9.22
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	2171.44		4698.72	3329.96	8043.47		87190.42	17794.35	17449.86	12610.79	22493.07	9.15
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	0.00		4238.40	2890.99	8141.41		87190.42	18898.20	17449.86	12890.36	23136.60	9.09
			6.53		8.54						189662.31	18659.98	11737.71		#######	26683.48			133779.88					103.65

Year 5

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	71083.37	17343.34	17015.48	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		71083.37	17839.53	17015.48	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		71083.37	18349.92	17015.48	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		71083.37	18874.91	17015.48	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		71083.37	19414.92	17015.48	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	0.00	0.00	0.00	0.00	0.00	2854.60	5171.25	4270.89	2122.00		71083.37	14421.61	17015.48	11910.66	19592.86	9.40
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	2246.23		5364.38	4264.09	4493.70		71083.37	14789.03	17015.48	11755.65	20153.41	9.33
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	2161.92		5428.75	4153.28	6816.59		71083.37	15301.25	17015.48	11706.26	20730.00	9.26
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	2080.77		5364.38	3949.98	8952.11		71083.37	15958.71	17015.48	11750.96	21323.09	9.20
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	2002.66		5171.25	3664.85	10758.87		71083.37	16761.89	17015.48	11879.09	21933.14	9.13
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	1927.49		4849.37	3307.73	12092.61		71083.37	17711.27	17015.48	12080.76	22560.65	9.07
			5.57		7.42						190053.47	18732.45	10419.07		31349.38	23610.81			131466.00					**103.50**

Year 6

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	9454.53	55069.82	17343.34	16333.34	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		55069.82	17839.53	16333.34	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		55069.82	18349.92	16333.34	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		55069.82	18874.91	16333.34	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		55069.82	19414.92	16333.34	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	0.00		0.00	0.00	7282.50		55069.82	19970.38	16333.34	16493.34	19970.38	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	0.00	0.00	0.00	0.00	0.00	1934.35	5375.83	4273.19	3596.88		55069.82	13969.64	16333.34	11104.32	19345.47	9.29
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	1997.58		5568.96	4260.55	6874.88		55069.82	14329.99	16333.34	10963.19	19898.95	9.23
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	1922.59		5633.34	4148.02	10135.24		55069.82	14834.92	16333.34	10923.47	20468.25	9.16
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	1850.43		5568.96	3946.70	13240.30		55069.82	15484.89	16333.34	10974.08	21053.85	9.09
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	1780.97		5375.83	3666.83	16049.60		55069.82	16280.37	16333.34	11104.75	21656.20	9.03
			4.61		6.27						190436.72	18802.20	7551.57		27522.92	20295.29								**103.33**

Year 7

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	9325.82	40817.40	17343.34	15612.85	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		40817.40	17839.53	15612.85	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		40817.40	18349.92	15612.85	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		40817.40	18874.91	15612.85	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		40817.40	19414.92	15612.85	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	0.00		0.00	0.00	7282.50		40817.40	19970.38	15612.85	16493.34	19970.38	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	0.00		0.00	0.00	8147.32		40817.40	20541.74	15612.85	16328.41	20541.74	9.35
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	0.00	0.00	0.00	0.00	0.00	1174.30	5555.54	4250.28	4999.44		40817.40	13465.63	15612.85	10301.91	19021.17	9.18
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	1783.65		5748.67	4232.95	9244.26		40817.40	13816.70	15612.85	10173.72	19565.37	9.12
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	1716.70		5813.05	4119.68	13506.08		40817.40	14312.09	15612.85	10142.92	20125.13	9.05
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	1652.26		5748.67	3921.14	17648.30		40817.40	14952.24	15612.85	10198.84	20700.91	8.99
			3.67		5.09						190812.23	18869.34	5152.61		22865.93	16524.05			131798.64					103.22

Year 8

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	9216.95	26466.34	17343.34	14200.88	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		26466.34	17839.53	14200.88	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		26466.34	18349.92	14200.88	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		26466.34	18874.91	14200.88	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		26466.34	19414.92	14200.88	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	0.00		0.00	0.00	7282.50		26466.34	19970.38	14200.88	16493.34	19970.38	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	0.00		0.00	0.00	8147.32		26466.34	20541.74	14200.88	16328.41	20541.74	9.35
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	0.00		0.00	0.00	8878.88		26466.34	21129.43	14200.88	16165.12	21129.43	9.28
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	0.00	0.00	0.00	0.00	0.00	570.54	5707.56	4202.68	7136.78		26466.34	12088.39	14200.88	8901.10	17795.95	9.03
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	1603.58		5900.69	4181.80	13268.35		26466.34	12404.40	14200.88	8790.95	18305.09	8.97
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	1543.39		5965.06	4068.74	19494.80		26466.34	12863.73	14200.88	8774.28	18828.80	8.90
			2.74		3.87						191180.14	18933.95	3146.96		17573.31	12453.21			########					103.06

Year 9

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	9130.06	12087.19	17343.34	11180.86	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		12087.19	17839.53	11180.86	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		12087.19	18349.92	11180.86	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		12087.19	18874.91	11180.86	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		12087.19	19414.92	11180.86	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	0.00		0.00	0.00	7282.50		12087.19	19970.38	11180.86	16493.34	19970.38	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	0.00		0.00	0.00	8147.32		12087.19	20541.74	11180.86	16328.41	20541.74	9.35
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	0.00		0.00	0.00	8878.88		12087.19	21129.43	11180.86	16165.12	21129.43	9.28
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	0.00		0.00	0.00	9462.74		12087.19	21733.95	11180.86	16003.47	21733.95	9.22
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	0.00	0.00	0.00	0.00	0.00	119.21	5828.89	4130.91	11248.42		12087.19	8583.37	11180.86	6083.00	14412.26	8.75
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	30787.52	25101.35	17121.49	1534.71	1456.49		6022.01	4107.58	21499.66		12087.19	8802.58	11180.86	6004.19	14824.59	8.69
			1.82		2.61						191540.62	18996.14	1456.49		11850.90	8238.49			132244.99					102.81

Year 10

Time	(1+r)^i	(1+r)^(-i)	ρ^i	ρ^(-i)	ρ^i*(1+r)^i	(1+g)^i	(1+g)^(-i)	((1+g)/(1+r))^i	w_i*(1+r)^i	w_i*(1+g)^i	w_i*((1+g)/(1+r))^i	Q_UG*(1+r)^(-i)	Q_PG*(1+r)^(-i)	D_pg	ϕ	ϕ(1+r)^(-i)	S	S_discounted	G_w|pg	c_i	1/λ	c_i(1+r)^(-i)	c_i+ϕ	V_w|pg
0.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	21000.00	21000.00	21000.00	2250.00	0.00		0.00	0.00	1406.66	7673.56	-669.13	17343.34	3722.28	17343.34	17343.34	9.76
1.00	1.04	0.96	0.99	1.01	1.03	1.02	0.98	0.98	21819.00	21378.00	20575.55	2165.54	0.00		0.00	0.00	2749.99		-669.13	17839.53	3722.28	17169.90	17839.53	9.69
2.00	1.08	0.93	0.98	1.02	1.06	1.04	0.96	0.96	22669.94	21762.80	20159.69	2084.26	0.00		0.00	0.00	4020.13		-669.13	18349.92	3722.28	16998.21	18349.92	9.62
3.00	1.12	0.89	0.97	1.03	1.09	1.05	0.95	0.94	23554.07	22154.53	19752.22	2006.02	0.00		0.00	0.00	5206.54		-669.13	18874.91	3722.28	16828.22	18874.91	9.55
4.00	1.17	0.86	0.96	1.04	1.12	1.07	0.93	0.92	24472.68	22553.32	19353.00	1930.72	0.00		0.00	0.00	6297.98		-669.13	19414.92	3722.28	16659.94	19414.92	9.48
5.00	1.21	0.83	0.95	1.05	1.15	1.09	0.91	0.90	25427.11	22959.28	18961.84	1858.25	0.00		0.00	0.00	7282.50		-669.13	19970.38	3722.28	16493.34	19970.38	9.42
6.00	1.26	0.79	0.94	1.06	1.18	1.11	0.90	0.88	26418.77	23372.54	18578.59	1788.50	0.00		0.00	0.00	8147.32		-669.13	20541.74	3722.28	16328.41	20541.74	9.35
7.00	1.31	0.77	0.93	1.07	1.22	1.13	0.88	0.87	27449.10	23793.25	18203.08	1721.37	0.00		0.00	0.00	8878.88		-669.13	21129.43	3722.28	16165.12	21129.43	9.28
8.00	1.36	0.74	0.92	1.08	1.25	1.15	0.87	0.85	28519.62	24221.53	17835.17	1656.75	0.00		0.00	0.00	9462.74		-669.13	21733.95	3722.28	16003.47	21733.95	9.22
9.00	1.41	0.71	0.91	1.09	1.29	1.17	0.85	0.83	29631.88	24657.51	17474.69	1594.57	0.00		0.00	0.00	9883.55		-669.13	22355.76	3722.28	15843.44	22355.76	9.15
10.00	1.47	0.68	0.90	1.11	1.33	1.20	0.84	0.82	0.00	0.00	0.00	0.00	0.00	0.00	5916.33	4035.50	21250.00		-669.13	-981.00	3722.28	-669.13	4935.33	7.69
			0.90		1.33						191893.82	19055.99	0.00		5916.33	4035.50			########					102.21