BEHAVIOURAL ASSUMPTIONS IN LABOUR ECONOMICS:

ANALYSING SOCIAL SECURITY REFORMS AND LABOUR MARKET TRANSITIONS

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Behavioural Assumptions in Labour Economics: Analysing Social Security Reforms and Labour Market Transitions

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Introduction

Economic analysis is in one way or another based on assumptions on human behaviour. The most fundamental and universal assumption in economics is that individuals aim to maximize utility, however this is defined. In order to construct a tractable model of reality, the argument goes, one needs to abstract from trivial elements by making such simplifying assumptions. But assumptions do not just make the life of economists easier. Because assumptions are the building blocks of theoretical models, economists rely on them to formulate testable hypotheses and to construct powerful tools that explain a broad variety of facts and figures.

Traditionally, economic models assume that people have consistent and stable preferences and rationally maximize utility under perfect information. Although it is evident that these assumptions are incorrect, the predictions of the model may be right. Economists generally argue that models should not be judged by the realism of the assumptions but by their explanatory and predictive power (Friedman, 1953). However, the traditional framework leaves many empirical puzzles unsolved and important economic phenomena unexplained (e.g. unemployment).[1] It is therefore not surprising that many scholars have challenged the foundations of the neoclassical model.

During the second half of the 20th century, models have been developed that replace the assumption of perfect rationality underpinning neoclassical models by bounded rationality, allowing for imperfect information and limited processing abilities (Simon, 1955; Stigler, 1961; Kahneman and Tversky, 1979). More recently, behavioural economics emerged as a new field that focuses explicitly on the realism of behavioural assumptions of economic models (Rabin, 1998; 2002; Camerer, 2006). The economists in this sub-discipline aim to identify systematic behavioural deviations from the homo economicus and to develop alternative theoretical models to better explain and predict the behaviour of the homo sapiens. These developments have led to revolutionary changes in economic thought.

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[1] The *Journal of Economic Perspectives* has a long tradition in publishing papers on anomalies of the standard economic framework (Loewenstein and Thaler, 1989; Thaler, 1990; Kahneman et al., 1991). Important puzzles in economics are, for example, the retirement savings puzzle (Banks et al., 1998) and the equity premium puzzle (Benartzi and Thaler, 1995).

This thesis demonstrates that allowing for more realistic behavioural assumptions is of vital importance for policy evaluations and for understanding labour market behaviour. Part I of this study focuses on the behavioural impact of certain promising, far-reaching policy proposals: the introduction of savings schemes in the system of social security. How will this reform alter labour market incentives and how will labour market behaviour be affected by these changed incentives? This study shows that the theoretical effects of social security savings schemes on labour market behaviour depend critically on two assumptions, one concerning the role of time preferences in job search models, the other dealing with the impact of wealth on labour supply behaviour. Section 1.1 of this introduction elaborates on these issues.

Part II examines the critical behavioural assumptions empirically. How do time preferences affect job search behaviour and labour market transitions? What is the effect of wealth on labour supply? As these questions refer to general behavioural assumptions in labour economic models, this study aims to provide new insights into labour market behaviour and to derive general implications for social security and labour market policies. In Section 1.2, these behavioural assumptions are discussed in more detail. The thesis thus contains both theoretical evaluations of specific policy proposals and empirical tests of general behavioural assumptions.

1.1 Social security revisited: challenges and policy proposals

The welfare state is one of the great human achievements of the past century. One of the most important functions of the welfare state is to provide (income) protection against risks and to support individuals to smooth consumption over the life cycle (Barr, 1992; 2001). The institutions that serve this 'piggy bank function' of the welfare state are generally based on social insurance. Traditionally, social security systems cover a limited number of risks that were considered outside the control of the individual ('external' risks), such as involuntary unemployment, disability and old age. This system may sufficed in many OECD countries during the early post World War II period, when societies were characterised by a strict division of labour between men and women (i.e. male breadwinner society); stable nuclear family structures (i.e. low divorce rates); people following a standard life course trajectory (i.e. education-activity-retirement); and workers having continuous full-time careers (i.e. strong internal labour markets).

These conditions no longer exist in present day welfare states. Over the past decades, female labour force participation has increased considerably and the number of single-parent households has risen. Furthermore, life courses have become more heterogeneous: in the modern 'choice biography' individuals move more frequently from one job to another and between full-time employment and voluntary (part-time) non-employment in order to invest in their human capital, care for children or relatives, start up a business or simply enjoy leisure. In addition, ageing and globalisation have generated new economic forces that put pressure on existing social security systems.

In a world that experienced these dramatic changes in socio-economic conditions, the traditional social security system is no longer adequate (Taylor-Gooby, 2004; Plantenga, 2005; Bovenberg, 2008; Schmid, 2008). On the one hand, the notion and nature of the risks that are typically covered by social security have changed. This is especially true for the unemployment risk. On the other hand, as a result of the social and economic trends, new social risks have emerged which are not covered by the traditional social security systems. As will be discussed below, both developments pose challenges to the traditional welfare state systems.

Changes in the notion and nature of unemployment

Nowadays, the general consensus is that the unemployment risk cannot be regarded as completely external: "[unemployment] should be contrasted with an insurable event that is wholly outside individual control, such as developing a kidney infection. Unemployment, it should be clear, is a very different animal" (Barr, 2001: p.47). In industrial societies, which were characterised by strong internal labour markets where workers in principle held their jobs for life, events outside the individual's control were to a large degree responsible for unemployment (e.g. declining demand, recession, bankruptcy of the firm). However, in today's dynamic labour markets, workers to a certain extent can affect both the probability and the duration of unemployment. Due to the erosion of internal labour markets and the rapid depreciation of human capital in knowledge-based societies, workers have to move more frequently between jobs or industries and are required to invest in their employability to reduce the risk of unemployment. Hence, by searching on-the-job and by (re)training, employees may avoid unemployment. Moreover, once unemployed, individuals can mitigate the risk by searching more intensively for job opportunities or by altering their job acceptance strategy.

If individuals are able to affect the probability and duration of unemployment, insuring this risk may give rise to moral hazard – a problem that has been extensively studied in economics (Holmlund, 1998; Fredriksson and Holmlund, 2006). "The safety net provided by social insurance may actually imply that people do not try hard enough to succeed, become careless, and take too dangerous short-cuts in the mountainous life paths" (Sinn, 1996: p.260). Unemployment insurance thus creates disincentives to keep and seek a job, giving rise to adverse effects on unemployment. The trade-off between the insurance benefits in terms of increased security and insurance costs in terms of adverse incentives is central in the literature on optimal unemployment insurance (Baily, 1978; Shavell and Weiss, 1979; Hopenhayn and Nicolini, 1997; Shimer and Werning, 2008). A reduction in benefit levels or a shortening of the benefit duration will obviously decrease moral hazard but at the same time will diminish the gains from income protection. So, an important challenge for social security is how to improve incentives while maintaining income protection. This challenge has become more severe in the current era of ageing, flexibilisation and globalisation. Ageing puts welfare states under pressure to cut spending in order to be sustainable in the future. Moreover, intensifying flexibilisation and globalisation threaten current social protection systems (Sinn, 2007; Snower et al., 2009) but at the same time increase economic insecurities and thereby strengthen the need for protection (Rodrik, 1998; Geishecker, 2008).

Emergence of new risks

As a result of the structural socio-economic trends discussed above, new social risks have arisen. Although various scholars have discussed and documented these new social risks (Esping-Andersen, 1999; Taylor-Gooby, 2004; Bonoli, 2005; Schmid, 2006), there is neither a strict definition nor a universal list of these new risks. However, without attempting to provide a complete overview of the new risks, the following are worth emphasising. First of all, citizens now face increasing difficulties during the 'rush hour of life' to combine many different time-demanding activities like paid employment and the care for children. An important challenge in this respect is how to facilitate the reconciliation between work and family life. Second, the traditional social security system takes a standard life course as a frame of reference and thereby does not take into account the growing diversity and de-standardisation of life courses. This may result in insufficient social security coverage (e.g. low pension benefits) for people with non-standard careers. Third, higher levels of international competition, increasing labour market flexibility and

rapid technological changes have resulted in a highly dynamic and insecure economic environment. For this reason, workers need to continuously invest in their human capital through life-long learning. Individuals who have low or obsolete skills face an increasing risk of long-term unemployment and social exclusion.

An important feature of these new social risks is that they are to a large extent manufactured or 'self-chosen'. Yet, they can lead to precariousness and social exclusion and as such represent important policy challenges. The main rationale to provide protection against these risks lies in the substantial externalities involved in the activities related to these risks. For instance, investments in training and education not only involve private benefits, but also reduce the risk and persistence of unemployment. Likewise, by raising children, parents invest in the future labour force. Because both activities produce (long-run) societal benefits, facilitating care activities and encouraging life-long learning are important policy objectives. However, since the risk of facing difficulties in combining work and family life and the risk of having obsolete skills and knowledge are to a large extent manufactured, protection through social insurance leads to moral hazard and is therefore inefficient. Instead of providing income replacement when the risk occurs, risk prevention by facilitating care and training activities may be a more effective risk management strategy.

Savings accounts in social security

The developments described above can be summarised along these lines: the unemployment risk is in fact partly manufactured and requires more individual responsibility, while new social risks actually call for more social protection. Apparently, the line between traditional (external) risks and new (manufactured) risks has become blurred. Both the inefficiencies of the traditional mechanism to provide protection against unemployment and the lack of protection against new social risks require a reorganisation of the social security system. How to improve employment incentives while maintaining protection against unemployment? And how to facilitate transitions and combinations between paid work and other socially productive activities without creating problems of moral hazard?

Against the backdrop of these developments and challenges, several influential scholars have proposed an alternative for insurance schemes to fulfil the piggy bank function of the welfare state: the introduction of special savings accounts in the system of social security. Some proposals involve rather comprehensive reorganisations of the social

security system, replacing public provision or insurance for various risks (unemployment, health, education, old age) by savings accounts (Orszag and Snower, 1999; Fölster, 2001; Snower et al., 2009). This study focuses on savings accounts for unemployment (i.e. unemployment accounts) and savings schemes to protect against new risks by facilitating reductions in labour supply (i.e. life course schemes).

Under the unemployment account (UA) system (Stiglitz and Yun, 2005; Feldstein and Altman, 2007; Brown et al., 2008), workers make mandatory contributions to special UAs and unemployed individuals withdraw savings from these accounts. By allowing account balances to be negative and by cancelling UA debt at retirement, this alternative system offers the same level of income protection as the current system: the reform essentially leaves the main features (e.g. level and duration of benefits, eligibility criteria) of existing insurance schemes unchanged. Proponents argue that under the UA system (most) people finance their own unemployment and thus internalise the costs of unemployment to a larger extent than under the prevailing system. Thus, UAs mitigate the problem of moral hazard without scaling back the level of income protection.

In contrast to UAs, life course schemes are more general income-smoothing devices that can be used during voluntary unemployment to finance leave for care and education, or periods in which the worker reduces the number of working hours. Unlike UAs, contributions to life course schemes are generally not mandatory but are encouraged through, for instance, tax incentives (as is the case in the Dutch Life Course Savings Scheme; e.g. Van Huizen and Plantenga, 2010). By offering an instrument for a more balanced allocation of time and money over the life cycle, these schemes aim to facilitate care activities and life-long learning. Moreover, they encourage individuals to take on more responsibility. Although the tax incentives may involve a certain level of deadweight loss, the costs of moral hazard are limited as individuals use their own savings to smooth income (Plantenga, 2005; Bovenberg, 2008).

Hence, social security savings accounts seem promising in the sense that they aim to address a variety of important issues and challenges that present-day welfare states are facing. It is therefore not surprising that the introduction of savings schemes is in fact a subject of discussion in several countries, for instance in Germany (Boss et al., 2008), the Netherlands (Van Ours, 2003), and Denmark (Sørensen et al., 2006). But even though these proposals for reform seem promising at first glance, it is imperative that they are comprehensively evaluated before actual implementation – particularly because the reforms imply fundamental changes to the social security system. In fact, some proposals

essentially involve the replacement of insurance schemes, the core of the current social security system, by savings schemes. As the main rationale of introducing social security savings accounts is to improve labour market behaviour, it is important to study the labour market effects of the reforms. While there are various other studies on these proposals, it is remarkable that so far the behavioural effects have not been examined extensively and systematically. Of course, as they have not been implemented, the effects of the savings schemes cannot be tested empirically.[2] Thus, these theoretical proposals can only be evaluated ex ante.

In Part I of this thesis, this ex ante evaluation of social security savings accounts is performed, focusing on the underlying behavioural assumptions. In Chapter 2 it is demonstrated that UAs provide a 'retirement bonus' for avoiding or shortening unemployment spells: this is a distant future incentive. Of course, the reform will be effective only if individuals care much about this type of incentives. Whether the move from unemployment insurance to unemployment accounts effectively improves employment incentives thus depends critically on the assumption on time preferences in labour market models. The theoretical impact of UAs on employment incentives is therefore not clear-cut. Next, Chapter 3 focuses on the labour market effects of life course schemes. The general presumption is that these savings schemes facilitate transitions between or combinations of paid employment and other life domains (such as education and care). This premise rests on two assumptions: life course schemes promote the accumulation of savings substantially and wealth (or a lack thereof) has a significant impact on labour supply behaviour. The former depends crucially on the design of life course schemes, whereas the latter remains an empirical question. Because these critical behavioural assumptions on time preferences and wealth determine the outcome of the policy evaluations, it is evident that the behavioural validity of these assumptions is crucial.

[2] In Chile, unemployment is financed through savings accounts (Acevedo et al., 2006). The Chilean unemployment accounts system is different from the UA proposals and will therefore not be discussed in this thesis. The Dutch Life Course Savings Scheme, implemented in 2006, is actually an example of a life course scheme. However, as the scheme has just recently been introduced, the level of accumulated savings is still low and therefore the behavioural effects cannot be examined yet.

1.2 Assumptions and labour market behaviour

The critical behavioural assumptions derived in Part I are tested empirically in Part II. What is the effect of time preferences on job search behaviour and labour market transitions? How does wealth affect labour supply decisions? Despite the prominent role of these effects in labour economic models of job search and labour supply, these questions are generally ignored in empirical work.

Search, transitions and time preferences

Job search theory is one of the cornerstones of modern labour economics. It provides economists with a framework to study unemployment spells and worker flows. These important economic phenomena are left unexplained in the neoclassical theory of labour supply. In the neoclassical framework, it is assumed that individuals are aware of all potential job offers and that jobs are immediately available at the market clearing wage. In the real world, however, people do not possess complete and perfect information. Stigler (1961; 1962) realized that information matters in economic models and allowed for imperfect information within a static labour market context. A decade later, these ideas were applied in a dynamic setting, resulting in the formulation of the first job search models (McCall, 1970; Mortensen, 1970).

The main innovation of the job search framework is that it formalises the idea that employment opportunities do not fall from the sky but that, in reality, it takes time and energy to locate and evaluate job offers. This may sound rather intuitive to most job seekers, but recognizing this explicitly evoked a revolution in labour economics. Soon these models became a popular tool to analyse unemployment and labour mobility (Lippman and McCall, 1976; Mortensen and Pissarides, 1999). Even in the most basic job search models, it is obvious that time preferences are directly related to search behaviour and unemployment durations. As Mortensen (2011: p.1073) pointed out in his Nobel Prize lecture[3], "[search costs] serve as a hindrance to the process of efficient allocation, not only because they reduce the gains from trade. The costs must be borne now but the returns come only in the future".[4] Search is an activity that involves immediate costs and future rewards: the individual discount rate thus directly affects search behaviour. It may not

[3] In 2010, Peter Diamond, Dale Mortensen and Christopher Pissarides received the Nobel Memorial Prize in Economic Sciences for their contributions on search and matching frictions in the labour market.
[4] Also in an earlier study, Mortensen (1986: p.854) argues that search involves immediate costs and "the returns to this investment in search are uncertain and in the future".

come as a bolt from the blue that this relation is discussed in theoretical work.[5] However, given the vast empirical literature that has tested the predictions of the job search model (e.g. Eckstein and Van den Berg, 2007), it is striking that empirical studies have entirely ignored the relation between time preferences and job search behaviour until recently (DellaVigna and Paserman, 2005). An explanation for this lack of attention could be that it is common in economics to set the discount rate equal to the prevailing interest rate (or, even more dubiously, to zero), thereby assuming away any heterogeneity in time preferences.

Of course, not only those who are unemployed try to improve their labour market position: once employed, workers can try to get a better job by searching on-the-job (e.g. Burdett, 1978; Mortensen, 1986). Moreover, workers try to climb the wage ladder by investing in their career through exerting high work effort, as emphasised in models that focus on internal labour markets and tournaments (e.g. Doeringer and Piore, 1971; Lazear and Rosen, 1981; Nalebuff and Stiglitz, 1983; Gibbons and Waldman, 1999). Basically, workers may try to receive outside job offers or internal promotion opportunities. Like unemployed job search, on-the-job search and work effort can be considered as investment activities: it is thus likely that individual time preferences matter for these behaviours as well as for internal and external job mobility.

A fundamental question now is how to model time preferences within search and career models. Since its introduction by Samuelson (1937), the exponential discounting model has been the standard in economics – despite the severe reservations of its founder.[6] This theoretical framework assumes that individuals have time consistent preferences, which is at odds with evidence obtained from experiments indicating time inconsistent, present-biased preferences (Strotz, 1956; Thaler, 1981; Ainslie, 1992; Frederick et al., 2002). The hyperbolic discounting model has been proposed as an alternative model of intertemporal choice that allows for present-biased preferences (Laibson, 1997). This analytically tractable model can explain findings from the laboratory (Frederick et al., 2002), the field (DellaVigna, 2009) and the functional MRI scanner (McClure et al., 2004).

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[5] Gronau (1971) derives theoretical relations between the discount rate, reservation wages and exit rates (assuming a fixed level of search effort). Albrecht et al. (1991) and Burdett and Mortensen (1978) discuss the theoretical effect of the discount rate on search effort and the reservation wage (but not on the exit rate). Interestingly, even labour economics textbooks discuss the role of the discount rate in job search models (e.g. Borjas, 2010: p.513; Cahuc and Zylberberg, 2004: p114).

[6] Samuelson (1937) noted that it is "completely arbitrary to assume that the individual behaves so as to maximise [the exponential discount function]" and that "in the analysis of the supply of savings, it is extremely doubtful whether we can learn much from considering such an economic man…".

One of the most important implications of this model is that individuals have self-control problems: people tend to pursue immediate gratification and procrastinate investment activities to a degree that is conflicting with their long-run preferences (O'Donoghue and Rabin, 2000). Although present-biased preferences have recently gained a fair amount of attention in economics, the idea itself is not new to the field: in the 18th century Adam Smith already discussed the inner conflict between the short-sighted 'passions' and the far-sighted 'impartial spectator' (see Ashraf et al., 2005).[7]

This thesis examines theoretically and empirically the effects of time preferences on job search behaviour of the unemployed (Chapter 4) and on career behaviour of the employed (Chapter 5). The aim is to test the exponential versus the hyperbolic discounting model within a labour market context. Because exponential discounters respond differently to certain incentives from hyperbolic discounters, these findings have important implications for social security and labour market policies.

Wealth and labour supply

Another central question in labour economics is how individuals spend their income and time endowments. However, when analysing labour supply, the role of wealth is often ignored. It is frequently assumed that wealth is derived from labour supply, but does not affect it. The fact that the economic literature has paid little attention to wealth effects may be due to the way economists generally analyse labour supply decisions: the static labour supply model, although insightful when analysing the income-leisure trade-off, provides little insight in how individuals allocate money and time over their life cycle. To put it differently: because such a static framework focuses on labour supply behaviour within one period, it does not allow for the accumulation or depletion of wealth over time.

Nevertheless, the role of wealth receives a prominent role in life cycle models: virtually all these models deal with asset holdings (Browning and Lusardi, 1996). Wealth is typically modelled as a choice variable. In this case, individuals decide on their optimal labour supply and wealth path and therefore there are no effects of wealth. However, when uncertainty is introduced, unexpected wealth shocks influence the optimal level of labour supply (MaCurdy, 1985; Blundell et al., 1997). Wealth effects are also present if one

[7] Of course, the idea is rather intuitive and appeals to common sense. Over two millennia before the writings of Smith, Aristotle discussed the problems of a lack of willpower ('akrasia'). The fact that references to this notion have also been made in the arts suggest that self-control problems are generally perceived as part of human nature: "If to do were as easy as to know what good to do, chapels had been churches, and poor men's cottages princes' palaces" [Shakespeare - The Merchant of Venice, act 1, scene 2].

allows for liquidity constraints (imperfect capital markets), as individuals facing binding constraints may work more than their optimal level.

Saving and labour market behaviour are in fact closely related. Individuals save for precautionary reasons, for instance to self-insure against the unemployment risk, as well as for life-cycle reasons: when workers plan or expect to leave the labour market or reduce working hours, savings can be used to smooth consumption. Unexpected changes in wealth increase or reduce this ability to smooth consumption and may thereby affect (future) labour supply behaviour. Because wealth shocks change the individual's intertemporal budget constraint, the individual needs to re-optimise his consumption and labour supply decisions. Hence, it may be argued that unexpected wealth gains reduce the marginal utility of wealth and thus create a disincentive to work.

The empirical evidence on this issue is scarce. Most existing studies consider discrete labour supply adjustments, mainly examining wealth effects on the timing of retirement (Samwick, 1998; Brown et al., 2010; Bloemen, 2011) and on transitions between unemployment and employment (Bloemen 2002; Algan et al. 2003; Card et al., 2007). This focus on the extensive margin may have been rational in a time when full-time employment was the rule and people followed the standard education-work-retirement life trajectory. However, as discussed above (1.1), these conditions no longer hold in developed economies. The final chapter of Part II therefore examines the effect of wealth on working hours.

1.3 Approach

The thesis examines social security reforms and behavioural assumptions in labour market models. It addresses a variety of important themes in labour economics, such as job search, careers and labour supply. Why do some people spend more time in unemployment than others? Where do workers end up on the career ladder? What determines the individual's labour supply? And how does the introduction of savings schemes affect these processes and outcomes? As the economic science studies the allocation of scarce resources and the fortunes of individuals, these questions are at the heart of the discipline.

The behavioural assumptions underlying labour economic models play a central role in the analysis of each of these questions. When evaluating the proposals on social security savings accounts, this study does not simply use a standard framework to assess their impact. Although such an analysis would of course provide some insights into the

effects of the reform, the theoretical results may lack external validity because they are limited to rather specific conditions and hold only under particular assumptions. Instead, the focus rather lies on the assumptions underpinning the theoretical framework: under what (behavioural) assumptions will the reform be effective and are these assumptions realistic? This ex ante evaluation points out several behavioural assumptions that are crucial for the labour market effects of the introduction of savings accounts.

When examining the validity of these critical behavioural assumptions, the thesis draws on insights from behavioural economics. The general claim of behavioural economists is that economic models can be improved by introducing more realistic assumptions on human nature (e.g. Rabin, 2002; Camerer, 2006), a claim that is generally supported in this thesis. The studies presented here fit in well with the more recent waves of behavioural economics. The early work in this field tested the economic assumptions primarily with laboratory experiments. Mounting evidence was collected on anomalies of standard rational choice models (e.g. Thaler, 1981; 1990; Loewenstein and Prelec, 1992; Camerer and Thaler, 1995). In later stages, these empirical findings inspired the development of new theoretical models (e.g. Laibson, 1997; Fehr and Schmidt, 1999), which were then tested in the field (DellaVigna, 2009), under the brain scanner (Camerer, 2007) and were applied to policy and welfare analyses (Thaler and Sunstein, 2003; Bernheim and Rangel, 2007; Kooreman and Prast, 2010). Like the latter studies, this study uses insights from behavioural economic to evaluate policy reforms, 'franchises' these insights to the field of labour economics and tests the (non-standard) predictions using field data.

All the empirical analyses that are presented in this thesis are based on the Dutch DNB Household Survey (DHS), a representative longitudinal survey consisting of around 2000 households. Since 1993, this data is collected annually by CentERdata. The DHS was originally designed to analyse economic and psychological determinants of financial behaviour (hence its former name: CentER Savings Survey). The survey therefore includes a large amount of data on assets and debt. Nevertheless, the data can also be used for labour market analyses, because it contains detailed information on labour market behaviour (such as employment status, job search behaviour and working hours). The longitudinal character of the survey makes it possible to study individual labour mobility and changes in working hours over time. Moreover, the DHS comprises a psychological data section, which is exploited here in various ways. For instance, in order to capture variation in time preferences, a psychological construct that measures an individual's

future orientation is used in Chapter 4 and 5. Applying this indicator contrasts with the common approach in field data research to elicit time preferences, which is based on behavioural proxies (e.g. smoking; alcohol consumption). Furthermore, Chapter 6 relies on information on expectations to assess the impact of unanticipated wealth shocks. It is this specific combination of data on actual behaviour and psychological concepts that makes the DHS unique and useful for the empirical analyses of this study.

1.4 Outline

The thesis consists of two parts: Part I evaluates theoretical policy proposals and Part II tests empirically several behavioural assumptions in labour economics. Part I contains two chapters that assess the labour market effects of introducing savings accounts into the system of social security. Chapter 2 examines the labour market effects of replacing the existing unemployment insurance system by unemployment accounts. The study reveals that the impact of UAs depends crucially on the assumptions on time preferences. Next, the labour market consequences of life course schemes are analysed in Chapter 3. It is demonstrated that life course schemes may have important labour supply effects if they significantly increase savings and if these increased savings affect labour supply decisions. Basically, the first part of the thesis points out behavioural assumptions that are key to the effectiveness of social security savings accounts.

Part II examines these critical assumptions empirically. How do time preferences affect job search behaviour, career investments and labour market transitions? Can job search behaviour be described by an exponential or hyperbolic discounting model? These questions are analysed in Chapter 4 and 5. Next, Chapter 6 examines how wealth and liquidity constraints affect labour supply decisions, focusing on the intensive margin (i.e. working hours).

The final chapter summarizes the main results and, using the empirical findings from Part II, reconsiders the effects of social security savings accounts. Moreover, several general implications for labour market policies and social security systems are discussed. The concluding chapter also points out some limitations of the studies and provides an outlook for future research.

PART I

EVALUATING SOCIAL SECURITY REFORMS

Chapter 2

Labour Market Effects of Unemployment Accounts: Insights from Behavioural Economics*

2.1 Introduction

In this chapter we focus on the behavioural effects of moving from an unemployment insurance (UI) system to a system based on unemployment accounts (UAs). Under this alternative system, instead of paying UI premiums, workers are required to make monthly contributions to special individual savings accounts. While unemployed, individuals will not receive unemployment benefits but are allowed to withdraw savings from these individual accounts. At the end of the working life, the accumulated savings become (partly) accessible and thereby top up pensions. Basically, the reform replaces unemployment insurance by self-insurance through mandatory savings. However, the new scheme can provide the same level of income support to the unemployed as under the current system by allowing individuals to have a negative account balance and by nullifying debt at the end of the working life via interpersonal redistribution.

The main rationale to introduce UAs is that they could improve employment incentives considerably: because individuals withdraw their own savings to finance unemployment, they internalise the costs of unemployment and for that reason exert more effort to avoid unemployment and shorten unemployment spells. Proponents of UAs argue that this reform will reduce moral hazard and lead to a substantial drop in unemployment levels and durations (e.g. Orszag and Snower, 1999; Feldstein and Altman, 2007). For example, Brown et al. (2008) find that introducing an UA system could decrease unemployment levels in Europe's high-unemployment countries by around 30 to 50 percent. It should be stressed that these results are obtained without reducing the level of income protection for the unemployed. As Snower et al. (2009: p.150) argue: "the resulting incentive effects of a shift to unemployment accounts can lead to substantial increases in employment rates, without making the unemployed worse off than they were under the

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* The study presented in this chapter is joint work with Janneke Plantenga and is published in *CESifo Economic Studies*, in an issue on 'Behavioural Welfare Economics' (Van Huizen and Plantenga, 2011).

unemployment benefits system and allowing all others who cannot finance their welfare needs out of their own accounts to receive support on the same terms and conditions as under the current system". The trade-off between insurance and incentives is central in the literature on optimal unemployment insurance (e.g. Baily, 1978; Hopenhayn and Nicolini, 1997; Shimer and Werning, 2008). By improving incentives and maintaining income protection, these proposals thus overcome this trade-off. Moreover, a system based on UAs may be interesting from a life-course perspective on social security (Bovenberg, 2008). It is therefore not surprising that proposals for UAs are discussed in many countries.[1]

By assessing the impact of this reform option on labour market behaviour, we examine whether it can be expected that the UA system will redeem its main promise of significantly reducing moral hazard and unemployment. It is striking that most studies on UAs do not examine behavioural effects but rather assume these to be substantial and positive (e.g. Feldstein and Altman, 2007). The exception is the study of Brown et al. (2008), whose simulation results indicate large positive incentive effects (as discussed above). We argue that these results are to a large extent inflated. The main contribution of this study is to point out that the behavioural effects of UAs depend crucially on the assumption about individual time preferences. Previous studies have simplified this critical assumption. Using recent insights from behavioural economics, we demonstrate that the positive effects are expected to be limited under plausible assumptions on time preferences.[2] In fact, the overall behavioural effects of UAs are ambiguous.

The remainder of the chapter is structured as follows. Section 2.2 reviews the literature on unemployment insurance savings accounts. Subsequently, Section 2.3 assesses the behavioural impact of the UA system. Finally, we conclude with several implications for unemployment insurance systems.

[1] Proposals have been made, for instance, for the US (Kletzer and Rosen, 2006; Kling, 2006), Germany (Boss et al., 2008), the Netherlands (Van Ours, 2003) and Denmark (Sørensen et al., 2006).

[2] This study thereby contributes to the literature that uses insights from behavioural economics to perform policy analyses (e.g. Dalton and Ghosal, 2011).

2.2 Unemployment accounts: an overview of the issues

2.2.1 Proposals

In some countries savings accounts have already been implemented in the system of social security and in many others this reform option is discussed.[3] Scholars have proposed both comprehensive reforms of the social security system based on individual savings accounts, and savings schemes exclusively for unemployment.[4] Here we focus on the latter. As many other papers on UAs (e.g. Brown et al., 2008; Feldstein and Altman, 2007; Snower et al., 2009) we take the central features of the current UI system (benefits levels, maximum duration, profile over time, eligibility criteria etc.) as given. The focus is therefore not on the potential (behavioural) effects of reducing the level of income protection, which is maintained, but rather on the impact of reorganising the existing UI benefit schemes through the introduction of mandatory savings accounts.

Although there are differences between the various proposals, most of them have several features in common. First, individuals make mandatory contributions to individual savings accounts instead of paying premiums and taxes to finance unemployment insurance. Individuals are allowed to contribute more to the accounts than the minimum rate and employers are encouraged or required to make additional contributions. In addition, an option could be to specify an UA ceiling (see for instance: Feldstein and Altman, 2007). Second, when individuals would be eligible for unemployment benefits, they are allowed to withdraw an amount of savings from their UAs up to the level of the current unemployment insurance benefits (until the normal expiration date). These withdrawals thereby replace the existing insurance benefits. However, unemployed individuals can opt for lower 'benefits' than the maximum withdrawal levels. Third, UAs are (either explicitly or implicitly) integrated in pension schemes as the accumulated savings become available at the retirement age. Fourth, the unemployment insurance savings accounts include two insurance elements: these are essential in order to provide the same level of income protection as the current UI system. The scheme provides liquidity

[3] A comprehensive savings scheme for social security exists in Singapore (Asher and Nandy, 2008): however, these are not used for unemployment. Since 2002, unemployment is financed through unemployment accounts in Chile (Acevedo et al., 2006; Sehnbruch, 2006). As the Chilean unemployment scheme differs significantly from the UA proposals on which we focus, we do not discuss the Chilean case in detail. See also note 1.

[4] See for proposals of comprehensive social security reforms: Orszag and Snower (1999); Fölster (2001); Snower et al. (2009). Others focus on savings accounts for unemployment (e.g. Orszag and Snower, 2002; Stiglitz and Yun, 2005; Feldstein and Altman, 2007). See Bovenberg, et al. (2008) for a review of the pros and cons of various policy options.

insurance by allowing individuals to have a negative account balance. So, even when individuals have not accumulated sufficient savings to finance unemployment, income support can still be provided through this credit facility. In addition, the system provides a form of lifetime income insurance: individuals who enter retirement with a negative account balance will still be entitled to basic retirement benefits as the debt on the UA will be cancelled by the government.[5] Unemployment accounts thus allow for intrapersonal redistribution as well as interpersonal redistribution. However, these redistributive elements introduce moral hazard in the system. In principle, individuals have an incentive to minimize contributions and maximize withdrawals. Contributions should therefore be mandatory and withdrawals restricted (up to the level of the existing benefits).

2.2.2 Assessments

The previous studies on savings schemes for unemployment examine the following issues: theoretical welfare implications; the viability of UAs and the effects on lifetime income distribution; and the impact on employment incentives and labour market behaviour. Bovenberg and Sørensen (2004) and Stiglitz and Yun (2005) focus on the first of these issues. Bovenberg and Sørensen (2004) find that replacing the UI system by an UA system leads to a (substantial) Pareto improvement because both liquidity insurance and lifetime income insurance will be provided more efficiently. Stiglitz and Yun (2005) point out that replacing unemployment benefits by individual savings is more likely to enhance welfare when risk aversion is lower, search elasticity is higher and the unemployment risk is lower.

A major part of the previous literature deals with the viability of the reform and analyses its impact on lifetime income distribution. In general, these studies make use of empirical data and apply simulation techniques. A central question is whether the unemployment accounts can finance a substantial part of the unemployment payments. If unemployment is concentrated in a rather small group of the population, the unemployed would typically have exhausted account balances and, since UA debt is cancelled at retirement, they would have to rely on interpersonal redistribution. Unemployed individuals would then face the same adverse incentive effects as under the current system. Feldstein and Altman (2007) make use of US panel data (PSID) to address this issue. Simulating the effects of the UA system, they indicate that almost all individuals (between 93.0 and 94.8 percent) will have positive balances at retirement. Feldstein and Altman

[5] This form of interpersonal redistribution can for instance be financed through normal wage taxes or by taxing the account balances.

(2007: p.48) therefore conclude that most individuals "generally face the cost of unemployment and would have little incentive for behaviour that would increase either the frequency or duration of unemployment". However, the empirical analysis indicates that the shift from the UI system to an unemployment accounts system has (small) adverse redistributive effects.

Vodopivec and Rejec (2001) and Vodopivec (2010) performed similar analyses for Estonia and Slovenia respectively and, compared to Feldstein and Altman, found a higher share of the population that would experience a negative balance during the life course and end the working life with a UA debt. Moreover, both studies indicate that the reform may have substantial adverse effects on the lifetime income distribution. Fölster (2001) and Fölster et al. (2002), using Swedish data, and Sørensen et al. (2006), making use of Danish data, examine the viability of a more comprehensive savings accounts based reform. The results indicate that the reform could increase the inequality of lifetime income.

The aforementioned studies do not examine the impact of UAs on employment incentives and labour market behaviour. Feldstein and Altman (2007) for example perform several simulations, ignoring behavioural responses in most simulations and assuming a 10 or 30 percent decrease in unemployment duration in some simulations. They present evidence that almost all workers will have a positive account balance at retirement which "suggests a substantial improvement in the incentives of the unemployed" (Feldstein and Altman, 2007: p.56). Sørensen et al. (2006: p.31) examine behavioural changes; however, these are static "aggregate back-of-the-envelope calculations". As improving incentives is the main rationale to introduce an UA system, behavioural effects are generally assumed to be positive and significant. Consequently, most papers focus on the potential obstacles by examining the viability of UAs and the potential adverse redistributive effects. An exception is the study of Brown et al. (2008), who focus on the effects of the reform on employment incentives. We discuss their model and results in more detail in Section 2.3.1.

2.2.3 Assumptions

In order to assess the behavioural impact of the introduction of UAs, we should examine under which conditions the incentives provided by the UA system are effective. Given that the level and potential duration of income support, as well as the eligibility criteria remain unchanged, what exactly are these incentives? When a worker becomes unemployed, he withdraws from his individual account an amount of savings. As the accumulated UA savings become available at retirement age, a longer duration of unemployment spells and

a higher frequency of unemployment during the life course imply a reduction of UA wealth. Thus, the unemployment accounts system provides an incentive to avoid unemployment through a 'retirement bonus'. The effectiveness of this incentive depends crucially on two assumptions: whether individuals expect that they will end their working life with a positive UA balance and how they value this potential retirement bonus.

First, individuals who expect to enter retirement with a positive UA balance will have an additional incentive to keep and seek a job. However, because UA debt is nullified at retirement, the incentives for people who expect to have a negative terminal account balance will not improve compared to the current UI system.[6] Nevertheless, it can be argued that by exerting more effort to keep and seek a job, workers can affect both the probability that the terminal account will be positive and, given a positive balance, the level of the pension top-up. Hence, the additional UAs incentive exists for all individuals attaching a positive probability to this outcome.

Second, even if a large part of the population expects to receive an UA retirement bonus, whether this incentive effectively alters behaviour depends on how individuals value this future payoff. Will the self-insurance or internalisation effect lead to a substantial increase in work and search effort? To assess the impact of the UA system, a fundamental question therefore is how the additional future reward for keeping and seeking a job is valued. How does the UA retirement bonus affect intertemporal choice?

In the next section we examine the behavioural effects of moving from an unemployment insurance system to an unemployment accounts system. First, we discus the analytical framework and results of Brown, Orszag and Snower (2008; BOS hereafter). As they perform the most comprehensive analysis of the incentive and behavioural effects of UAs, their study provides a benchmark. Next, we relax some assumptions made by BOS and extend their framework to more general models of discounting.

[6] As discussed above, this issue is addressed in several studies. For instance, Feldstein and Altman (2007) show that it is likely that a rather small proportion of the individuals would end their working life with a negative balance and therefore argue that the reform improves the incentives for a large majority of the population. However, if most individuals will have a positive terminal balance *ex post*, this does not imply that they expect this outcome *ex ante*.

2.3 Behavioural impact of Unemployment Accounts

2.3.1 The BOS model

The theoretical model of BOS is based on the work of Phelps (1994) and assumes perfect capital markets. The model consists of two periods. The discount rate between the periods is assumed to be equal to the interest rate, which is set at 4 percent.[7] The agent is 'young' in the first and 'old' in the second period. Whether a young individual is employed or unemployed is determined exogenously. However, the employment state when old depends on the search and work effort decisions when young. The focus of the analysis is therefore on the work and search decisions of young agents.[8] The job search intensity of a young unemployed agent positively affects his hiring rate when old. Similarly, the work effort of an employee has a negative effect on his firing rate. As in all standard job search models, the level of work and search effort increases with the rewards for keeping and seeking a job. The central question is thus how the payoffs for keeping and seeking a job change by the introduction of an UA system.

The UA and UI systems provide the same level of income protection to the unemployed. Hence, in both systems the unemployed receive benefits b. In the current UI system workers receive wage w net of taxes τ, that is $w(1-\tau)$.[9] The reward for keeping or seeking a job thus equals $\Delta^{UI} = w(1-\tau) - b$. Under the UA system, it is important to distinguish between two cases. First, if the individual was unemployed when young he has a negative UA balance. He then receives $w(1-\kappa)$ when he becomes employed in the second period, where κ represents the taxes that are used to finance negative account balances. The reward for finding a job is thus $\Delta_{-}^{UA} = w(1-\kappa) - b$. Comparing the rewards in the two systems, the difference is:

$$\Delta_{-}^{UA} - \Delta^{UI} = w(\tau - \kappa) \tag{2.1}$$

Next, when the individual was employed in the first period, he made mandatory contributions to the unemployment account equal to $b/(1+r)$, where r is the prevailing interest rate. In this way, a young worker is able to fully finance his own unemployment when old: this individual thus completely internalises the costs of unemployment. As forced saving plus interest becomes available in this second and last period, the rewards for

[7] This is the average interest rate in the OECD countries over the last four decades.
[8] Old individuals die in the next period, so they are assumed to exert a fixed level of search and work effort.
[9] For simplicity, we ignore voluntary savings: this does not affect the rewards however.

keeping a job when old are $w(1-\kappa)+b$.[10] Moving to an UA accounts changes the rewards with:

$$\Delta_{+}^{UA} - \Delta^{UI} = w(\tau - \kappa) + b \tag{2.2}$$

In this framework, UAs will increase the reward for keeping and seeking a job through two effects. First, there is an internalisation effect, implying that individuals stand to loose more from being unemployed because they have to finance their unemployment with their own savings: b in equation (2.2) represents this effect. Second, there is a tax reduction effect because a part of the unemployed individuals finance their own unemployment and thereby do not impose costs on others. This implies that $\kappa < \tau$ and therefore $w(\tau - \kappa) > 0$.[11] These two effects are unambiguously positive, which means that $\Delta_{+}^{UA} - \Delta^{UI} > 0$ and $\Delta_{-}^{UA} - \Delta^{UI} > 0$. This implies that the rewards for seeking and keeping a job are (substantially) higher in the UA system than in the UI system.

Using data from several European countries, BOS calibrate this model and demonstrate that introducing UAs will have substantial effects on unemployment: the predicted drop in unemployment rates varies from 34.4 percent in Italy to 50.9 percent in Germany. The large drop in unemployment is mainly driven by the internalisation effect. Although BOS note that the results indicate "only general orders of magnitude" (p.599), they claim that "for reasonable parameter values, the unemployment reductions can be substantial in Europe's high-unemployment countries" (p.594). Can these parameters indeed be considered reasonable?

2.3.2 Introducing the role of time preferences

The analytical framework of BOS consists of two periods and assumes that the discount rate is equal to the interest rate. What are the theoretical employment incentives of UAs in a more general model of intertemporal choice? The exponential discounting model is the standard economic model to analyze intertemporal decision making. It is generally assumed that individuals have well-defined preferences and try to maximize life-time utility according to (a variant of) the following intertemporal utility function:

[10] Note that in this analytical framework, it is unnecessary to study mandatory savings in the second period because these savings will become available in the same period.

[11] Moreover, there is an indirect tax reduction effect: the increase in employment broadens the tax base and thereby results in lower taxes, which again improves employment incentives.

$$U^t(u_t, u_{t+1}, ..., u_T) = \sum_{\tau=t}^{T} \delta^t u_t \tag{2.3}$$

where t denotes the time period, T the final period, u_t represents the instantaneous utility in period t and δ is the discount factor ($0<\delta\leq 1$), indicating the individual's time preference. The discount factor is negatively related to the discount rate: $\delta = 1/(1+d)^t$, where d is the discount rate which is discretely compounded over time t. Individuals with a higher discount factor (lower discount rate) care more about the future and can thus be considered more 'patient'.

To assess the effects of UAs in a more general model, we relax two assumptions. First, instead of two periods (T=2) we allow for a finite number of periods. Next, we do not assume that the subjective discount rate is equivalent to the prevailing interest rate. Now consider the rewards for being an additional period in employment under the alternative systems. Because the UI system has no intertemporal component, the rewards remain the same as in the BOS model ($\Delta^{UI} = w(1-\tau) - b$). The theoretical incentives change substantially under the system of UAs. Like BOS, we distinguish between two cases. First, if a worker expects to retire with a non-positive account balance, he simply receives wage w, net of taxes κ and forced savings s: $w(1-\kappa-s)$. Given benefits b, the reward for spending an additional period in the state of employment thus equals:

$$\Delta_{-}^{UA} = w(1-\kappa-s) - b \tag{2.4}$$

Replacing the current UI system by UAs affects the rewards according to:

$$\Delta_{-}^{UA} - \Delta^{UI} = w(\tau-\kappa-s) \tag{2.5}$$

When the individual expects to enter retirement with a positive UA balance, he anticipates a retirement bonus for avoiding unemployment. Consequently, if the individual becomes unemployed he receives benefits b, thereby depleting savings accessible in period T by the same amount. Payoffs in present value terms for those in unemployment are thus $b - \left[\delta^T (1+r)^T b\right]$. While employed, the worker earns the net wage in the current period as well as the discounted value of forced saving sw plus interest: $w(1-\kappa-s) + \left[\delta^T (1+r)^T sw\right]$. The reward for one period of employment instead of unemployment is therefore:

$$\Delta_{+}^{UA} = w(1-\kappa-s) - b + \left[\delta^T (1+r)^T (b+sw)\right] \tag{2.6}$$

So, the difference in the rewards under the two alternative systems is given by:

$$\Delta_{+}^{UA} - \Delta^{UI} = w(\tau - \kappa - s) + \left[\delta^{T} \left(1+r\right)^{T} \left(b + sw\right) \right] \tag{2.7}$$

Until now we have differentiated between two extreme cases: individuals expect that they will have either a positive or a non-positive terminal account balance. Instead we can introduce a subjective probability parameter γ, which indicates to what extent people expect to have a positive balance when they retire and depends on the employment history (which determines the current balance level), the expected future employment positions and institutional features.[12] In this way, we can combine equation (2.5) ($\gamma = 0$) and equation (2.7) ($\gamma = 1$) to formulate:

$$\Delta^{UA} - \Delta^{UI} = w(\tau - \kappa - s) + \gamma \left[\delta^{T} \left(1+r\right)^{T} \left(b + sw\right) \right] \tag{2.8}$$

So far, the theoretical analysis has relied on comparing the differences in rewards for being employed one additional period. The same qualitative results are obtained in a model where workers choose the level of effort to maximise lifetime income or utility (see Appendix 2A).

Comparing incentives

Equation (2.8) shows how moving to an UA system changes the rewards for keeping and seeking a job. Basically, the reform improves employment incentives if $\Delta^{UA} - \Delta^{UI} > 0$. To assess the behavioural effects of the reform, we make two assumptions on the specific institutional features of the UA system. First, because (some) individuals finance their own unemployment in the UA system, redistributive taxes are lower than in the current system: $\kappa < \tau$. Second, the level of the mandatory savings rate should be sufficient to finance a significant proportion of the unemployment benefit payments. For that reason, we assume $s > \tau$. These assumptions are generally made in the studies on UAs.[13]

Replacing the current unemployment protection system by a system that is based on unemployment accounts improves employment incentives if:

$$w(\tau - \kappa - s) + \gamma \left[\delta^{T} \left(1+r\right)^{T} \left(b + sw\right) \right] > 0 \tag{2.9}$$

[12] Ceteris paribus, a higher *s* or lower *b* increases the probability that the individual retires with a positive account balance: γ therefore increases with *s* and decreases with *b*.

[13] See for instance, Feldstein and Altman (2007). BOS also show that $\kappa < \tau$ and set a high contribution rate ($b/(1+r)$), although they not explicitly assume $s > \tau$.

Whether this inequality holds depends on the relative strength of three incentive effects. There is an internalisation effect ($\gamma\left[\delta^{T}\left(1+r\right)^{T}\left(b+sw\right)\right]>0$) and a tax reduction effect ($\tau-\kappa>0$), which are both positive. However, these incentive improvements should be balanced against the decrease in the rewards for keeping and seeking a job as a result of forced savings. As $\tau-s<0$, under the UA scheme the wage net of taxes and mandatory savings is lower than the net wage in the current system: $w(\tau-\kappa-s)<0$. The reform thus essentially leads to smaller short-term rewards and larger long-term rewards.

It is clear from equation (2.9) that whether the positive incentive effects outweigh the negative forced savings effect depends crucially on expectations γ, the discount factor δ and the distance to retirement *T*. Besides institutional features, these three variables determine the size of the internalisation effect. As recognized in previous work, γ is positively related to the internalisation effect and therefore with the value of the UA system. If $\gamma=0$, the internalisation effect evaporates and consequently the overall incentive effect is negative. This means that the long-term unemployed, who expect to enter retirement with a negative UA balance, face worse employment incentives than in the current system. When $\gamma>0$, the sign of the overall effect is not clear a priori and depends on the discount factor and the distance to retirement. A lower discount factor (given *r*) implies that workers care less about the retirement bonus and hence reduces the internalization effect. Furthermore, if the discount rate is not equal to the interest rate, the years to retirement play an important role: when workers are patient ($\delta>1/\left(1+r\right)$), the internalisation effect increases with the distance to retirement, whereas it decreases with *T* if workers are impatient ($\delta<1/\left(1+r\right)$). The sign of the incentive effects of UAs is thus ambiguous: theoretically, the effects are negative for sufficiently low γ, low δ and high *T*.

Of course, one may argue that in this theoretical framework the effects of the reform are ambiguous because we assume $s>\tau$. If we would instead assume a low mandatory savings rate, such that $\tau-\kappa-s\geq 0$, the incentives effects would be positive by definition. However, when the savings rate is low, just a minor fraction of the unemployment benefits can be financed through the savings accounts. As a result, more people would end up with a negative account balance at retirement age: this would necessitate a higher level of interpersonal contribution, that is an increase in κ. In the extreme case that the forced savings rate is very low, κ approaches τ, turning the UA

system in an insurance system.[14] In addition, setting a lower savings rate diminishes the internalisation effect both directly and indirectly though γ (see note 12). Nevertheless, the forced savings effect may be absent for some workers in case an UA savings ceiling is established: the workers who have reached the ceiling are no longer required to contribute to the UAs, so the reform improves their employment incentives.

The substantial difference in theoretical effects between BOS and our theoretical framework mainly arises because BOS assume that the discount rate is equal to the interest rate. In fact, under this assumption a significant part of our framework collapses to the BOS model (if $\delta^T \left(1+r\right)^T = 1$, equation (2.7) corresponds to (2.2) respectively). As a result of this specific assumption, the negative forced savings effect disappears. For individuals expecting to retire with a positive UA balance, the net present value of contributions and withdrawals is zero, implying they care the same about losing money from their UA as they care about losing cash-on-hand. Whether this assumption on the discount rate holds is an empirical matter.

Measuring the discount rate

Over the past decades, numerous studies have tried to measure the discount rate. Although an average discount rate of 4 percent is within the range of the estimates of some studies, it is rather low according to many studies.[15] There appears to be a very large variation in the estimates of this rate between and even within studies. However, high discount rates seem to dominate (see for a survey: Frederick et al. (2002)). As estimated discount rates vary considerably between studies, it is impossible to infer the 'real' level of the discount rate. To illustrate the potential size of the internalization effect, we assume a discount rate 28.75 percent, the median discount rate found by Dohmen et al. (2010) using a random sample from the German population. This discount is comparable to estimates from other studies (e.g. Warner and Pleeter, 2001; Harrison et al., 2002; Andersen et al., 2010). Setting the discount rate at this level, mid-career individuals will hardly take into account the level of pension top-ups.[16] In this case, the internalisation effect would be around 0.5 percent of the

[14] When forced savings are close to zero, unemployment benefits are financed by taxes: $\lim_{s\to 0} \kappa = \tau$.

[15] This discount rate is within the range of the estimates of 11 of the total 42 studies presented by Frederick et al. (2002: p.379). As a comparison, a discount rate of 100 percent is within or below the range of 17 studies.

[16] For instance, when the retirement age is 65, a 40-year old individual has to wait another 25 years to access his UA savings. Given a median discount rate of 28.75 percent, the value of the internalisation effect is:

benefits per additional period of unemployment, which is 200 times smaller than in the BOS model. To assess the overall impact of UAs, these minor gains should of course be weighed against the costs due to mandatory savings. It is thus unlikely that the reform has significant positive effects on unemployment for these workers. In fact, if the forced savings effect is substantial, the overall incentive effects may be negative. The bottom line is that when the discount rate is set at a plausible level and the distance to retirement is sufficiently large, the internalisation effect evaporates to a large extent.

Moreover, not only the median or average discount rate but also the variation in discount rates between individuals matters for the effectiveness of UAs. Several studies indicate substantial heterogeneity in (exponential) discount rates between individuals (e.g. Harrison et al., 2002; Andersen et al., 2010). For instance, the results of Dohmen et al. (2010) indicate that about 12 percent of the sample has a discount rate below 5 percent, whereas almost a quarter has a discount rate over 52.5 percent. Heterogeneity in discount rates is highly relevant because individuals with a relatively high unemployment risk – those who are young, low educated and have a lower income – have a higher discount rate (Becker and Mulligan, 1997; Warner and Pleeter, 2001; Andersen et al., 2010; Dohmen et al., 2010).

The behaviour of high discount rate (low δ) individuals will be hardly affected by the introduction of UAs as they do not care about the retirement bonus (see equation (2.8)). Thus, impatient individuals (those who are on the right side of the discount rate distribution) have a relatively high unemployment risk but will hardly internalise the distant future reward for keeping and seeking a job: this group will therefore be the least affected by the reform. Encouraging only those individuals to avoid unemployment, who will spend no or little time in the state of unemployment, is unlikely to affect unemployment significantly. Hence, UAs seem ill-targeted.

2.3.3 Introducing hyperbolic discounting

Although the exponential discounting model has been and still is the standard model of intertemporal choice in economics, its descriptive validity has been challenged by many scholars. One assumption in particular has been criticized: exponential discounting implies

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$$\left[\left(\frac{1}{1+d}\right)^{T}(1+r)^{T}(b+sw)\right]=\left(\frac{1}{(1+0.2875)}\right)^{25}(1+0.04)^{25}(b+sw)=0.00481(b+sw)$$

If we assume $sw=0.05b$, then $0.00481(b+sw)=0.005b$. Given a monthly benefit level of 1500 euro, this would be 7.5 euro.

that individuals have time-consistent preferences, which means that "[a] person feels the same about a given trade-off no matter when she is asked" (Rabin, 1998). Basically, the preference for A at some future time *t* over B at time *t+x*, implies a preference for A over B for all values of t.

However, evidence from a wide range of laboratory experiments indicates that individual time preferences are dynamically inconsistent (Frederick et al., 2002). Particularly, experiments point out that the discount rate is a decreasing function of time: discounting is steeper in the immediate future than in the more distant future. For instance, Thaler (1981) found that the median subject is indifferent between $15 today and $20 in one month and between $15 today and $100 in ten years. The former implies an annual discount rate of over 300 percent, while the latter implies an annual discount rate of about 19 percent.

Based on the work of Strotz (1956) and Phelps and Pollak (1968), Laibson (1997) proposes the following quasi-hyperbolic discounting model (hyperbolic discounting models hereafter) to take into account time-inconsistent preferences:

$$U^t(u_t, u_{t+1}, ..., u_T) = u_t + \beta \sum_{\tau=t+1}^{T} \delta^t u_t \tag{2.10}$$

The difference between the exponential discounting model and this model is the introduction of the β parameter ($0 < \beta \leq 1$), which indicates a preference for immediate gratification. When β is equal to one, the model is identical to the standard exponential model. However, when this parameter is below one, the individual's preferences are present-biased.

An important implication of this type of models is that individuals have self-control problems. "We would 'like' to behave in one manner, but instead we 'choose' to behave in another. In particular, we tend to pursue immediate gratification in a way that we ourselves do not appreciate in the long run" (O'Donoghue and Rabin, 2000: p. 233). Although individuals may be unwilling to engage in an investment activity (which involves immediate costs and delayed rewards) in the present or near future, they may be willing and planning to do so in the more distant future. However, as time passes and the future becomes the present, the person prefers to abandon the original plan and tends to procrastinate. In the end, people may end up continuing to postpone the investment activity until the next period.

The assumptions concerning an individual's beliefs about future behaviour and self-control problems play an important role. Strotz (1956) discusses two distinct cases of hyperbolic discounting: 'naives' believe they will have exponential preferences in the future and are thus unaware of their future self-control problems (they believe there is no present bias in the next periods, $\widehat{\beta}=1$). On the other hand, 'sophisticates' correctly predict their future present bias ($\widehat{\beta}=\beta$).[17] Sophisticated individuals, aware of their self-control problems, are willing to constrain future choices to overcome future self-control problems. Commitment devices, instruments that restrict the possibilities of 'future selves' to pursue immediate gratification, are therefore valued by (partially) sophisticated agents (e.g. Laibson, 1997).

In addition to evidence from numerous experimental studies, findings from field data provide support for the hyperbolic discounting model (see DellaVigna (2009) for a recent review on field evidence). Various studies reject the exponential discounting model, indicating that the hyperbolic discounting model fits the behaviour of a major part of the population (Fang and Silverman, 2007; Laibson, et al., 2007; Skiba and Tobacman, 2008). Other studies suggest that the population consists of both exponential and hyperbolic discounters.[18] Interestingly, some scholars tested the exponential versus the hyperbolic discounting model in a job search context. Using US data, DellaVigna and Paserman (2005) find support for the hyperbolic discounting model. Ben Halima and Ben Halima (2009) replicate the findings of DellaVigna and Paserman (2005) for France. The finding that job search behaviour is in line with the hyperbolic discounting model implies that in general job seekers have a tendency to procrastinate job search activities. This is consistent with evidence from time-use studies that the unemployed spend a small amount of time on job search activities. For example, Krueger and Mueller (2010) show that US and Western European unemployed individuals devote on average respectively 32 and 11 minutes per day on job search activities.

So, taking into account this empirical evidence, what are the expected effects of introducing an UA system? It can be shown that allowing for quasi-hyperbolic discounting does not affect the sign of the overall incentive effect (see 0). The rationale is that,

[17] O'Donoghue and Rabin (2001) discuss a third case: partially sophisticated individuals are aware of their self-control problems, but underestimate the degree ($\beta<\widehat{\beta}<1$).

[18] For instance, Coller et al. (2012) show that the two types of discounters are about equally represented in the population. The findings of Meier and Sprenger (2010) indicate a smaller fraction of present-biased individuals (28 percent).

compared to standard exponential discounting, quasi-hyperbolic discounting gives extra weight to present payoffs. However, the reform affects the future rewards for search (and work) effort, but has no effects on (marginal) present costs or benefits of effort. Nevertheless, for a given exponential discount rate, a larger present bias (smaller β) decreases the (positive or negative) effects. When we allow for 'real' hyperbolic discounting instead of quasi-hyperbolic discounting, the sign of the incentive effect may actually change. Under real hyperbolic discounting, not only present but also near future payoffs are given more weight compared to the exponential model. As replacing the existing insurance system by an UA system increases the long-term rewards but also decreases the short-term rewards for employment, it is more likely that the reform has adverse employment effects.

Again, heterogeneity in time preferences is important. Empirical findings point out that unemployed job seekers with a larger present-bias (lower β) search less intensively for a job and have longer unemployment durations (DellaVigna and Paserman, 2005). In addition, Paserman (2008) finds that low and middle income groups have a large present-bias (low β). Furthermore, impatient workers exert lower levels of work effort (Drago, 2006). So, present-biased individuals have higher unemployment risks and longer unemployment spells but hardly care about the future UA retirement bonus. The size of the internalisation effect is therefore small for the individuals who face a high unemployment risk.

To summarize, hyperbolic job searchers have a tendency to procrastinate job search activities and distant future incentives do not provide an effective instrument to overcome these procrastination problems. Since UAs provide a distant future incentive to increase job search effort, it is unlikely that the reform increases search intensity significantly. Search effort can be encouraged by decreasing immediate costs or by increasing short-term payoffs. In fact, by weakening short-term incentives for keeping and seeking a job, UAs do the opposite and may thus lead to negative behavioural effects.

2.3.4 Further concerns: early retirement

In Section 3.2 we have shown that, when the discount rate is not equal to the interest rate, the distance to retirement affects the size of the internalisation effect (see equation (2.8)). If the discount rate is higher than the prevailing interest rate, the positive employment incentives increase with the proximity to retirement. However, at the same time a second effect kicks in. Workers who have experienced no or only short unemployment spells may

have accumulated a significant amount of UA savings during their working life. In general, the higher the life-time income of the individual, the higher will be the UA retirement bonus. This bonus may not only affect job search incentives, but may also encourage workers to retire early.[19] To finance early retirement, the older workers can use their private non-contractual savings: they no longer need these savings during their normal retirement years as they have build up a (large) retirement nest egg through the UA system. This effect may be especially relevant for hyperbolic discounters, who have a preference for instant gratification and therefore a tendency to retire early. As a result, the effect of this short-term incentive may be substantial. Various studies point out that a higher level of (pension) wealth induces people to retire early (Samwick, 1998; Buetler et al., 2005; Bloemen, 2011; see also Section 3.4.2). Given that the retirement bonus increases the level of pension wealth, it is likely that the reform will encourage early retirement, particularly among higher income groups. Thereby, UAs may reduce labour market participation, decrease the tax base and in this way reduce employment.[20] This increases the potential costs of the reform.

2.4 Conclusion and discussion

The main objective of unemployment insurance is to provide income protection against the risk of unemployment. However, UI involves welfare costs due to adverse incentive effects: UI reduces the incentives to search intensively for a job and to accept a job offer. Proposals to replace the unemployment insurance system by an unemployment accounts system seem particularly interesting as they promise to mitigate these moral hazard effects considerably while maintaining the existing level of income protection.

Previous studies have argued that introducing UAs will improve employment incentives considerably and will lead to a dramatic drop in the unemployment rate. It is generally presumed that individuals expecting to retire with a positive UA balance "completely internalise the cost of their own unemployment" (BOS: p.594). Thus, the UA

[19] It may be argued that workers can also use the current unemployment benefit system to retire early. It should be stressed that when a worker leaves the employer voluntarily, he would be ineligible for unemployment benefits under the current UI system and loses his accrued rights. Conversely, under the UA system the worker who leaves his job voluntarily keeps his accumulated savings.

[20] To compensate for the resulting loss in taxes, in the UA system an additional tax κ^{ER} is needed. This changes equation (8) to: $\Delta^{UA} - \Delta^{UI} = w(\tau - \kappa - s - \kappa^{ER}) + \gamma\left[\delta^{T}\left(1+r\right)^{T}\left(b+sw\right)\right]$

This implies that even if $\tau - \kappa - s = 0$, the overall incentive effect is ambiguous.

system "would provide the same income protection [to these individuals] as the current UI system, but without any distortion" (Feldstein, 2005: p.15). We show that this only holds under the assumption that the subjective discount rate is equal to the prevailing interest rate. However, except for mathematical tractability, there is no reason to make this assumption a priori. Given that empirical studies indicate a large variation in average discount rates as well as substantial heterogeneity in time preferences, this assumption is unlikely to hold for almost all individuals.

We have demonstrated that, if we no longer make this specific assumption, forcing people to allocate money to an account that will become accessible in the future leads to distortions of employment incentives. Whether this negative forced savings effect is outweighed by the positive internalisation effect depends critically on the level of the discount rate, type of discounting and heterogeneity in time preferences. The overall incentive effect is thus ambiguous. In fact, under plausible conditions the effects may be negative. Hence, allowing for more realistic behavioural assumptions could completely change the predicted behavioural effects of UAs. This confirms a central claim of behavioural economics scholars: "Ceteris paribus, the more realistic our assumptions about economic actors, the better our economics" (Rabin, 2002: p.658).

If individuals have hyperbolic time preferences, as empirical evidence suggests, introducing UAs is likely to backfire: the reform decreases the rewards of effort in the short-run, and increases the rewards in the long-run. The opposite should actually be done to encourage work and search effort. As job search is an investment activity and individuals have a tendency to procrastinate on such activities, introducing commitment devices to overcome the procrastination problem may be effective. Intensifying monitoring of job search effort could function as such a commitment device. Recent empirical evidence shows that more stringent monitoring of job search substantially reduces the duration of unemployment (Abbring et al., 2005; McVicar, 2008; Arni et al., 2009). The results of Paserman (2008) also show that monitoring job search decreases unemployment (and increases welfare) substantially when agents discount hyperbolically. Interestingly, monitoring job search as an instrument to mitigate moral hazard is on the rise in OECD countries (OECD, 2007).

Finally, it should be stressed that we do not claim that the exponential or the hyperbolic discounting model is the only 'real' model of intertemporal choice. Some researchers have criticised discount models in general (e.g. Rubinstein, 2003). However, if we take seriously the large amount of empirical evidence on time preferences, we have to

conclude that the positive employment effects assumed and estimated in previous studies are largely inflated. An important agenda for future research is therefore to examine the role of time preferences in labour market models. Specifically, the role of hyperbolic discounting in job search models deserves further attention. These issues are examined in Chapter 5 and 6 of this dissertation.

Appendix 2A The search model

Exponential discounting

Unemployed individuals choose e_0 in period 0 to maximize lifetime utility. Under the UA system, they optimize according to:

$$\max \; b - c(e_0) + \delta\left[e_0 V_1^E + (1-e_0) V_1^U \right] \tag{2.A1}$$

where $c(e_t)$ represents the costs of search ($c(e_t)$ is an increasing, strictly convex function of e_t). The individual retires in period *T*. However, for simplicity, we ignore pensions in period *T* as they are present in both systems. V_{t+1}^E and V_{t+1}^U are the discounted lifetime payoff streams from period *t*+1 to *T*-1 while being in the state of employment and unemployment (in period *t*) respectively:

$$V_{t+1}^E = w(1-\tau) - c(e_{t+1}) + \delta\left[(1-f(e_{t+1}))V_{t+2}^E + f(e_{t+1})V_{t+2}^U \right] \tag{2.A2}$$

$$V_{t+1}^U = b - c(e_{t+1}) + \delta\left[e_{t+1} V_{t+2}^E + (1-e_{t+1})V_{t+2}^U \right] \tag{2.A3}$$

where $f(e_{t+1})$ is the firing rate, which decreases with the level of effort while employed. Now, taking the derivative of (2.A1) with respect to search effort e_0 leads to:

$$c'(e_0) = \delta\left[V_1^E - V_1^U \right] \tag{2.A4}$$

Equation (2.A4) shows that the individual chooses the optimal level of effort when the marginal costs are equal to the marginal benefits of effort. The larger the difference between V_1^E and V_1^U, the higher the marginal benefits and therefore the higher the level of search effort. Under the UA system, the unemployed individual chooses e_0 to maximize:

$$\max \; b - c(e_0) + \delta\left[e_0 V_1^E + (1-e_0) V_1^U \right] - \gamma\delta^T \left(1+r\right)^T b \tag{2.A5}$$

where V_1^E and V_1^U are given by:

$$V_{t+1}^E = w(1-\kappa-s) - c(e_{t+1}) + \delta\left[(1-f(e_{t+1}))V_{t+2}^E + f(e_{t+1})V_{t+2}^U \right] + \gamma\delta^T \left(1+r\right)^T sw \tag{2.A6}$$

$$V_{t+1}^U = b - c(e_{t+1}) + \delta\left[e_{t+1} V_{t+2}^E + (1-e_{t+1})V_{t+2}^U \right] - \gamma\delta^T \left(1+r\right)^T b \tag{2.A7}$$

Optimal search effort is chosen according to:

$$c'(e_0) = \delta\left[V_1^E - V_1^U \right] + \gamma\delta^T \left(1+r\right)^T \left(b + sw\right) \tag{2.A8}$$

To assess the change in incentive effects when UAs are introduced, we can compare equations (2.A4) and (2.A8). In a 3-period model (*T*=2), equation (2.A4) is $\delta\left(w(1-\tau)-b\right)$

and equation (2.A8) is $\delta\left(w(1-\kappa-s)-b\right)+\gamma\delta^2\left(1+r\right)^2\left(b+sw\right)$. Moving from an UI system to an UA system thus changes employment incentives with:

$$c'(e_0,UA)-c'(e_0,UI)=\delta\left(w(\tau-\kappa-s)\right)+\gamma\delta^2\left(1+r\right)^2\left(b+sw\right) \tag{2.A9}$$

The reform improves effort incentives if (under $s>\tau$):

$$\gamma\delta\left(1+r\right)\left(b+sw\right)>w(\kappa+s-\tau) \tag{2.A10}$$

Clearly, the size of the change in incentives depends on δ. In addition, as the left hand side of equation (2.A10) increases with δ, the higher the discount factor, the more likely it is that UAs improve incentives. Note that (2.A9) and (2.A10) correspond to (2.8) and (2.9).

Hyperbolic discounting

Under quasi-hyperbolic (β,δ) preferences, the marginal benefits of efforts (RHS of (2.A4) and (2.A8) are multiplied by β. Equation (2.A9) then becomes:

$$c'(e_0,UA)-c'(e_0,UI)=\beta\left[\delta w(\tau-\kappa-s)+\gamma\delta^2\left(1+r\right)^2\left(b+sw\right)\right] \tag{2.A11}$$

The size of the change in employment incentives thus depends on β. However, because the reform only affects future payoffs, the sign of the effect is independent of β (inequality (2.A10)) remains the same under hyperbolic discounting).

Instead of quasi-hyperbolic discounting, we now assume real hyperbolic discounting. Loewenstein and Prelec (1992) propose the following discount function:

$$\phi(t)=(1+\alpha t)^{-\beta/\alpha} \qquad \alpha,\beta>0 \tag{2.A12}$$

The parameter α determines how much the discount function deviates from standard exponential discounting. For $t>0$, this function is decreasing continuously as a hyperbola. Now, using this discount function, equation (2.A9) becomes:

$$c'(e_0,UA)-c'(e_0,UI)=(1+\alpha)^{-\beta/\alpha}\,w(\tau-\kappa-s)+(1+2\alpha)^{-\beta/\alpha}\,\gamma\left(1+r\right)^2\left(b+sw\right) \tag{2.A13}$$

Replacing the UI system by and UA system thus improves employment incentives if the following inequality holds:

$$(1+2\alpha)^{-\beta/\alpha}\,\gamma\left(1+r\right)\left(b+sw\right)>(1+\alpha)^{-\beta/\alpha}\,w(\kappa+s-\tau) \tag{2.A14}$$

Although more impatient individuals search less intensively because future rewards of search are lower (RHS of (2.A13)), the relative weight of long-run incentives decreases compared to short-term incentives.

Chapter 3
Life Course Schemes, Wealth and Labour Market Transitions

3.1 Introduction

There is a growing concern that social security systems are not only financially unsustainable, but are also insufficiently adapted to changing social and economic conditions. During the past decades, female labour force participation has increased, individual life courses have become more diverse and internalisation and globalisation have created new economic forces that put social security under pressure (Taylor-Gooby, 2004; Bonoli, 2005; Schmid, 2008; see Section 1.1 for a more detailed discussion). These developments imply new challenges for social policy: how can work and family life be reconciled? How to allow for more diversity of life courses in social security systems? And how to stimulate lifelong learning in a dynamic knowledge economy?

Given these challenges, the life course perspective may provide a useful framework for modernising social security systems (Plantenga, 2005; Bovenberg, 2008). Such a perspective focuses on transitions from paid employment to other domains during the life course and on the risks related to these transitions. The perspective emphasises flexibility, freedom of choice and individual responsibility. In fact, the life course perspective is adopted within the European Employment Strategy (EES) and many member states have developed life course policies.[1] These policies generally deal with specific life events or phases (e.g. child bearing and rearing) (D'Addio and Whiteford, 2007). The Dutch Life Course Savings Scheme ('Levensloopregeling'; LCSS), which came into force in 2006, is one of the exceptions: this scheme provides all employees with a legal right to save part of their gross wage in order to finance a period of unpaid leave for whatever purpose (e.g. Van Huizen and Plantenga, 2010).

The introduction of such individual savings accounts into the system of social security may be an innovative option for reform. This kind of savings schemes – here

[1] The promotion of 'a life-cycle approach to work' is one of the guidelines of the EES. Moreover, the life course perspective is closely related to the concept of 'flexicurity', a crucial element in the European Employment Strategy (EES) (European Commission, 2007; Bovenberg and Wilthagen, 2008).

labelled as 'life course schemes' – can be used as a general income-smoothing device during periods in which the worker reduces the number of working hours or temporarily leaves the labour market. "Individual saving accounts should allow individuals to bear more individual responsibility for their own employability. Endowed with sufficient human and financial capital, adaptable individuals are empowered to embrace the risks associated with a dynamic internal market" (Bovenberg, 2005: p.420). Indeed, life course schemes could provide an instrument for a more balanced allocation of time and money over the life course and may thereby facilitate the combination of paid employment with care activities, allow for flexibility and freedom of choice, and support lifelong learning (Plantenga, 2005). Moreover, the assumption is that, by increasing flexibility of working time over the life course and by facilitating periods of non-employment, the introduction of life course schemes will lead to a more productive and adaptable workforce and will increase the labour force participation over the life cycle (D'Addio and Whiteford, 2007; Bovenberg, 2008). Thereby these savings schemes may also contribute to the financial sustainability of the social security system.

The general assumption underlying these policy ambitions is that, through encouraging saving in special accounts, life course schemes facilitate (partial) transitions from paid work to other life domains. The presumption is therefore that life course schemes support individuals to temporarily reduce labour supply. Whether the reform will indeed have this effect depends on two assumptions: first, life course schemes promote the accumulation of savings; and second, savings affect labour supply behaviour. By examining these underlying behavioural assumptions, this chapter aims to provide new insights into the labour market effects of life course schemes. The analysis is thus parallel to the one in the previous chapter, which examined the critical behavioural assumptions for unemployment accounts. The focus of this study is not on specific policy proposals or existing life course schemes, such as the Dutch LCSS (a life course scheme pur sang). Rather, we assess whether life course schemes in general – that is, independent of their specific institutional features – have the potential to facilitate combinations of and transitions between paid work and other life domains.

The chapter is organised as follows. Section 3.2 elaborates on the rationale for introducing life course schemes and describes the general features of life course schemes. Moreover, this section examines the assumptions underlying the life course schemes: we show that the effects of life course schemes depend on the impact on saving behaviour and the relation between saving and labour market behaviour. In Section 3.3 and 3.4 we

analyse these effects by drawing on various theoretical perspectives and by surveying findings from previous studies. In the final section we point out some directions for further research.

3.2 Life course schemes: an overview of the issues

3.2.1 Promises and features

Several scholars have discussed how life course schemes could provide an answer to a variety of economic and social problems. Bovenberg (2008) argues that, by allowing individuals to shift time and money over their life course, savings schemes may reduce some of the time pressure during the rush hour of life or the summer season of the modern life course. "The key challenge is to accommodate these preferences by allowing parents to strengthen their family life while also maintaining their human capital so that they can enjoy long, fulfilling careers" (p.402). Plantenga (2005) also discusses savings schemes against the background of changing nature of social risks (see also Leijnse et al., 2002). "The bottom line in all these proposals is that individuals should have more individual choice over the life course in order to reach a more optimal allocation between working, caring and learning" (Plantenga, 2005: p.303).

In general, life course schemes may facilitate individuals to become the director of their own life course, provide an instrument to reduce the rush hour problems and encourage employees to invest more in human capital and spend more time on care activities. Thus, the introduction of these savings schemes into the system of social security seems a promising option for reform. Moreover, life course schemes seem to involve relatively low costs. Individuals use mainly their own savings to finance leave and thereby internalise the costs of the (partial) transition from employment to another life domain.

Although specific elements of life course schemes may vary from one proposal to another, life course schemes have the following central features:

- Contribution rates: individuals are expected to make monthly contributions to special savings accounts. These contributions may be voluntary, stimulated by tax incentives or defaults, or mandatory (e.g. Bovenberg et al., 2008).
- Withdrawals restrictions: as life course schemes aim to facilitate transitions and combinations between paid employment and other life domains, individuals are allowed to withdraw savings when their income drops as a result of a reduction in

labour supply. More general schemes may also allow individuals to take up their life course savings to deal with income shocks related to a demotion or to a transition from dependent employment to self-employment. Furthermore, maximum withdrawal rates can be specified: for instance, monthly withdrawals may not exceed the current monthly wage.

The Dutch Life Course Savings Scheme (LCSS) is a pioneering example in this respect.[2] The scheme offers all employees a legal right to save up to a maximum of 12 per cent of the yearly gross wage, under favourable tax conditions, in order to finance a period of (part-time) unpaid leave. The state provides fiscal support by applying the deferred tax principle and by providing a tax credit.[3] Employees are allowed to take up their leave for whatever purpose, for example for care reasons, a sabbatical period, educational leave or early retirement. The LCSS is thus a rather general income smoothing device.

Before the introduction of the LCSS, expectations on participation rates were high: the Dutch government estimated that around 1.9 million workers (20 percent) would participate in 2006 and that this number would rise to 3 million (33 percent) in 2009 (Tweede Kamer, 2004). The popularity of the scheme appeared to be highly overestimated: in 2006, just 259 thousand employees (3.7 percent) participated in the LCSS.[4] And although the number of participants increased a little in subsequent years (to 270 thousand (4.2 percent) in 2008), in 2009 participation dropped again to 237 thousand employees (3.7 percent) (CBS Statline, 2011b). An important reason for low participation is that the LCS has to compete with an employer-sponsored savings plan ('Spaarloonregeling'): employees are not allowed to participate in both schemes. Nevertheless, the sum of all LCSS account balances increased substantially: from 0.9 billion euros on the 1st of January 2007 to almost 3.3 billion euros in 2010 (CBS Statline, 2011c). However, most employees who participate in the LCSS plan to use their accounts to finance early retirement (CBS Statline, 2011a). The scheme thus seems to facilitate early retirement, which conflicts with the current policy objective of active ageing and increasing the retirement age. It may therefore not be surprising that the LCSS will be abolished. In 2013, the scheme will be replaced by the Vitality Scheme ('Vitaliteitsregeling'), another, revised life course scheme (MSW, 2011).

[2] Examples of other arrangements that have some similarities with the Dutch LCSS are the German working time accounts (Seifert, 2008) and the Belgium career break system (Devisscher and Sanders, 2007).
[3] This tax incentive is rather small: in 2006, the tax credit was 185 euro per year of participation.
[4] The initial, in 2007 published estimate of the number of the 2006 LCSS participants was substantially higher (340 thousand employees (5.5 percent)) (CBS, 2007).

The Dutch life course scheme has been studied in previous research. Maier et al. (2007) examined to what extent the LCSS is in line with a life-course perspective on social policy and whether it provides sufficient opportunities to facilitate combinations of and transitions between paid work and other activities during the 'peak hour' of life. Van Huizen and Plantenga (2010) assessed the merits and drawbacks of the LCSS using the Transitional Labour Market approach as a frame of reference. The study of Delsen and Smits (2010) evaluated the potential of the LCSS to improve work-life balance. All these studies discuss the limitations of the scheme and point out potential improvements. Here, we do not examine this specific scheme, but focus on a more fundamental issue: under which behavioural assumptions will life course schemes effectively facilitate labour market transitions?

3.2.2 Assumptions

The main rationale to introduce life course schemes is that, when left to their own devices, individuals are not able or willing to reduce working hours or make transitions from employment to non-employment. The aim of life course schemes is to facilitate these transitions. By providing liquidity when income drops, savings schemes may eradicate the financial barrier to make these transitions.

Under what assumptions will life course schemes be effective instruments to support transitions? First, the presumption is that, in the absence of life course schemes, individuals would not accumulate sufficient wealth or face liquidity constraints. Of course, people do in fact self-insure by accumulating liquid wealth to cope with foreseen and unforeseen income risks. Savings schemes will institutionalise this individual risk management device by encouraging individuals to build up a buffer stock of savings – either by means of mandatory contributions or through tax incentives – and in this way they will provide liquidity when income drops due to changes in labour supply. Life course schemes thus should promote individuals to transfer money from the current period to the future, that is, to save more. So, in order to be effective, life course schemes should effectively stimulate individuals to save. Second, even if life course schemes meet this first condition, it remains a question whether liquidity constraints or the lack of wealth is an important barrier to reduce labour supply (temporarily). How do savings affect labour supply behaviour?

The first assumption – the impact of savings schemes on saving behaviour – is examined in Section 3.3. Next, Section 3.4 focuses on the relation between savings and labour market behaviour.

3.3 Savings schemes and saving behaviour

The effects of life course schemes on saving behaviour have not yet been examined empirically since they have not (or just recently) come into existence. However, the effects of other savings schemes, such as pension arrangements, on individual saving behaviour have been analysed extensively: these studies provide insights in the impact of life course schemes on individual savings and will therefore be reviewed in this section. An important question in this respect is whether savings schemes affect the total level of wealth and how they affect the composition of the wealth portfolio. Does savings scheme wealth displace or 'crowd out' other types of wealth and to what extent? Of course, if wealth that has been accumulated in a savings account would fully displace 'free' savings, there would be an important impact on the composition of wealth, but the total level of savings would be unaffected. In order to shed light on this issue, we discuss theoretical perspectives (3.3.1) and empirical findings (3.3.2) on how savings schemes affect saving behaviour.

3.3.1 Theoretical perspectives

The level and structure of wealth

Intuitively, one would expect that the implementation of savings schemes will increase the level of savings done by individuals: encouraging people to save is actually the raison d'être of many savings schemes in social security. "The difficulty or inability of many individuals to save enough for their retirement may well be the most persuasive justification for encouraging saving incentives" (Hubbard and Skinner, 1996, p88). Likewise, Feldstein (1985: p.303) state that "[t]he principal rationale for such mandatory programs is that some individuals lack the foresight to save for their retirement years" and Jappelli and Modigliani (1998: p.18) argue that "[a]fter all, the existence of mandatory saving programs and the widespread implementation of retirement plans should be interpreted as the social approval of schemes designed to ensure people with adequate reserves to be spend during retirement".[5]

[5] See also Chapter 2 for a more extensive discussion on myopic behaviour.

However, in a simple life-cycle model, with perfect capital markets, no uncertainty and perfectly fungible assets, the introduction of savings schemes would have no effect on the level of savings. In such a framework, the savings accumulated via a savings scheme fully offset the savings done in other, non-contractual private wealth and therefore savings schemes affect the portfolio allocation of assets but not the level of total wealth. One can argue that under such circumstances, there is 'full displacement': accumulated contractual wealth, for instance pension wealth, completely crowds out private or free wealth.

The full displacement hypothesis following from the simple life-cycle model hinges on simplifying assumptions. In reality the impact of savings schemes is much more complex. Since the paper of Feldstein (1976), the extent of crowding out of private savings by contractual savings has been assessed frequently and extensively by many scholars. Feldstein (1976) argues that pensions have two effects. First, because pension wealth substitutes (partly) for other wealth, it decreases the level of private savings. Second, pension schemes may induce (earlier) retirement, thereby lengthening the retirement period and increasing the need to save: this implies a positive effect on wealth accumulation. The net effect on private savings is not clear a priori.

Life course schemes can be expected to affect saving behaviour in a similar way. In this section, we focus on the substitutability between contractual and private savings – interactions between wealth and labour market behaviour are discussed in the Section 3.4. If the two different types of savings are imperfect substitutes, the structure as well as the level of wealth will be affected. Of course, these effects will be larger when individuals accumulate more wealth through savings schemes. The impact of savings scheme on saving behaviour thus depends on the strength of the savings incentives.

Imperfect substitutes

A crucial difference between contractual savings and free savings is that savings accumulated through savings schemes are, by definition, more illiquid than free wealth: once the transfers to the special accounts have been made, the savings cannot be withdrawn freely. The degree of liquidity depends on the specified withdrawal conditions of the savings scheme. With respect to pension wealth, a condition for withdrawal of savings is usually that one has reached the retirement age. Similarly, individuals may have access to their life course scheme wealth when they temporarily leave the labour market or decrease the number of working hours. However, even when one meets the conditions, withdrawals of savings schemes are regulated to some extent, for instance by a maximum

withdrawal rate of 75 per cent of the previously earned wage. The fact that savings scheme wealth is rather illiquid means that it is an imperfect substitute for other (non-contractual wealth). Theoretically, this has important implications for saving behaviour.

Due to these restrictions, savings scheme wealth is unable to satisfy a number of saving motives, such as the precautionary savings motive, the bequest motive and the downpayment motive (see for a discussion on saving motives: Browning and Lusardi 1996). In general, pension wealth cannot be used as a buffer stock against adverse income shocks during the working life (Engen et al., 1996; Gale 1998). When individuals face liquidity constraints and future income and consumption patterns are uncertain, this illiquidity feature has important implications for saving behaviour. In case of unforeseen income shocks that occur during the life cycle, the individual has to reoptimise (Attanasio and Rohwedder, 2003). The wealth accumulated in the special accounts ex ante cannot be undone even if the individual would prefer to do so ex post. As individuals may decrease total net savings through borrowing, this is especially important under binding borrowing constraints. It is then likely that consumption will be decreased, so 'new' additional saving done in the past is financed by a reduction in current (and future) consumption. Overall, because contractual savings cannot be used for a variety savings objectives, free savings and contractual savings are imperfect substitutes: this implies that savings done in social security schemes do not fully displace other types of savings and therefore that a part of the contributions represents net new savings. The total level of savings will thus increase.

Another reason why savings scheme wealth may not fully crowd out other types of wealth is that different types of wealth vary in terms of consumption value. Although accumulated financial wealth may have the same pecuniary value as a house or car, financial wealth differs from these tangible assets as the normal savings do not provide consumption flows. This is an important argument why assets are not perfectly fungible and therefore it can be expected that increases in financial wealth (for instance in the form of social security savings) do not displace other wealth completely (Browning and Crossley 2001; Engen and Gruber 2001).

Furthermore, even if it where costless to transfer the savings from the special accounts to other accounts, the level of savings may be affected as a result of mental accounting, which refers to the set of cognitive operations that individuals use to evaluate and organise their financial activities. "Behavioural economists posit that individuals create "mental accounts" for their different assets causing their marginal propensity to consume from those assets to vary with the level of temptation associated with each one"

(Browning and Lusardi 1996: p.1847). Since different types of wealth differ in terms of their marginal propensity to spend, Thaler (1990; 1994) argues that transfers from normal accounts, with a high marginal propensity to consume, to accounts with a low marginal propensity to consume (e.g. retirement accounts, social security accounts) reduce consumption and thus increase savings in the long run.

Finally, it should be noted that, from the perspective of behavioural economics, these withdrawal restrictions make the scheme a valuable commitment device for present-biased individuals, who have trouble to postpone consumption (i.e. to save) and therefore procrastinate (see Section 2.3.3). Sophisticated agents are aware of their self-control problems and are therefore willing to tie their hands by saving in illiquid assets. Because social security savings schemes may function as such commitment devices, they may raise the level of individual wealth (Laibson 1997; Thaler and Benartzi 2004; Ashraf et al., 2006; Sourdin 2008).

Instruments to encourage contributions

Because savings schemes involve withdrawal restrictions, wealth accumulated in the special accounts is not perfectly substitutable with other types of wealth. The withdrawal restrictions also make the savings schemes a rather unattractive saving vehicle (as discussed above, this is not necessarily the case for sophisticated present-biased individuals). Saving incentives are therefore used to encourage participation in and contributions to these schemes. Accumulation of wealth in such accounts is generally stimulated through (a combination of) three instruments: tax incentives, mandatory contributions and default options.

Tax incentives, such as tax deferrals and tax credits, imply an increase in the rate of return of that particular asset and thereby enhance the relative attractiveness of that specific type of wealth. For that reason, these arrangements result in the reshuffling of the wealth portfolios of individuals towards the encouraged form of saving (Börsch-Supan 2004; Alessie et al., 2006). However, the effect of tax incentives on the total level of savings depends on the relative size of the income and substitution effect. On the one hand, the substitution effect implies that present consumption is more expensive compared to future consumption, increasing the level of savings. On the other hand, the subsidy increases total income, thereby decreasing the need to save to reach a specific level of wealth (Börsch-Supan and Brugiavini, 2001; Attanasio et al., 2004).

Second, when contributions to the savings schemes are mandatory, the structure of the wealth portfolio will be affected by encouraging a specific type of savings. In addition, it is likely that schemes that involve mandatory contributions boost the total level of savings. When the mandatory contributions exceed the savings that the individual would have done voluntarily, the schemes may have an effect on lifetime saving (Pries, 2007). Such schemes will thus increase the total level of savings if individuals are forced to save more than they would have done without the savings schemes (Gustman and Steinmeier, 1999; Cesaratto, 2006). This is likely to be the case when individuals are prone to myopic behaviour: people tend to procrastinate saving, for instance for old age or the risk of unemployment, and realise this when it is too late.

Third, default options may affect the participation in savings schemes. In a standard economic framework, assuming time-consistent preferences, default options have an impact because changing the participation status or savings rate involves transaction costs. When the financial and psychological costs of opting out are insignificant (for instance, in case it just involves making a phone call), defaults have hardly an effect on the individual's decision whether or not to be signed in a savings scheme. However, O'Donoghue and Rabin (1999; 2001) show that even minor transaction costs may have major effects on participation when individuals have present-biased (hyperbolic) preferences and are naïve (see Section 2.3.3). Given the immediate utility costs associated with opting in or out, present-biased agents have the tendency to postpone such activities. Bernheim et al. (2011) argue that defaults may have an effect due to inattentiveness or because defaults may serve as a psychological anchor, suggesting that individuals perceive the default as salient or an official suggestion.

3.3.2 Empirical findings

Various studies have examined empirically the effects of savings schemes on saving behaviour. We review these studies below, arranging them according to the type of saving incentives: voluntary savings schemes (tax incentives); mandatory savings schemes; savings schemes with automatic enrolment (defaults).

Voluntary savings schemes: impact of tax incentives

There is a wide range of studies that analyse to what extent tax incentives induce 'new' savings or simply result in a reshuffling of the asset portfolio. Since the theoretical impact of saving incentives is ambiguous, empirical findings on this issue are insightful. The US is

the most extensively examined case in this respect: the lion's share of the studies analyse the effects of Individual Retirement Accounts (IRAs) or 401(k) accounts. There is however also empirical evidence on savings schemes in other countries.

Despite the large number of studies on this issue, no consensus has been reached on the order of size of the crowding out effect. On the one hand, some studies argue that most of the saving incentives have no or little impact on total savings (Engen et al., 1996). For instance, Attanasio et al. (2004) examined whether US (IRAs) and UK (TESSA and ISA) savings schemes boost the total level of savings. In both the US and the UK case, the results suggest that just a very small part of the contributions to these schemes can be considered as new savings and thus that tax incentives mainly lead to a reshuffling of the wealth portfolio. On the other hand, various scholars conclude that there is strong evidence that most contributions to savings accounts represent new saving (e.g. Poterba et al., 1996). Poterba et al. (1995) and Gustman and Steinmeier (1999), studying the effects of US pension schemes, indicate no or small displacement effects. This means that most of the savings done through these schemes represent additional savings.

Hubbard and Skinner (1996) argue that the conclusions of 'all new savings' and 'no new savings' may be too extreme. Their study points out that tax incentives of retirement savings schemes (IRAs and 401(k)'s) lead to moderate amounts of new savings. Moreover, it should be stressed that even though the overall impact on household savings may be limited, savings schemes may raise savings significantly for the lower-to-middle income households. An explanation for this finding is that this group may have limited opportunities to reshuffle their wealth portfolio and therefore a substantial part of the contributions represent new, additional savings (Gale 1998; Engelhardt 2000; Börsch-Supan and Brugiavini 2001; Börsch-Supan 2004). The excellent recent study of Engelhardt and Kumar (2011), the only US study using instrumental variable techniques to estimate displacement effects, confirms this hypothesis: although their results point to substantial crowding out (53-67%) at the mean, no displacement was found below or at the median of the non-pension wealth distribution: "policies targeted to increase pension wealth for lower-wealth households will raise overall household wealth accumulation essentially dollar-for-dollar" (Engelhardt and Kumar, 2011: p.205).

Finally, it should be noted that the evidence on tax incentives of non-pension savings schemes is rather scarce. Mills et al. (2008) studied individual development accounts (IDAs): these accounts are targeted to lower-income groups and match withdrawals when they are used for specific purposes, such as investments in education or

the purchase of a house. The results of Mills et al. (2008: pp.1519-1520) indicate that "IDA holders used their pre-existing stock of financial assets or current-period saving that they would have used anyway to fund their IDAs". Nevertheless, Mills et al. (2008) are not able to make a clear-cut conclusion on whether private savings were fully or partially crowded out. In addition, Dutch evidence on employer-sponsored savings plans (ESSPs) suggests that most of the contributions made to these savings schemes are new savings rather than a reshuffle of the existing wealth portfolio (Alessie et al., 2006). A large majority (85.7%) of the participants indicated that saving trough ESSPs did not induce them to decrease saving in other forms. ESSP participants who report to have reduced other savings tend to have difficulties to make ends meet. This finding seems to suggest that, in contrast to the evidence reviewed above, crowding out is larger for those who face binding liquidity constraints. However, it should be noted that this evidence is not derived from data on wealth accumulation but is based on a survey question. Those who face binding liquidity constraints may actually not have saved at all under the absence of this financially attractive savings vehicle.

Interestingly, Nies (2010) examined the effects of the Dutch LCSS on individual saving behaviour using simulation methods. However, the study focuses on LCSS as an early retirement scheme. The results point out that the scheme increases the marginal propensity to save, though the LCSS has little effect on the final (age 65) total wealth. During the working life, total wealth levels are substantially higher for LCSS participants, but these additional savings are used to finance early retirement. Of course, this is in line with the hypothesis that life course schemes increase savings before a (temporary) reduction of labour supply.

To sum up, the impact of voluntary (retirement) savings schemes remains a controversial issue, as some found a small displacement effect, while others found substantial offset of private savings by retirement savings. Estimates vary between and within countries. Moreover, the size of the crowding out effect seems to depend on employed estimation strategy. There are various sources of biases plaguing the identification of the displacement effect and studies use different techniques to deal with (some of) these identification problems. However, we can conclude that, although probably not all contributions represent net new savings, in general it can be argued that tax incentives have a positive impact on the level of total savings. The size of this effect differs between different (income) group: savings schemes primarily lead to the reshuffling of the wealth portfolio for high income groups but may stimulate saving for low income groups.

Mandatory savings schemes

For mandatory pension schemes the evidence is less ambiguous. "Most empirical studies suggest in fact that the offset between private and mandatory saving is well below unity" (Jappelli and Modigliani, 1998: p.13). For instance, Attanasio and Rohwedder (2003) and Attanasio and Brugiavini (2003) found a significant but less than full displacement effect of pension savings on normal savings for the UK and Italy, respectively. Analyses for Germany indicate a rather small displacement effect (maximum 22% in the base specifications) (Kim and Klump, 2010). Studies that examined the effects of Dutch mandatory pension schemes on savings behaviour also suggest that mandatory savings do not displace free savings completely. The findings of Alessie et al. (1997) indicate no displacement of private savings by occupational pension savings, but they found (more than) full displacement by social security wealth. In a later study, Kapteyn et al. (2005) present evidence of a substantial but less than full offset of social security wealth on other wealth types. Euwals (2000) found a significant displacement effect for the highest-income-decile households, which seem to be able to reshuffle the wealth portfolio. Overall, however, the results indicate that there is no full displacement effect and therefore these arrangements increase the level of household savings. This is consistent with the recent study of Alessie et al. (2011), which points out significant but less than full displacement effects. The study also shows that crowding out depends on the educational level: displacement is absent among low educated individuals, while the evidence indicates full displacement for high educated individuals. To conclude, it can be expected that mandatory savings schemes stimulate the accumulation of savings scheme wealth and thereby increase the total level of wealth of individuals.

Savings schemes with automatic enrolment

The impact of default options on participation and contribution rates has recently gained a lot of attention. Madrian and Shea (2001), using data from a large US corporation, show that participation in 401(k) is substantially higher under automatic enrolment in the savings scheme (the participation rates of the treatment group and control group are 86% and 49% respectively): note that participants had the option at any time to opt out or alter their contribution rate by just submitting a form or making a phone call. Choi et al. (2004) show that similar results hold for other companies in different industries (for an overview of default effects of US retirement savings schemes, see Beshears et al., 2009). Cronqvist and Thaler (2004) also find considerable default effects of a Swedish retirement scheme. An

interesting general finding is that default effects seem to be particularly large among lower-income individuals (e.g. Choi et al., 2004). Default effects are important in other domains as well. "Overall, the finding of large default effects is one of the most robust results in the applied economics literature of the last ten years" (DellaVigna, 2009: p.322). However, recent evidence indicates that defaults also have limitations: when defaults are aggressive (i.e. the default contribution rate is very high), many people tend to opt out (Beshears et al., 2010). Moreover, although a large amount of evidence shows that automatic enrolment in savings schemes affects participation rates significantly, it is not clear to what extent this leads to crowding out of non-contractual wealth. However, as discussed above, the evidence on voluntary savings schemes suggest that full displacement is unlikely. It seems therefore plausible that defaults also affect the total level of savings.

3.3.3 Conclusion

The introduction of life course schemes can be expected to affect individual saving behaviour in various ways. Although in a simple, stylised life-cycle model savings done in savings schemes displace normal savings completely and the introduction of such schemes results just in the reshuffling of the existing wealth portfolio, under more realistic assumptions there are theoretical arguments that suggest that savings accumulated in savings schemes are not a perfect substitute for 'free', non-contractual savings. The review of empirical finding indicates that normal savings are indeed offset by contractual wealth, but that full displacement is implausible. Moreover, the findings suggest that crowding out is especially low for lower-income groups. Of course, the exact impact depends on the specific features of the savings schemes. Note that less than full displacement implies that individuals increase saving by decreasing current consumption and/or increasing income (labour supply). This is exactly the purpose of pension or life course schemes: by encouraging individuals to transfer money to a later period, individuals are facilitated to smooth consumption over the life cycle.

In sum, it can be expected that the implications of the introduction of savings schemes for saving behaviour are twofold. First of all, the wealth portfolio of individuals changes when they make contributions to savings schemes. Second, it is likely that savings schemes will raise the total level of savings.

3.4 Wealth and labour market transitions

The previous section considered the effect of savings schemes and points out that this effect depends on the specific features of the schemes. However, under the assumption that life course schemes encourage saving, examining the effects of increased savings on labour market behaviour becomes crucial. We assess this issue both theoretically (3.4.1) and empirically (3.4.2), drawing on findings from earlier studies that examined the relation between savings and labour market behaviour.

3.4.1 Theoretical perspectives

Labour supply models

The most common framework to examine labour supply decisions are static and dynamic (life-cycle) labour supply models. Wealth may enter the static labour supply model through capital gains as a source of unearned income. In such a model, agents seek to maximize their utility by choosing the optimal amount of leisure and consumption. Basically, individuals trade off leisure against income. Assuming that leisure is a normal good, an increase in the level of wealth implies a higher level of unearned income: this produces an income effect and therefore increases the optimal level of leisure. Wealth is thus negatively related to labour supply. However, wealth accumulation plays no role in a static framework as the time dimension is absent and it is assumed that individuals consume their total (labour and non-labour) income during the single period of analysis.

The life-cycle framework provides the most general tool in economics to study intertemporal allocation of money, time and effort. In life-cycle models individuals are allowed to accumulate and deplete wealth over time and thereby these models provide more insight in the theoretical relation between wealth and labour supply. In basic life-cycle models (e.g. MaCurdy, 1981; Cahuc and Zylberberg 2004), individuals maximise the sum of discounted utilities subject to a budget (wealth) constraint. One of the main implications of the life-cycle model is that individuals try to equalize the marginal utility of expenditure over time: as a result, the path of consumption is independent of the path of income and this leads to consumption smoothing (Browning and Lusardi 1996).

Labour supply and wealth are jointly determined in life-cycle models. When choosing the optimal number of working hours, workers take into account all future income and asset changes. For example, if a worker expects to receive an inheritance after, say, twenty years, he or she may already adjust working hours downwards. Under the

assumption of incomplete information, however, workers do not fully anticipate changes in wealth and income. When individuals experience unexpected wealth shocks, they have to reoptimise their lifetime labour supply decisions and therefore this type of wealth shocks can be expected to affect labour supply (Joulfaian and Wilhelm, 1994). Furthermore, wealth may have an impact on labour supply when capital markets are imperfect (or individuals are unwilling to borrow) and liquidity constraints are binding: in this case wealth gains and losses affects labour supply behaviour even if they are completely expected. Basically, if a worker wishes to reduce working hours but is not able to do so because liquidity constraints are binding, an increase in wealth may reduce labour supply. So, in a life-cycle framework, wealth affects labour supply behaviour under uncertainty and in the presence of liquidity constraints (see Chapter 6 for a more formal discussion).

Job search models

Both static and dynamic labour supply models assume that each (employed or unemployed) individual is aware of all potential job offers available and thereby assumes perfect information. Job search theory introduces search frictions as a result of imperfect information on job offers (Rogerson et al., 2005; Mortensen, 2011). These models assume that it takes time and effort to locate a job and provide a general framework to examine transitions between unemployment and employment and from one job (employer) to another. The central decision rule is that the individuals will continue searching when the expected marginal benefits of searching are higher than the marginal costs of searching.

Because in most search theoretical models individuals are assumed to maximise expected discounted income rather than utility, the role of savings is generally ignored (e.g. Mortensen, 1986). The typical worker "is interested in maximizing expected discounted income. This is the same as maximizing expected utility if he is risk neutral, but also if he is risk averse and consumption markets are complete, since then he can maximize utility by first maximizing income and then smoothing consumption" (Rogerson et al., 2005: p.962).

Nevertheless, several studies in the search theoretic literature deal with the relation between wealth and labour market transitions. Danforth (1979) presents a search model in which unemployed individuals maximize the expected utility of consumption and incorporates wealth in this model. He derives that the level of assets is positively related to the reservation wage and the duration of unemployment. In this search model, employment is an absorbing state: once a job seeker has found a job, he will keep it forever. This implies that the analysis is only relevant for new entrants. Blundell et al. (1997) also

develop a model of labour market transitions which allows for the possibility of using savings to smooth consumption. In contrast to the model of Danforth (1979), their model includes lay-offs. When employment shocks can only be partially insured, saving is a useful device to preserve consumption levels, in particular when individuals face borrowing constraints. They argue that labour market transitions and saving behaviour are closely related: "Individuals save to self-insure against the possibility of unemployment or to take planned time off work" (Blundell et al., 1997: p. 161). Their search model distinguishes between three labour market states: employed, unemployed (active job search) and out of the labour market. Theoretically, the value of these different positions is dependent on the level of accumulated wealth. A reservation asset level can be derived: if the individual's wealth level is above this reservation level, he will reject a job offer when he is unemployed or quit when he is employed. Accordingly, there exists a negative relation between wealth at the beginning of the period and the probability of becoming and staying employed. Blundell et al. (1997) derive the following hypotheses with respect to wealth and transitions (see Bloemen, 2002). First, for the unemployed, wealth is positively related to the reservation wage and the unemployment duration. Second, for the employed, wealth is positively related to the probability of quitting. Whereas both Danforth (1979) and Blundell et al. (1997) focus on the reservation wage and assume search effort to be fixed, Lentz and Tranaes (2005) allow for endogenous search effort in a search model with savings. They show that the relation between wealth and search effort is negative when wealth does not affect search costs, but is ambiguous when wealth decreases marginal costs of search. The bottom line in all these job search models is that the marginal valuation of wealth is higher when the agent is unemployed compared to when he is employed. For that reason, the value attached to finding or retaining a job decreases with the wealth level. Theoretically, wealth and labour market behaviour are thus closely related.

3.4.2 Empirical findings

The effects of wealth on several types of labour market behaviour have been examined in previous research: retirement transitions; labour supply effects (pre-retirement); transitions between employment and unemployment; transitions to self-employment.

Wealth and labour supply

As most of the empirical life cycle literature deals with the retirement transitions, it may not be surprising that several scholars have examined the relation between wealth and the timing of retirement. Early research using US data found little or no effects (Diamond and Hausman, 1984; Samwick, 1998). However, these studies have not taken into account various endogeneity issues. Workers who plan to retire early save more in anticipation, leading to an upward bias. Unobserved characteristics may also lead to biases. For instance, risk averse workers may prefer a financially solid retirement and therefore may both save more and retire later (causing a downward bias). The general approach in the literature is to rely on windfalls and unexpected changes in wealth: some have used information on (unexpected) inheritances (Brown et al., 2010), while others have drawn on unexpected stock market returns (Corondo and Perozek, 2003; Coile and Levine, 2006) or exploited regional differences in house price developments (Sevak, 2007; Disney et al., 2010). Following a different approach, Van Ooijen et al. (2010) used information on expected retirement age and unexpected changes in wealth and applied panel data techniques to control for unobserved heterogeneity. Bloemen (2011) estimates a joint model for retirement and wealth holdings, including unobserved individual specific random effects. The empirical results found in these studies vary from (almost) none to substantial wealth effects on retirement.

Studies that do not focus exclusively on the retirement transition but more generally examine the effect of wealth on labour supply are very scarce. Holtz-Eakin et al. (1993) use US data on tax returns and find that inheritances depress labour supply: "families with one or two earners who received inheritances above $150.000 were about three times more likely to reduce their labor force participation to zero than families with inheritances below $25.000" (Holtz-Eakin et al., 1993: p.432). In addition, for those who did not withdraw from the labour market, receiving large inheritances is associated with decreases in earnings. This suggests inheritances have a negative effect on the intensive margin (though no information on working hours is available to tests this directly). Joulfaian and Wilhelm (1994), using PSID data, estimated the effects of inheritance receipt on labour supply: the results show that inheritances decrease the number of working hours for men and married women, though the disincentive effects are quantitatively small. A third US study exploits a survey of lottery players and finds that those who receive higher lottery prizes are more likely to decrease labour earnings, indicating a negative effect on labour supply (Imbens et al., 2001). The only studies on wealth effects on (pre-retirement) labour supply outside the

US are those of Henley (2004) and Benito and Saleheen (2011), who uses BHPS data (UK). Henley (2004) reports significant reductions in working hours as a response to financial windfall gains (such as inheritances, lottery prizes, personal accident claims). Moreover, the results show that labour supply is affected by house price shocks. Benito and Saleheen (2011) use a different strategy to examine the effects of wealth on both the intensive and extensive margin. By comparing expectations of the future household financial situation at time *t-1* with the actual household financial situation at time *t*, they construct dummies indicating whether the individual experienced an unexpected financial loss or gain. The results of Benito and Saleheen (2011) point out that working hours as well as participation decisions are affected by financial wealth shocks. Finally, Kimball and Shapiro (2008) stress that workers may be unable to adjust labour supply when hours rigidities are present and therefore the effects of income or wealth shocks may be limited. Kimball and Shapiro (2008) therefore propose an experimental approach to assess the effects of a wealth shock on (optimal) labour supply. Using data from an HRS experimental module that contains questions on how respondents would change their labour supply behaviour if they would receive a large sweepstake, they found that a large majority of the workers would either quit their job (56 percent) or reduce working hours (23 percent). These wealth effects are substantially larger than those found in the field.

Wealth and transitions

Empirical findings support the hypotheses that wealth has a positive effect on the reservation wage, a negative impact on the probability of leaving unemployment and a positive impact on leaving employment (Bloemen and Stancanelli, 2001; Bloemen, 2002; Algan et al., 2003). It should be noted that these studies make use of different wealth variables: liquid wealth (i.e. time deposits and savings accounts) (Algan et al., 2003), financial wealth (Bloemen and Stancanelli, 2001) or total wealth (including and excluding housing wealth) (Bloemen, 2002). Furthermore, several studies show that unemployment duration decreases when liquidity constraints are binding: unemployment spells increase with cash-on-hand (e.g. Card et al., 2007; Chetty, 2008; Shimer and Werning, 2008).

In a somewhat different stand of literature, various studies found that wealth is positively related to the probability of entering self-employment (e.g. Evans and Jovanovic, 1989). This evidence indicates that liquidity constraints provide a barrier to become entrepreneur. Again, endogeneity is an issue as individuals may accumulate wealth to finance start-ups. As in the retirement literature, several studies exploit data on

inheritances as a source of exogenous variation. However, Hurst and Lusardi (2004) question the validity of this instrument and argue that wealth may proxy for other characteristics (for instance, economic preferences). They show that both past and future inheritances increase the probability of becoming an entrepreneur and propose an alternative instrument, which is based on differences in regional house price variation. Applying this alternative estimation strategy, the results of Hurst and Lusardi (2004) point out that there are no significant wealth effects in the US. Disney and Gathergood (2009) replicate this study for the UK and found substantial wealth effects.

3.4.3 Conclusion

In theoretical models with uncertainty and liquidity constraints, wealth accumulation and labour supply behaviour are closely connected. As wealth can be used to smooth consumption, higher asset levels decreases the value of employment. The effects of wealth on various types of transitions have been examined empirically. In order to address endogeneity, a large number of existing studies rely on data on windfalls (e.g. inheritances, regional house price growth). The evidence on wealth effects on labour supply and unemployment durations is the most conclusive: wealth depresses working hours and lengthens unemployment spells. The findings on retirement and self-employment are less conclusive. Some scholars find no or little impact, while others find substantial wealth effects. The results seem to depend on the specific source of exogenous variation.

3.5 Conclusion and discussion

A number of social and economic trends pose important policy challenges and call for the modernisation of the system of social security. Introducing life course schemes may provide an answer to these challenges. If the main objective of these schemes is to facilitate labour market transitions and enhance the ability of individuals to cope with critical life events, it is imperative to examine whether the reform will indeed have this behavioural impact. This chapter examined the underlying assumptions of life course schemes theoretically and confronted the assumptions with empirical evidence. The study points out that the effectiveness of life course schemes depends on their impact on savings behaviour and, subsequently, the impact of these changes in savings behaviour on labour market behaviour. Both the relation between savings schemes and wealth accumulation and the relation between wealth and labour market behaviour are complicated and difficult

to identify empirically. Whereas the former relation remains controversial, the empirical findings on the latter issue are rather scarce.

First of all, it is critical that life course schemes increase total wealth. Although not fully conclusive, empirical evidence generally shows that savings schemes boost the total level of savings, particularly among lower-income individuals. Next, since various studies indicate that wealth negatively affects labour supply, it can be expected that life course schemes – through an increase in the level of savings – (temporarily) decrease labour supply. However, empirical evidence finds relatively small wealth effects on labour market behaviour, suggesting that the labour market impact of additional assets accumulated through life course scheme schemes may be limited. Nevertheless, it can be argued that savings accumulated in life course schemes have a larger effect on labour market transitions than other (non-contractual wealth), as these savings can only be used to finance working hours reductions and transitions to non-employment. Because of these withdrawal restrictions, the empirical results on the impact of total wealth on labour supply behaviour indicate a lower bound of the effects of savings scheme wealth. Moreover, following Feldstein's argumentation that pension schemes may induce earlier retirement, if life course schemes facilitate labour supply reductions they may actually increase the need to save, thereby leading to a multiplier effect. However, a (central) objective of life course schemes is to increase total life-time labour supply: if the schemes will be successful in that respect, they will actually reduce life-time leisure and decrease the need to save.

Of course, even if wealth substantially affects labour market behaviour, life course schemes should encourage saving to be effective. If the schemes are poorly designed, they are unlikely to significantly affect savings and labour market behaviour. Though mandatory contributions to the special life course accounts may stimulate wealth accumulation considerably, an important disadvantage of this policy option is that (some) people may be forced to save too much. Voluntary savings schemes allow for more individual choice, but tax incentives have a smaller impact on saving behaviour and may involve a substantial deadweight loss. The recent behavioural economics literature provides some interesting suggestions to encourage savings: for example, schemes that automatically enrol workers and/or that commit participants to save a fraction of their future wage increases in special accounts (e.g. Thaler and Bernartzi, 2004). However, the impact of such schemes on total savings requires further research.

Finally, while some previous studies analysed the effects of wealth on labour market behaviour, it is striking that the impact on several aspects of labour supply

behaviour are largely ignored in empirical work. The lion's share of existing research concentrates on the wealth effects on the timing of retirement or the duration of unemployment. In general, little attention is paid to voluntary reductions of labour supply. These effects are crucial for the functioning of life course schemes, which aim to facilitate transitions to non-employment and reductions of working hours during the working life. Chapter 6 of this thesis therefore examines the wealth effects on the intensive margin of labour supply more extensively.

PART II

EXAMINING BEHAVIOURAL ASSUMPTIONS

Chapter 4

Job Search Behaviour and Time Preferences: Evidence from the Netherlands

4.1 Introduction

Standard job search models assume that agents discount future costs and benefits exponentially, which implies that preferences are time-consistent. However, a substantial amount of experimental and field evidence on intertemporal choice demonstrates that preferences are time-inconsistent and that individuals tend to be present-biased (see for a review: Frederick et al., 2002; DellaVigna, 2009). In order to allow for time-inconsistency, hyperbolic discounting models have been proposed as an alternative for the standard exponential model (e.g. Laibson, 1997). One of the most important predictions of hyperbolic discounting models is that individuals have a tendency to procrastinate investment activities, i.e. activities that involve immediate costs and delayed rewards. As job search can be considered as an (unpleasant) investment activity, it can be argued that hyperbolic agents are inclined to procrastinate looking for job openings, writing resumes and sending applications. The prediction that job searchers tend to postpone job search activities is in line with the empirical finding that on average the unemployed spend just a couple of hours per week on job search activities (Krueger and Mueller, 2010).

DellaVigna and Paserman (2005; DV&P hereafter) provide the first test of the exponential against the hyperbolic discounting model within a job search context. They demonstrate that the theoretical relations between patience on the one hand and job search intensity, reservation wages and the exit rate to employment on the other hand depend on whether agents discount exponentially or hyperbolically. Using US data, they examine these relations empirically and find support for the hyperbolic discounting model.

An important drawback of the study of DV&P is that their empirical assessment relies completely on behavioural proxies for patience, such as information on smoking, alcohol consumption, drug use and having a life insurance: these proxies are context specific and noisy measures of time preferences. Moreover, it is likely that their time preference measure is related to risk aversion, which may also affect job search behaviour

(Pannenberg, 2010). A critical question is therefore whether their findings depend on this specific measure for patience. In order to answer this question, this study uses self-reported information on time preferences. Making use of the DNB Household Survey (DHS), a large longitudinal Dutch survey, we construct an indicator of patience which is based on items from the Consideration of Future Consequences Scale, a psychological construct to measure an individual's future orientation. This study thus examines whether the support for the hyperbolic discounting model is robust to an alternative (more accurate) patience measure. Moreover, the chapter provides an analysis of the Dutch case and thereby contributes both to the labour economics literature on job search and to the behavioural economics literature on hyperbolic discounting.

Research that examines the role of time preferences in job search models has important policy implications. Hyperbolic agents are mainly responsive to immediate costs and benefits, while the behaviour of exponential agents is more affected by long-run payoffs. Therefore, it can be expected that the effectiveness of social security and labour market policies depends on whether job seekers discount future payoffs exponentially or hyperbolically.

The chapter is structured as follows: Section 4.2 reviews the previous literature on hyperbolic discounting and discusses the theoretical model proposed by DellaVigna and Paserman (2005). In Section 4.3, we describe the data and discuss indicators for time preferences and job search intensity. The results are presented in Section 4.4. The final section concludes.

4.2 Theoretical framework and previous literature

4.2.1 Time preferences

In the standard economic literature, it is assumed that individuals have well-defined preferences and try to maximize life-time utility according to a function in which individuals discount utility exponentially. This implies that individuals have time-consistent preferences. However, evidence from a wide range of laboratory experiments (e.g. Frederick et al., 2002) demonstrates that individual time preferences are dynamically inconsistent. Various experimental studies point out that discounting is steeper in the immediate future than in the more distant future (Thaler, 1981). To capture the idea of time-inconsistent preferences, Laibson (1997) proposes the following quasi-hyperbolic discounting model as an alternative for the exponential discounting model:

$$U^t(u_t, u_{t+1}, ..., u_T) = u_t + \beta \sum_{\tau=t+1}^{T} \delta^t u_t \tag{4.1}$$

In the exponential discounting model, $\beta = 1$ and time preferences are fully measured by δ. In this alternative model, there are two parameters for time preferences: short-run patience β and long-run patience δ. In hyperbolic discounting models ($0<\beta\leq 1$), individuals have present-biased preferences or are 'myopic' since the individual attaches extra weight to current utility compared to future utility. A general prediction of this type of models is that people have a tendency to postpone investment activities and to do soon leisure activities (O'Donoghue and Rabin, 1999).

In the literature on hyperbolic discounting models, the assumptions concerning an individual's beliefs about future behaviour and self-control problems play an important role (e.g. Strotz, 1956; O'Donoghue and Rabin, 2001). Agents who are 'sophisticated' predict their future behaviour in the correct way and are fully aware of their self-control problems ($\widehat{\beta} = \beta$), whereas 'naives' believe they will behave as planned and are completely unaware of their self-control problems ($\widehat{\beta} = 1$). Individuals may also be partially naïve: in that case they are aware of their self-control problems but underestimate the degree ($\widehat{\beta} > \beta$). An important implication is that (partially) sophisticated people know they will have self-control problems in the future and are willing to constrain future choices, using (costly) commitment mechanisms.

In addition to evidence from numerous experimental studies, findings from field data provide support for the hyperbolic discounting model. Many studies examined whether the model can help to explain saving behaviour (Angeletos et al., 2001; Laibson et al., 2007). Other studies focus on the effectiveness of commitment savings schemes (Thaler and Benartzi, 2004; Ashraf et al., 2006) or the impact of default options on saving behaviour (Madrian and Shea, 2001; Choi et al., 2003). The findings from these studies are hard to reconcile with standard economic theory but can be explained by hyperbolic discounting models. Moreover, empirical analyses outside the saving domain provide support for the hyperbolic discounting model: studies on gym attendance and contract choice (DellaVigna and Malmendier, 2006), quitting smoking (Gruber and Koszegi, 2001), contract design in consumer markets (DellaVigna and Malmendier, 2004), effects of (self-imposed) deadlines for homework assignments (Ariely and Wertenbroch, 2002) and evidence from neuroscience (McClure et al., 2004) are also in line with the predictions of

the hyperbolic discounting model. Evidence on hyperbolic discounting in a labour market context is scarce however.

4.2.2 Job search model

In this section, we follow the theoretical framework of DellaVigna and Paserman (2005), who introduce hyperbolic discounting in a job search model. Unemployed individuals choose in each period the amount of job search intensity and the level of the reservation wage. Job search intensity involves search costs $c(s)$ and is parameterized as the probability of receiving a job offer ($s \in [0,1]$).[1] With a probability s the job seeker receives a wage offer w, which is the outcome of a random variable W, with a known cumulative distribution F.[2] When the individual receives a wage offer that is higher than his or her reservation wage, the job seeker accepts the offer and receives w from the next period ($t+1$) onwards. If the wage offer is below the reservation wage, the individual declines the offer and continues searching for a better job. The model abstracts from firm behaviour and does not allow for on-the-job search.[3]

Assuming an infinite planning horizon, individuals choose job search intensity and the reservation wage in order to maximize discounted payoff streams:

$$\max_{s_t \in [0,1]} b - c(s_t) + \beta\delta\left[s_t E_F \left\{ \max\left(V_{t+1}^E(w), V_{t+1}^U \right) \right\} + (1-s_t) V_{t+1}^U \right] \tag{4.2}$$

where b represents unemployment benefits, $c(s)$ the costs of search; β and δ denote short-run and long-run patience respectively. The future payoffs, which are multiplied by $\beta\delta$, consist of the probability (s) times the expected value of receiving a job offer: the worker may either accept ($V_{t+1}^E(w)$) or reject (V_{t+1}^U) the offer. Furthermore, when the individual does not find a job, he remains unemployed and receives V_{t+1}^U. The time subscripts of the value functions can be dropped because a stationary environment is assumed. So, in case the worker accepts the job, he moves into employment and obtains the following payoff:

$$V^E(w) = w + \delta\left[qV^U + (1-q)V^E(w) \right] \tag{4.3}$$

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[1] $c(s)$ is an increasing , strictly convex function of s. Moreover, zero fixed costs are assumed, so $c(0) = 0$.

[2] It is assumed that F has bounded support $[\underline{x}, \overline{x}]$, strictly positive density f, does not change over time and does not dependent on the level of search intensity.

[3] When searching while employed is sufficiently more costly than searching while unemployed, the same theoretical results hold.

where the individual receives wage w and faces a layoff probability $q \in [0,1]$ in the next period. DV&P treat the maximisation problem (4.2) as an intrapersonal game, where the optimal search and reservation wage depend on the behaviour of future selves (via V^U and V^E). Each of these selves wants to allocate search effort to other selves. In this game, DV&P searched for the Markov perfect equilibria. Now, under the stationarity assumption equations (4.2) and (4.3) can be used to derive the reservation wage in equilibrium:

$$w^* = (1-\delta)V^U \tag{4.4}$$

It is clear that the reservation wage increases with the utility derived from being unemployed. Moreover, expression (4.4) illustrates that the reservation wage is not directly affected by short-run patience. The intuition is that the reservation wage decision involves comparing delayed payoff streams: accept the job and receive the offered wage in the future or reject the offer and wait for a better job. As immediate payoffs are not affected, this decision is not directly dependent on short-run patience.

Taking the derivative of (4.2) with respect to search s and using the expression for the reservation wage (4.4), the following first-order condition can be formulated:

$$c'(s^*) = \frac{\beta\delta}{1-\delta(1-q)}\left[\int_{w^*}^{\bar{x}}(u-w^*)dF(u)\right] \tag{4.5}$$

Expression (4.5) shows that, under utility maximization, the marginal costs of search are equal to the marginal benefits of search. The expression demonstrates that job search intensity is positively related to both long-run (δ) and short-run (β) patience. The choice on search effort is principally an investment decision involving immediate costs – looking for job openings, contacting employers, going to job interviews – and future rewards in terms of better job opportunities. For that reason search effort increases with the individual's degree of patience. It also holds that hyperbolic discounters search less intensively than exponential discounters with the same δ: a higher degree of 'present-biasedness' implies a lower value of the future gains of the search investment.

Hypothesis EXPO1: *patience (δ) is positively related to job search intensity*
Hypothesis HYPO1: *patience (β) is positively related to job search intensity*

Note that naïve individuals believe that future selves will exert high search effort and are thus inclined to postpone these activities. Sophisticated job seekers have the correct expectations about future (search) behaviour and are aware of their future self-control

problems. They will therefore value commitment mechanisms that help them overcome the procrastination of job search activities.

Next, consider the effect of patience on reservation wages. When the agent has searched for a job and receives a job offer, he will accept it if the offer is higher than his reservation wage. Choosing a reservation wage involves the comparison of delayed payoff streams: the job seeker either accepts the job and receives the offered wage in the future, or rejects the job offer and continues searching. As the reservation wage decision is about future rather than current payoff streams, this decision is mainly affected by long-run patience (δ): the higher the level of long-run patience, the more the job seeker is inclined to reject the offer and to search for better job opportunities.

The relation between short-run patience and the level of reservation wages is more complex and depends on sophistication. The naïve (hyperbolic) individual believes incorrectly that he will behave as an exponential discounter in the future. The reservation wage is determined by comparing future payoffs that are not affected by short-run patience directly or indirectly by expectations (as the naïve agent believes that β=1 in the future). However, for sophisticated hyperbolic individuals there is an indirect effect of short-term patience on reservation wages through expectations. This sophistication effect means that the more impatient job seeker is aware that future selves will not search intensively and is therefore inclined to accept lower wage offers today. More patient (higher β) sophisticated workers will thus be more selective about job offers.

Hypothesis EXPO2: *patience (δ) is positively related to reservation wage*
Hypothesis HYPO2: *for naïve agents, patience (β) is orthogonal to reservation wage; for sophisticated agents, patience (β) is positively related to reservation wage*

Finally, the effect of patience on the exit rate depends on the joint impact on search intensity and reservation wages. The probability to exit unemployment is composed of the probability of finding a job offer times the probability that this offer is accepted – that is, the wage offer is higher than the reservation wage ($h = s(1 - F(w^*))$). For naïve workers, the effect is unambiguous: the level of search effort increases with short-term patience β, while the effect on the reservation wage is absent. Hence, for naïve agents patience has a positive impact on the exit rate. However, the effect of patience on the exit rate is more complex for exponential and sophisticated hyperbolic discounters. Long-term patience δ is positively related to job search intensity and the reservation wage: the former relation

implies an increase and the latter a decrease in the exit rate to employment. The same applies for the level of short-term patience β of sophisticated hyperbolic discounters. So, the theoretical impact of patience on the labour market transitions is not clear a priori. DV&P show that, although the direction of the effects of δ and β on reservation wages is the same, the magnitudes of the effects are different. For hyperbolic discounters, the effect on the reservation wage is indirect and can be expected to be small.[4] It can be demonstrated that the search intensity effect dominates and patience is positively related with the probability of leaving unemployment when:

$$\frac{\partial E\left[W \mid W \geq x\right]}{\partial x} \leq \frac{1}{1-\beta} \text{ at } x = w^* \tag{4.6}$$

DV&P illustrate that, under exponential discounting and some plausible assumptions, the reservation wage effect dominates and patience has a negative effect on exit rates. "In a nutshell, due to different time horizons, variation in δ primarily drives variation in reservation wages while variation in β primarily drives variation in search effort" (DellaVigna and Paserman, 2005: p.544). This leads to the final hypotheses:

Hypothesis EXPO3: *patience (δ) is negatively related to the exit rate*
Hypothesis HYPO3: *patience (β) is positively related to the exit rate*

DV&P test these hypotheses using two US longitudinal data sets (NLSY and PSID) and construct a measure of impatience applying factor analysis: the items included in this aggregate measure include several (lagged) behavioural proxies of time preferences.[5] The study examines the effects of this variable on search effort, measured by the number of search channels, (self-reported) reservation wages and the duration of unemployment. The empirical findings are in the direction predicted by the hyperbolic discounting model.[6] Furthermore, Ben Halima and Ben Halima (2009) replicate these findings for France, applying the same empirical strategy and using similar proxies for impatience as DV&P.

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[4] DV&P calibrate the model and show that the effect of short-term patience on the level of the reservation wage is quantitatively small.

[5] In the analysis using the NLSY, the following indicators are used: having money in a checking or saving account; contraceptive use; having a life insurance; smoking; number of hangovers; participation in vocational clubs in high school; whether the interviewer specified that the respondent's attitude was 'impatient and restless'. To deal with endogeneity, most indicators refer to the period prior to the unemployment spell.

[6] In a later study, Paserman (2008) performs a structural estimation (using the NLSY) which he uses to evaluate several policy options.

An important drawback of both studies is that they rely on rather noisy indicators of patience. This is acknowledged by DV&P (p.551): "The impatience proxies are noisy measures, derived from different sections and years of the NLSY". The Cronbach reliability measure and the average interitem correlation of the proxies for patience used in the study of DV&P are 0.278 and 0.059.[7] In fact, these reliability measures are below conventional norms, indicating a low level of reliability and internal consistency. The question therefore arises whether the empirical results depend on the type of indicators used for patience.

4.3 Data

4.3.1 The sample

For the empirical analysis, we make use of the DNB Household Survey (DHS; former name: CentER Savings Survey), a Dutch panel survey which has been collected annually by CentERdata since 1993. The panel consists of around 2000 households. Once a year, each household member aged 16 or older fills in a questionnaire via the internet.[8] The survey contains six different modules which focus on specific domains: demographic characteristics of the respondent and the household, housing, health and income, assets and liabilities, and economic and psychological concepts.

For the empirical analysis, male non-employed job seekers are selected. Students, (early) retirees and (partially) disabled individuals are not included in the sample. Furthermore, respondents below the age of 18 and above 64 are excluded from the analysis. Respondents are asked whether they are looking for a job: they are included if they report that they are either considering looking or seriously searching for a job.[9] As in the study of DV&P, an individual is considered as unemployed if he does not hold a job and is looking for (or is willing to) work. Depending on the specification, the sample used for the analyses consists of around 200-350 observations (approximately 160-210 individuals).

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[7] In the study of Ben Halima and Ben Halima (2009) these reliability indicators are 0.536 and 0.06 respectively.

[8] It is not necessary that households have a PC or internet: when a PC is absent, access is provided through a special box which enables household members to fill in the survey via the television.

[9] In each wave, respondents are asked the following question: "Are you currently looking for a(nother) job?" Potential answers are: (1)"Yes, I am seriously searching for a(nother) job"; (2)"Yes, I am considering searching for a(nother) job"; (3)"No, I just found another job"; (4)"No, I am not looking". When their answer is (1) or (2) they are included in the analyses.

4.3.2 Time preferences

The central independent variable in this study is an indicator measuring variation in patience. In order to test the exponential versus the hyperbolic discounting model, it is not necessary to distinguish empirically between short-run and long-run patience. We use an indicator for patience that may, in principle, capture variation in δ or β (or a combination of both). If this indicator captures heterogeneity in δ, the empirical results should be consistent with EXPO1-3. Job search behaviour can then be explained by the standard exponential discounting model. However, when the findings are in line with HYPO1-3, variation in δ cannot explain the results. In that case, the findings can be rationalized if the patience indicator captures heterogeneity in short-run patience β. Since there is variation in β in hyperbolic discounting models but not in exponential discounting models (β=1), such results would provide support for the former and reject the latter model of time discounting. So, like DV&P we exploit the theoretical predictions on the relations between patience and job search behaviour to test the two alternative models of intertemporal choice.

The indicator for patience is constructed from eleven general statements about time preferences and orientation towards the future (see Table 4-1 for details). These statements basically represent the Consideration of Future Consequences (CFC) Scale, a psychological construct to measure how an individual weighs immediate and future outcomes of behaviour (Strathman et al., 1994).[10] These CFC items have been used in some other economic studies (Borghans and Golsteyn, 2006; Webley and Nyhus, 2006). Respondents indicate to which extent they agree with the statement using a 7-point Likert scale (1=completely disagree; 7=completely agree).

It can be expected that some of the FUTURE items are positively related to patience, whereas others are negatively correlated with patience. We therefore recode the latter group of variables (1 is recoded to 7, 2 is recoded to 6, etcetera) in such a way that all eleven FUTURE variables are expected to be positively correlated with one another. The average covariance (correlation) between the items is 0.44 (0.20) and the Cronbach reliability measure of these eleven items equals 0.734, pointing out internal consistency and good reliability.[11] Appendix 4A provides details about the correlations between these

[10] The original CFC Scale uses a 5-point scale and consists of twelve rather than eleven statements. However, this twelfth item is missing in the waves 1996-2003 and is therefore not included in the analysis.

[11] The Cronbach reliability measure and the average interitem correlation are considerably larger than the ones obtained in the study of DV&P and of Ben Halima and Ben Halima (2009). This suggests that the FUTURE items are substantially more precise.

items, KMO measures and results from factor analysis. The correlation matrix shows that in general correlations between these variables are positive and highly significant: the exceptions seem to be FUTURE04 and FUTURE05. Moreover, the KMO measures vary between 0.70 and 0.82 (overall KMO of 0.77). This indicates that the FUTURE items reflect the same underlying trait.

Table 4-1 Time preferences: statements and descriptive statistics

Name	Description	Mean (St. Dev.)	Patience
FUTURE01	I think about how things may be in the future and I try to influence these in everyday life	4.14 (1.52)	+
FUTURE02	I often deal with things that will have consequences in several years	3.64 (1.58)	+
FUTURE03	I am only concerned about the present, assuming it will turn out all right in the future	3.65 (1.55)	-
FUTURE04	I only think about the immediate consequences of my actions (several days/weeks)	3.62 (1.58)	-
FUTURE05	Whether something is convenient determines my decisions to a large extent	4.44 (1.37)	-
FUTURE06	I am prepared to sacrifice my current well-being in order to achieve objectives in the future	3.56 (1.48)	+
FUTURE07	I think that it is important to take warnings about negative future results of my actions seriously, even if these results will materialize in the distant future	4.92 (1.37)	+
FUTURE08	I believe it is more important to deal with matters that will have major consequences in the future, than to deal with matters with immediate but minor consequences	4.26 (1.36)	+
FUTURE09	I generally ignore warnings about future problems because I assume that these problems will be solved by then	3.33 (1.38)	-
FUTURE10	I believe that there is no need to make sacrifices now for future issues, because these could be solved later	3.83 (1.45)	-
FUTURE11	I only respond to urgent problems, supposing that I can deal with future problems when they emerge	3.75 (1.47)	-

Note: The means and standard deviations of the non-rescaled items are for the entire male sample (including employed and non-employed; N=14074).

We performed a factor analysis on all 11 FUTURE variables using the entire male sample. The model is estimated with maximum likelihood (see Appendix 4A for details on the factor analyses). Consistent with the results discussed above, all loadings are positive but the 04-05 items have the lowest loading. We retain the first factor and interpret this as a measure of patience. As the questions about time preferences are not available in the years 1993-1995 and 2008 and are in some cases missing in the other years, the following imputation strategy is applied in order to maintain a sufficient number of observations. Because time preferences are assumed to be relatively stable over time, we calculated the

average patience level for the years 1996-2007 and 2009-2010, using a five year window.[12] When this new patient variable was missing, lags and leads were imputed. For the years 1993-1995 and 2008, the patient variable is taken from the closest year. The correlation between the original patience variable and this 'patience sum' variable is very high (0.90) and significant ($p<0.0001$).

Table 4-2 shows some descriptives of both the original patience variable (1996-2010)[13] and the patience sum variable (1993-2010) for the complete and the unemployed job seekers sample. Comparing the distribution of the original and the sum patience variable, the differences are rather small for both the complete and the job-seeker sample. As the patience sum variable is basically the individual five-year average, variation over time within individuals is rather low and therefore this variable has a lower standard deviation than the original patience variable. Interestingly, the difference between the complete sample and the job seekers is relatively small (according to both the original and average variable). Although one may expect that less patient individuals are more likely to become unemployed, job seekers seem not to be significantly less patient than average. An explanation for this could be that the job seeker sample contains only those individuals who report to be searching for a job, thereby selecting a rather 'future-oriented' group. The complete sample includes also individuals who are not active on the labour market. This group may score relatively low on the patience indicator.

To further investigate the validity of the patience sum variable, we tested to what extent this measure is correlated with behavioural outcomes, statements about spending behaviour and statements about the financial position (Table 4-3). It can be expected that, when the indicator measures patience, it is correlated with several outcomes. First of all, we would expect a positive correlation between the patience measure and the likelihood that the individual has a life insurance, a bank account or a savings account. Furthermore, a negative correlation is expected between the patience measure and the probability that the respondent smokes, consumes several units of alcohol every day, has credit card debt and has any outstanding hire-purchase debt. All correlations between the patience variable and

[12] To compute the five year average for the years 1998-2005, next to the patience variable of year t, two lags and two leads are used. If one of the five patience variables was missing, a four year window is used instead. This procedure is repeated, using a three year window, two year window and finally the patience level of year t. For the first and last years a four year window is used: 1996 (three leads), 1997 (one lag and two leads), 2006 (two lags and one lead), 2007 (two lags and the 2009 wave), 2008 (two lags, two leads), 2009 (one lead and two lags – the 2006 and 2007 waves) and 2010 (two lags – the 2007 and 2009 waves).

[13] For the 2008 wave, the average between the 2007 and 2009 patience variable is used. If the variable was missing in either 2007 or 2009, a lead or lag was imputed instead.

the behavioural proxies have the expected sign and are significant (except for alcohol consumption). In addition, correlations between the patience measure and various variables indicating individual statements about spending behaviour and the financial situation of the household are in line with the theoretical predictions. These findings suggest that our measure is indeed a reliable indicator of patience.

Table 4-2 Patience measure: summary statistics

	Obs.	Mean	Std. Dev.	Min	Max
Complete sample					
Patience	14074	0	0.949	-2.792	2.745
Patience sum	24630	-0.008	0.884	-2.792	2.744
Unemployed job seekers					
Patience	234	0.007	0.976	-2.519	2.407
Patience sum	345	0.024	0.930	-2.276	2.407
	Percentiles				
	10	25	50	75	90
Complete sample					
Patience	-1.230	-0.670	-0.024	0.676	1.248
Patience sum	-1.128	-0.601	-0.024	0.575	1.120
Unemployed job seekers					
Patience	-1.378	-0.668	0.056	0.733	1.224
Patience sum	-1.236	-0.575	0.046	0.648	1.286

Several sensitivity tests have been performed using various alternative indicators of patience. For instance, the average of the 11 FUTURE items can be used instead of the factor scores or a three year instead of a five year window can be used to create an average patience variable. Furthermore, a patient variable can be constructed excluding the FUTURE04 and FUTURE05 variables. Using such alternative measures leads to similar estimation results. For most estimations presented in Section 4.4, we show the results for both the original patience and the patience sum variable. Next to the patience measure which is based on the CFC Scale, we also created a patience indicator using similar methods and comparable behavioural proxies as DV&P (life insurance, savings account, smokes cigarettes, and alcohol consumption). However, the analyses using this measure for patience are not discussed here, because this leads to insignificant results: this is probably due to a combination of imprecise measurement and a small sample size.

Note that this measure of patience is fundamentally different from those used in the previous studies on this issue. Most studies measure time preferences using information on 'financial patience' (e.g. lottery questions) or health related behaviour (e.g. smoking, drug use). An important identifying assumption in the study of DV&P (p.545) is that "the individual's discount rate is the same across different activities". Given that the behavioural proxies are rather domain or activity specific, this seems a rather strong assumption. On the contrary, because in this study rather general items are used to construct a patience indicator, the assumption that the indicator captures variation in time preferences within the job search domain is more likely to hold.

Table 4-3 Correlation between patience, behavioural proxies and statements

	Coefficient
Behavioural outcomes	
Life insurance	0.0722*
Savings account	0.0472*
Smoker	-0.0460*
Drinker	-0.0060
Credit card debt	0.0514*
Statements about spending behaviour and financial situation	
Spend (1-7)	0.2034*
Planning (1-7)	0.0518*
Period (1-5)	0.2833*
Financial situation (1-5)	0.0770*
Manage on income (1-5)	0.0711*

Note: The complete sample is used here. See Appendix 4B for details on the questions/items.
* $p<0.0001$

4.3.3 Job search intensity

In the previous literature, the intensity of job search effort has been measured by various proxies: some rely on the amount of time spent on search activities (Krueger and Mueller, 2008), others use the number applications during a specific period (Gorter and Kalb, 1996; Van der Klaauw and Van Vuuren, 2010), the number of different search methods (DellaVigna and Paserman, 2005; Ben Halima and Ben Halima, 2009; Manning, 2009) or a combination of different indicators (Bloemen, 2005). Interestingly, the empirical evidence (Krueger and Mueller, 2008) points out that the number of search methods is highly related to time spent on searching activities (by unemployed individuals).

Table 4-4 Job search effort: job applications and search channels

	# applications		# channels	
	Frequency	Percentage	Frequency	Percentage
0	105	30.43	34	9.86
1	30	8.70	101	29.28
2	33	9.57	69	20.00
3	21	6.09	53	15.36
4	16	4.64	38	11.01
5	15	4.35	26	7.54
6	7	2.03	17	4.93
7	3	0.87	6	1.74
8	21	6.09	1	0.29
9	18	5.22		
10	18	5.22		
12	16	4.64		
13	2	0.58		
≥14	40	11.59		

Different search channels		
Answered advertisements	191	55.36
Placed advertisements	8	2.32
Asked employers	87	25.22
Asked friends/relatives	114	33.04
Through job centre	125	36.23
Temporary employment agency	92	26.67
Reading advertisements	142	41.16
Other way	73	21.16

In the empirical analysis, we use the following indicators of search effort: whether the respondent has applied for a job during the last two months; the number of job applications during the last two months; and the number of job search methods used by the worker during the last two months.[14] The correlation coefficient between the number of applications and the number of search methods equals 0.5672 and is highly significant ($p<0.0001$). Job seekers who applied more frequently to a job in the last months have also used a larger number of search methods, which indicates that the proxies represent the same underlying variable.

Table 4-4 and Table 4-5 provide descriptive statistics of these search effort variables. Approximately 30 percent of the job seekers has not applied for a job in the last two months; around 50 per cent of this sample completed at least three job applications.

[14] For these variables information is obtained from the questions "How many times have you applied for a job during the last two months" and "How have you searched for a job during the last two months?" (up to eight different methods).

Over 11 per cent of the unemployed has applied 14 or more times for a job in the past two months. The average number of job applications is between 4 and 5. Furthermore, Table 4-4 shows that the most commonly used search channels are answering and reading advertisements. Almost one out of three job seekers have asked friend and relatives about potential job openings, demonstrating the relevance of informal networks as a job search channel. A quarter of the unemployed respondents have asked employers directly for job openings. Using job centres and temporary employment agencies is also rather common. While about 10 per cent of the job seekers have used no search channel in the past two months – this group seems not to be looking for a job actively – the majority has used as least two job search methods.

Table 4-5 Descriptives: Number of channels and applications

Variable	Obs.	Mean	Std. Dev.
# channels	345	2.4116	1.7682
# applications	345	4.7797	4.9951

4.3.4 Reservation wages

Like DV&P and Ben Halima and Ben Halima (2009), this study makes use of subjective reservation wage data. To calculate the individual's hourly reservation wage, the following questions are utilized. First, the respondents are asked how many hours per week they are willing to work. Second, they are asked about the minimal net wage for which they would accept the job offer with the preferred working hours. Third, respondents specify whether this wage should be paid per week, per four weeks, per month or per year. Respondents fill in the answers to these three questions on the same screen.

Table 4-6 reports descriptive statistics of the hourly net reservation wages, in real terms (year 2000 euros). The table shows that the average reservation wage is just over 9 euros per hour, which is higher than the median (8.2). Moreover, as expected the reservation wages for the older group (40 years and older) are higher than the wages for the younger group (<40). Furthermore, the level of the reservation wage rises with the educational level – higher educated are more selective, as they have generally a higher earnings potential.

Table 4-6 Reservation wage: summary statistics

	Obs.	Mean	Std. Dev.	Percentiles				
				10	25	50	75	90
All	291	9.058	4.657	4.955	6.708	8.224	10.201	13.701
Age<40	98	7.229	2.776	3.801	5.367	7.200	8.563	10.630
Age≥40	193	9.987	5.127	5.812	7.230	8.823	11.176	14.821
By education level:								
Pre-vocational (VMBO) or below	90	8.116	3.743	4.843	6.120	7.539	8.941	11.225
Pre-university (HAVO/VWO)	61	7.732	3.927	3.435	5.077	7.530	8.956	12.543
Senior vocational (MBO)	50	8.077	2.777	5.522	6.779	7.830	8.568	10.738
Vocational college (HBO)	51	9.687	2.812	6.811	7.622	9.406	11.230	13.751
University	39	13.742	7.667	7.416	9.139	11.176	14.886	30.125

4.3.5 Transitions

Because the DHS contains no exact information on the duration of unemployment, we make use of data on transitions from one labour market state to another. The transition variable is 0 if the unemployed job seeker observed in year t is still unemployed in year t+1, and equals 1 if he becomes employed in year t+1. Moreover, unemployed individuals who report not to be searching for a job because they already found one are included in the analysis (see note 9): these individuals are also assumed to have made a transition when they are employed in year t+1. According to this definition, 32 percent of the individuals made a transition to employment between two consecutive years. Interestingly, there is a substantial difference in the transition rate between impatient job seekers and patient job seekers: 27 percent of the former and 37 percent of the latter group moved to employment.[15] This difference is consistent with the hyperbolic discounting model.

4.4 Results

4.4.1 Job search intensity

Theoretically, both short-run and long-run patience are positively related to job search intensity (EXPO1 and HYPO1). In order to examine the relation between patience and search effort empirically, three equations are estimated using three different dependent variables: whether the job seeker applied for a job in the last two months (estimated with a probit model), the number of applications in the last two months, and the number of search methods used in the last two months (the latter two are estimated by Poisson regressions).[16]

[15] An individual is defined as patient (impatient) if he scores above (below) 0 on the patience sum variable.
[16] Since the number of applications and channels can be considered as count data, the models using these dependent variables are also estimated with a negative binomial regression. This leads to similar results.

Table 4-7 Job search intensity

	Applied for a job (probit)			# applications (poisson regressions)			# channels (poisson regressions)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Patience	0.231**	0.195*	0.279**	0.0531	-0.00785	0.0351	0.125**	0.100*	0.106
	(0.0977)	(0.116)	(0.138)	(0.0723)	(0.0709)	(0.0843)	(0.0598)	(0.0514)	(0.0683)
N	240	230	152	246	234	152	246	234	152
Patience sum	0.312***	0.279***	0.517***	0.144*	0.136**	0.191**	0.139***	0.103*	0.137**
	(0.0968)	(0.0999)	(0.137)	(0.0739)	(0.0687)	(0.0768)	(0.0522)	(0.0561)	(0.0609)
N	365	345	229	365	345	229	365	345	229
Controls (without UB)	No	Yes	No	No	Yes	No	No	Yes	No
Controls (with UB)	No	No	Yes	No	No	Yes	No	No	Yes

Note: Entries represent coefficients, see Appendix 4D for marginal effects. Clustered (at individual level) and robust standard errors in parentheses.
Controls: age, age squared, marital status, main earner of the household, number of children, educational level, the unemployment rate (province level), three regional dummies, year dummies. Models without controls include year dummies.
*** p<0.01, ** p<0.05, * p<0.1

The models are estimated without controls and with a set of controls, consisting of demographic characteristics (age, age squared, marital status, main earner of the household, number of children), educational level (dummies), the unemployment rate (province level), and region and year dummies (see Appendix 4C for descriptives of the controls). Unfortunately, the DHS data does not provide adequate information on whether the respondent is currently on (unemployment) benefits. However, respondents report whether they received benefits in the previous calendar year. So, using information from year t+1, we created a dummy indicating whether the individual received unemployment benefits and/or social assistance in year t. Because including this additional control leads to a substantial drop in observations, separate analyses are performed using the unemployment benefits variable next to the set of controls listed above.

The estimation results are shown in Table 4-7. Using the patience sum variable, the relation between patience and search intensity is positive and significant for all three indicators of search intensity (without and with controls). When the benefits control is added, the coefficients increase in size and remain significant. The average marginal effects are positive for all three indicators of search effort in all specifications: in addition, the marginal effects are positive and significant at most values of the patience sum variable (see Appendix 4D for marginal effects). The results do not change substantially when the sample is restricted to those individuals for which information on reservation wages is available (N=291). Furthermore, when the original patience variable is used instead, the number of observations drops considerably but the patient coefficients remain positive in all but one specification. To be specific, the coefficient of this variable is positive and generally significant in the models where the job application dummy or the number of channels is used as a dependent variable. Thus, more patient unemployed individuals invest more in job search activities: they are more likely to have applied for a job in the last two months, apply for jobs more frequently and use a larger number of search channels. The findings are in line with those of DV&P and Ben Halima and Ben Halima (2009) and demonstrate that the empirical relation between patience and search effort is robust to different measures of patience as well as to alternative indicators of job search intensity (both previous studies used only the number of search channels as a measure of search intensity). Since these results confirm both hypothesis EXPO1 and hypothesis HYPO1, they do not allow us to discriminate between the exponential and hyperbolic discounting model.

4.4.2 Reservation wages

According to the theoretical predictions, long-run patience has a substantial positive effect on the reservation wage (EXPO2), whereas the relation between short-run patience and the reservation wage is small or absent (HYPO2). To examine this relation empirically, we regress the level and the log of individual reservation wages on patience and a set of other explanatory variables, estimating the models with pooled OLS.

Estimating the models without controls and using the patience sum variable, the coefficient of patience is positive and significant ($p<0.05$) in both the level and the log specification (see Table 4-8). This finding is consistent with DV&P's estimates in the model without controls (DV&P, 2005: p.565). However, when controls are included (with and without the unemployment benefits variable), the coefficient becomes insignificant. Using the original patience variable, the sign of the coefficient of patience is not consistent across specifications and the variable is insignificant in all six specifications.

This result is robust to a variety of other specifications using alternative indicators for patience (using a dummy indicating that the job seeker is patient (see note 15) or alternative methods of constructing an indicator for patience (see Section 4.3.2). So, there is no evidence of a positive relation between patience on reservation wages, both in the level and the log specification. This finding does not provide support for the exponential discounting model (EXPO2), but is consistent with the hyperbolic discounting model with (partially) naïve individuals (HYPO2). Note however that the power of the test is rather low due to the small number of observations.

Table 4-8 Reservation wages

	Level (OLS)			Log (OLS)		
	(1)	(2)	(3)	(4)	(5)	(6)
Patience	0.348	-0.00122	-0.234	0.0281	-0.00516	-0.0358
	(0.446)	(0.351)	(0.469)	(0.0378)	(0.0282)	(0.0359)
N	210	199	129	210	199	129
Patience sum	0.686**	0.182	-0.0219	0.0718**	0.0304	0.0138
	(0.321)	(0.264)	(0.406)	(0.0311)	(0.0255)	(0.0357)
N	310	291	195	310	291	195
Controls (without UB)	No	Yes	No	No	Yes	No
Controls (with UB)	No	No	Yes	No	No	Yes

Note: Clustered (at individual level) and robust standard errors in parentheses. For the list of controls, see Table 4-7.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

4.4.3 Transitions

An analysis of the relation between patience and the exit probability out of unemployment provides the final and crucial test of the two alternative models of time discounting. Theoretically, δ is negatively related to the probability of moving from unemployment to employment (EXPO3), while β is positively related to the exit rate (HYPO3). So, if the patience indicator captures heterogeneity in δ, a negative relation between patience and the exit rate is expected. Alternatively, when the indicator measures variation in β, we would predict that the empirical relation between patience and the transition probability is positive.

The transition equation is estimated with a probit model: the estimation results are presented in Table 4-9 (see Appendix 4D for the marginal effects). The coefficient of the patience sum variable is positive but insignificant in the specifications including and excluding controls (without the control for benefits).[17] The marginal effects (average and estimated at different patience levels) are also positive and insignificant. An explanation for these insignificant relations could be that the measure of patience captures a combination of β and δ and the two contradictory effects on the exit rate cancel out. However, when the unemployment benefit control is added (column (3)), the patience coefficient is positive and significant. The average marginal effect is also positive and significant, as are the marginal effects estimated at various patience levels (Table 4D-1).[18]

The sign of the patience sum coefficient is robust to different definitions of transitions and alternative patience indicators. Moreover, the relation between patience and the exit rate is significant in various cases. The general results are confirmed when instead of the patience sum variable a patient dummy (note 15) is used (see rows 'High patient level' of Table 4-9): the coefficient of the patient dummy is positive and significant ($p<0.05$) in specifications including controls (with and without unemployment benefits). If the patience indicators would capture variation in δ, a negative rather than a positive relation between the patience variable and the exit rate can be expected. The empirical findings can therefore not be rationalised by the exponential discounting model. The results can be explained however by the hyperbolic discounting model: when the patience variable measures heterogeneity in the short-run patience β, the findings are in line with the theoretical predictions.

[17] Only the results using patience sum are presented here: for the original patience variable, the number of observations is very low and the results are inconsistent.
[18] The marginal effects turn only just insignificant at higher levels of patience.

Table 4-9 Transitions to employment

	Transition (probit)		
	(1)	(2)	(3)
Patience sum	0.0693	0.110	0.214*
	(0.0972)	(0.108)	(0.124)
High patient level	0.261	0.383**	0.552**
	(0.187)	(0.194)	(0.225)
N	273	257	204
Applied for a job	0.466**	0.679***	0.900***
	(0.215)	(0.209)	(0.256)
# applications	0.0590***	0.0965***	0.103***
	(0.0187)	(0.0207)	(0.0241)
# channels	0.0762*	0.135**	0.159**
	(0.0451)	(0.0540)	(0.0694)
N	312	296	212
Reservation wage	-0.0148	0.0361	0.0222
	(0.0253)	(0.0283)	(0.0313)
Log reservation wage	-0.0830	0.642**	0.658*
	(0.249)	(0.314)	(0.346)
N	270	255	182
Controls (without UB)	No	Yes	No
Controls (with UB)	No	No	Yes

Note: The results are obtained from separate estimations. Entries represent coefficients of the specific variable, see Appendix 4D for marginal effects. Clustered (at individual level) and robust standard errors in parentheses. For the list of controls, see Table 4-7. All coefficients and standard errors of the specific variable are estimated with separate models.
*** p<0.01, ** p<0.05, * p<0.1

A second test of the two alternative models of time discounting exploits the predictions on the relative size of the reservation wage effect and job search intensity effect on the exit probability: the (negative) reservation wage effect dominates in the exponential, whereas the (positive) job search effort dominates in the hyperbolic discounting model. Table 4-9 illustrates that, across a variety of specifications, job search intensity is significantly and positively related to the probability of making a transition to employment (each row in the table reports the coefficients from separate estimations). In addition, the results for the models without controls indicate a negative but insignificant relation between reservation wage (level or log) and the exit rate. However, when controls are included, this relation becomes positive (and significant when the log reservation wage is used). Consistent with the hypothesis derived from the hyperbolic discounting model (HYPO3), these results imply that variation in exit rates is mainly driven by search effort.

Through a positive effect on job search intensity, patience indirectly affects the exit rate positively.

The empirical finding concerning reservation wages contrasts with the general theoretical prediction of a negative relation between reservation wages and the transition probability: it can be expected that job seekers with a higher reservation wage are – by definition – more selective in accepting a job offer and will for that reason have a longer unemployment spell (ceteris paribus). This result may be due to unobserved heterogeneity: the reservation wage may not just measure the likelihood that job offers are declined, but may also be positively correlated with the job offer probability – the latter implying a positive relation between the reservation wage and the exit rate.

4.4.4 Alternative explanations

All the major findings presented in the preceding sections can be explained by the hyperbolic discounting model, indicating that the items from the CFC Scale capture variation in short-run patience. Of course, the patience measure may be related to other individual characteristics, which may rationalise the empirical results. These alternative stories are summarised in Table 4-10. DV&P (pp.566-568) discuss several potential other explanations: more patient individuals may have a higher level of human capital or lower utility of leisure (i.e. they are more eager to work). The patience measure may also be positively related to the productivity of search, work attitudes, the wage offer distribution and the probability of layoff. DV&P argue that their empirical results reject these alternative stories as they do not provide a coherent explanation of all the empirical findings: the other explanations are inconsistent with at least one finding. As we obtain similar results, the same reasoning applies in this study.

Here we discuss two alternative interpretations that are not assessed by DV&P (see the bottom rows of Table 4-10): wealth and risk aversion. First, it is evident that more patient individuals accumulate more savings.[19] Previous studies point out that wealth decreases search effort, increases the level of the reservation wage and (consequently) reduces the exit rate (Blundell et al., 1997; Bloemen, 2002; see also Section 3.4.2). So, if the patience indicator would capture variation in wealth, the variable can be expected to be negatively correlated to job search effort and the exit rate and positively to the reservation

[19] The correlations presented in Table 4-3 actually indicate that the patience measure used here is positively related to the financial situation and wealth accumulation.

wage. Clearly, this alternative explanation contradicts with all the empirical findings presented in this section.

Second, time preferences and risk preferences may be correlated. The empirical evidence on risk aversion and job search behaviour is scarce and inconsistent. Some studies point to a negative relation between patience and risk aversion (Andersen et al., 2008), while other studies find the opposite (Sutter et al., 2010). In fact, the same behavioural proxies are used in empirical work to capture patience (e.g. DV&P) and risk aversion (Hersch and Viscusi, 1990): for instance, smokers are assumed to be both less patient and less risk averse. According to this perspective, patience and risk aversion are both related to impulsivity. Since the patience measure used in this study is positively correlated to having a life insurance and negatively to being a smoking (see Table 4-3), individuals who score higher on the patience indicator seem to be more risk averse. Yet, the relation between the patience variable and more direct indicators of risk aversion is inconsistent.[20] The relation between patience and risk aversion is therefore not clear-cut. First, assume that our patience measure is positively related to risk aversion. Risk averse individuals tend to have lower reservation wages (Pannenberg, 2010) and may search less intensively, because search is a costly activity with uncertain rewards. The theoretical relation between risk aversion and the exit rate is therefore ambiguous. However, Feinberg (1977) shows that risk averse individuals have shorter unemployment spells.[21] Because the relation between risk aversion and the reservation wage as well as search effort is negative, this alternative story is inconsistent with our findings. Next, if we assume instead a negative relation between the patience indicator and risk aversion, patience and the exit probability are expected to be negatively related: this is not in line with the results. Hence, various alternative stories are not able to rationalise all the empirical results in a unified manner. Of course, we cannot fully rule out that the patience indicator captures a combination of the alternative explanations. Given that all findings are consistent with the hypotheses on short-run patience, the hyperbolic discounting model provides the most plausible explanation.

[20] Respondents of the DNB survey are asked to indicate on a 7-point scale to what extent they agree with the several statements on saving and risk taking, including the following: "I think it is more important to invest in safe assets and receive certain returns than to invest in risky assets in the hope of receiving the highest returns" [SPAAR1]; "I am prepared to take the risk of losing money when there is also a chance that I will gain money" [SPAAR6]. Obviously, scoring high on the former indicates risk aversion and scoring high on the latter high indicates risk tolerance. However, the patience indicator is positively related to both SPAAR1 and SPAAR6 (see also Section 5.4.4).

[21] Diaz-Serrano and O'Neill (2004) find that more risk averse people are more likely to be unemployed (non-employed). However, this does not imply that they have shorter unemployment durations.

Table 4-10 Does the patience measure capture other factors?

	Search effort	Reservation wage	Exit prob.	Explains all findings?
Sign of the empirical relations between the dependent variable and the patience measure	+	0	+	
Sign of the theoretical effect on the dependent variable by a(n):				
Increase in δ	+	+*	-*	No
Increase in β	+	0	+	Yes
Alternative stories				
Discussed by DV&P:				
Right shift wage distr. (human capital)	+	+*	+	No
Decrease in utility of leisure	+	-*	+	No
Increase in productivity of search	+	+*	-*	No
Increase in dispersion of wage distribution	+	+*	-*	No
Decrease in layoff probability	+	+*	-*	No
Other relations:				
Increase in wealth	-*	+*	-*	No
Increase in risk aversion	-*	-*	+	No
Decrease in risk aversion	+	+*	-*	No

Note: The relations marked with * are inconsistent with the empirical relations.

4.5 Conclusion and discussion

This chapter builds on the work of DellaVigna and Paserman (2005) and tries to integrate insights from behavioural economics into a job search model, one of the cornerstones of modern labour economics. By exploiting theoretical predictions on the relation between patience and job search behaviour, this study tests empirically the exponential versus the hyperbolic discounting model. In line with the predictions of the hyperbolic model, the results show that patience is significantly positively related to job search intensity and orthogonal to the reservation wage. The relation between patience and the exit rate from unemployment to employment is positive and in some cases significant. An explanation for insignificant relations between patience and the probability to exit unemployment could be that the measure of patience captures a combination of short-run and the long-run patience. The empirical findings also demonstrate that job search effort positively affects the exit probability and dominates the reservation wage effect: this suggests that there is an indirect

positive relation between patience and the transition probability. The empirical findings thus favour the hyperbolic rather than the exponential discounting model.

The results have important implications for social security and labour market policy. The behaviour of hyperbolic job searchers is mainly affected by immediate costs and benefits, whereas long-term payoffs are of minor importance. Furthermore, hyperbolic discounting models emphasize the relevance of commitment devices, which are ineffective instruments in a world consisting of exponential discounters. Rather than implementing an unemployment scheme that provides long-term incentives to find a job, it would be more effective to implement job search commitment mechanisms, for instance through setting-up individual action plans and by intensifying monitoring of job search effort (combined with sanctions). Although earlier research on the effectiveness of search monitoring is mixed, more recent empirical evidence indicates that more stringent monitoring of job search substantially reduces the duration of unemployment (McVicar, 2008; Arni et al., 2009; Card et al., 2009). It is striking that both the use of individual action plans and job search monitoring are on the rise in OECD countries (OECD, 2007). Finally, the fact that there is heterogeneity in patience has important policy implications. The empirical results show that more impatient job seekers search less intensively and are less likely to exit unemployment. In order to encourage these 'inactive' job seekers – a primary target group of many policy programmes – to search more actively, policy makers should not rely on long-term incentives as myopic individuals hardly care about such incentives.

An interesting area for future research would be to assess optimal unemployment insurance schemes under hyperbolic discounting. This may be particularly relevant because hyperbolic discounting introduces a different type of moral hazard. As the hyperbolic job seeker tends to procrastinate search activities, the level of job search intensity is not just non-optimal from a societal point of view, but also from the individual's long-run perspective. In the standard exponential framework, long unemployment spells are the result of the individual's optimizing behaviour, whereas under hyperbolic discounting lengthy durations of unemployment are (partially) attributable to non-optimal decision making.

Appendix 4A FUTURE items

Table 4A-1 Correlation matrix

	future01	future02	future03	future04	future05	future06	future07	future08	future09	future10	future11
future01	1										
future02	0.6301*	1									
future03	0.3183*	0.4489*	1								
future04	0.0057	0.0506*	0.3195*	1							
future05	-0.1032*	-0.0484*	0.1544*	0.3086*	1						
future06	0.2736*	0.3239*	0.1247*	-0.0586*	-0.0751*	1					
future07	0.2934*	0.2506*	0.1504*	-0.0195	-0.2076*	0.2299*	1				
future08	0.3526*	0.3808*	0.2049*	0.0261	-0.1119*	0.3205*	0.4470*	1			
future09	0.1407*	0.1552*	0.3671*	0.1839*	0.0893*	0.0336*	0.1691*	0.1113*	1		
future10	0.1321*	0.1886*	0.3675*	0.1784*	0.1457*	0.2056*	0.0678*	0.1043*	0.4515*	1	
future11	0.1765*	0.2441*	0.4619*	0.2715*	0.1715*	0.1329*	0.1080*	0.1393*	0.4494*	0.5388*	1

Note: The correlation coefficients are based on the entire male sample (N=14074).
* p<0.0001

Table 4A-2 KMO measures

future01	0.7548
future02	0.7265
future03	0.8207
future04	0.7292
future05	0.7050
future06	0.7863
future07	0.7352
future08	0.7900
future09	0.8008
future10	0.7643
future11	0.8087
Overall	0.7706

Table 4A-3 Factor analysis: All FUTURE items

Variable	Factor loadings	Uniqueness	Scoring coef.
future01	0.5370	0.7117	0.15900
future02	0.6244	0.6102	0.21569
future03	0.6799	0.5377	0.26643
future04	0.2667	0.9289	0.06051
future05	0.0854	0.9927	0.01813
future06	0.3386	0.8854	0.08059
future07	0.3384	0.8855	0.08052
future08	0.4214	0.8224	0.10798
future09	0.4914	0.7585	0.13652
future10	0.5316	0.7174	0.15615
future11	0.6028	0.6366	0.19948

Note: All eleven FUTURE items are included in the factor analysis, which is estimated with maximum likelihood. The eigenvalue of the first factor (retaining 6 factors) is 2.60, explaining 45 percent of the total variance. The results presented in the table represent estimates retaining only the first factor.

Appendix 4B Behavioural proxies and statements

Table 4B-1 Behavioural proxies and statements

Smoker Question: *"Do you smoke cigarettes?"* (Smoker = 0 if "No"; 1 if "Yes, daily" or "Yes, occasionally")
Drinker Question: *"Do you consume over four alcoholic beverages each day?" (*Drinker = 0 if "No"; 1 if "Yes")
Spend (7-point scale) Question: *"Would you indicate on a scale from 1 – 7 how you use the money that is left after having paid for food, housing and other necessaries? (1 means you want to spend the money immediately - 7 means you want to save as much money as possible)"*
Planning (7-point scale) Question: *"Do you find it difficult to control your expenditures?" (1 very difficult –7 very easy)*
Period Question: *"Which of the following time periods is the most relevant to you when planning household expenditures and savings?* (Period = 1 if "next few months"; 2 if "next year"; 3 if "next few years"; 4 if next 5 to 10 years"; 5 if "beyond the next 10 years")
Financial situation Question: *"What is the current financial situation of your household?"* (Financial situation= 1 if "making debt"; 2 if "drawing on savings"; 3 if "can just manage"; 4 if "some money is saved"; 5 if "a lot of money is saved")
Manage on income Question: "*How difficult/easy are you able to manage on your income*?" *(1 very difficult –7 very easy)*

Appendix 4C Controls

Table 4C-1 Controls: descriptives

Variable	Mean	Std. Dev.
Age	43.66	13.40
Unemployment rate	5.90	1.70
		Percentage
Married		42.90
Main earner		72.75
Nr of children:		
None		40.17
One		14.34
Two or more		45.49
Education level:		
Pre-vocational (VMBO) or below		31.01
Pre-university (HAVO/VWO)		21.45
Senior vocational (MBO)		15.65
Vocational college (HBO)		18.55
University		13.33
Region:		
North		15.94
East		20.87
South		30.14
West		33.04
Unemployment benefits*		58.95

Note: The descriptives presented here are for the sample used in the job search intensity analyses (with controls, excluding UB, N=345.
* The sample with controls including UB is used (N=229).

Appendix 4D Marginal effects

Table 4D-1 Marginal effects of patience sum: search intensity and transitions

	Average	ME at different levels of patience sum				
	ME	-2	-1	0	1	2
Results without UB						
Applied for a job	0.0798***	0.0942***	0.0904***	0.0820***	0.0704***	0.0573***
	(0.0280)	(0.0347)	(0.0349)	(0.0300)	(0.0217)	(0.0125)
# applications	0.650**	0.490***	0.562**	0.644**	0.737*	0.845
	(0.327)	(0.177)	(0.240)	(0.319)	(0.416)	(0.534)
# channels	0.200**	0.200**	0.222**	0.246*	0.273*	0.302
	(0.0859)	(0.0859)	(0.108)	(0.133)	(0.163)	(0.197)
Transition	0.0317	0.0287	0.0303	0.0317	0.0329	0.0339
	(0.0312)	(0.0250)	(0.0284)	(0.0312)	(0.0335)	(0.0352)
Results with UB						
Applied for a job	0.131***	0.147***	0.152***	0.136***	0.105***	0.0700***
	(0.0334)	(0.0300)	(0.0410)	(0.0364)	(0.0212)	(0.00927)
# applications	0.889**	0.599***	0.725***	0.877***	1.061**	1.284*
	(0.353)	(0.143)	(0.227)	(0.340)	(0.491)	(0.692)
# channels	0.327**	0.245***	0.281***	0.322**	0.369**	0.424*
	(0.142)	(0.0746)	(0.103)	(0.137)	(0.180)	(0.232)
Transition	0.0573*	0.0445**	0.0510**	0.0569*	0.0618	0.0653
	(0.0331)	(0.0180)	(0.0259)	(0.0329)	(0.0381)	(0.0407)

Note: All estimations include controls, see Table 4-7 for the list of controls.
*** p<0.01, ** p<0.05, * p<0.1

Chapter 5
On-the-Job Search, Work Effort and Hyperbolic Discounting

5.1 Introduction

Climbing up the wage ladder – like any other ladder – takes time and effort. In order to obtain a promotion within the firm or to receive an outside job offer, the worker has to exert high effort on-the-job or search for job openings, respectively. Since these activities involve immediate costs and delayed rewards in terms of better career prospects, they can be considered as investment activities. It can therefore be expected that whether and to what extent workers are willing to make career investments depends on how they value the future rewards compared to the current costs. Individual time preferences are thus likely to be important for this intertemporal decision making process.

Standard economic models assume that individuals discount the future exponentially, which implies that time preferences are time-consistent. However, a large number of studies indicate that preferences are time-inconsistent and present-biased (e.g. Frederick et al., 2002; DellaVigna, 2009; see also 4.2.1). Hyperbolic discounting models allow for time-inconsistency (e.g. Laibson, 1997). One of the most important predictions of hyperbolic discounting models is that individuals have a tendency to procrastinate investment activities. This chapter examines theoretically and empirically the effects of time preferences on career investments. Similar to Chapter 4, this study aims to test the exponential against the hyperbolic discounting model. Whereas the previous chapter analysed search behaviour of the unemployed, this chapter focuses on the career behaviour of employees.

We assume that a worker's career investment portfolio consists of two main activities. First, an employee can search on-the-job for another job to increase the probability of receiving an outside offer. Second, a worker can increase the chance of getting promoted by exerting high work effort on the job and by engaging in extra-role behaviours (such as accepting temporary impositions without protest, assisting co-workers and building good relationships with supervisors). Empirical evidence points out that both

internal and external mobility are important sources of wage growth (e.g. Le Grand and Tahlin, 2002; Blau and DeVaro, 2007; Kosteas, 2009).

Despite the growing behavioural economic literature on hyperbolic discounting, the labour economic research has paid little attention to the role of time inconsistent preferences in job search and work effort models. In addition to the study presented in the previous chapter of this dissertation, the exceptions are DellaVigna and Paserman (2005) and Paserman (2008), who examine theoretically and empirically the relation between patience and job search and provide a test of the hyperbolic discounting model. However, both studies focus on search behaviour of unemployed individuals. Furthermore, Drago (2006) incorporates a hyperbolic discount function in a theoretical model of work effort and on-the-job search and tests the hypotheses using data on job duration and absenteeism. However, the theoretical model assumes that the total effort level is exogenous and (implicitly) that on-the-job search is a leisure activity. The model may therefore overlook some central dimensions of the job search process. Moreover, the empirical analysis focuses on mobility – the potential outcome of the search process – rather than search activity.

The contribution of this study is threefold. First, we develop an alternative model of on-the-job search and work effort with endogenous career investments. To test whether workers are exponential or hyperbolic discounters, we exploit the theoretical finding that the expected relation between patience and the intensity of on-the-job search depends on the type of discounting. Second, this study is, to our knowledge, the first to analyse empirically the effect of time preferences on the intensity of on-the-job search. In general, studies on on-the-job search examine job-job transitions and ignore the search process (this may be due to a lack of data and to the fact that search is assumed to be costless in most on-the-job search models). The third contribution is methodological: whereas most studies rely on (rather noisy) behavioural proxies for time preferences (such as smoking, drinking, drug use, having a life insurance)[1], we use information about self-assessed time preferences. This study thereby contributes on the one hand to the labour economics literature on work effort, on-the-job search and careers, and on the other hand to the behavioural economics literature on hyperbolic discounting.

[1] Drago (2006: p.18) and DellaVigna and Paserman (2005: p.551) report that the behavioural proxies are noisy measures. In fact, the Cronbach reliability measures are below conventional norms in both studies. This indicates a low level of reliability and internal consistency.

This chapter is structured as follows: Section 5.2 provides a review of the the theoretical model of Drago (2006), points out several limitations of his analyses and proposes an alternative theoretical model. The next section presents the data and indicators for time preferences, work effort and search intensity. Section 5.4 discusses the empirical results. The final section concludes and discusses several policy implications.

5.2 Theoretical framework

5.2.1 Search and collaboration on-the-job

Three period model

Drago (2006) analyses the career effects of hyperbolic discounting (see Section 4.2.1 for a more general discussion on hyperbolic discounting). Drago incorporates hyperbolic discounting in a model of on-the-job behaviour, where workers can experience wage increases through promotion or by moving to another employer. Workers have to allocate time between job search and collaboration: the former positively affects the probability of receiving an outside job offer, while the latter positively affects the probability of receiving a promotion. When workers receive a promotion their wage will receive a wage gain equal to $w^p - w$, where w and w^p represent the wage obtained before and after the promotion respectively. The level of w^p is follows from the deterministic function $\Phi(w)$, where $\Phi'(w) > 0$. Furthermore, the worker moves to another employer if he receives a job offer w' (from the cumulative density function $F(w')$) that is higher than his current wage ($w' > w$). The main assumptions of the three period model are the following:

Assumption 1 *The functions* $\Phi(w)$ *and* $F(w')$ *are such that:*
$[1 - F(w)]E(w' \mid w' > w) < w^p$. *This implies that the expected rewards from a promotion are higher than the expected rewards of outside mobility.*

Assumption 2 *Workers allocate one unit of time between job search* (s) *and collaboration* ($1 - s$).

Assumption 3 *The relative cost of search* $c(s)$ *is a U-shaped convex function of the level of search intensity* s.

Assumption 4 *The rewards from search effort s_t materialize in period (t), whereas the rewards from collaboration $(1-s)$ materialize in period (t+1).*

Central in the model is that the expected size and timing of rewards of the two career paths are different (Assumption 1): "the long-run benefit from collaboration [i.e. promotion] is greater than the one from search, and benefits that result from collaboration are not as immediate as the rewards from search conditional on the arrival of a better job offer" (Drago, 2006: p.3). The paper reviews previous empirical findings that support this assumption.

Workers choose the level of search effort to maximize utility according to the following equation:

$$\begin{aligned}&\max_{s\in[0,1]} w-c(s)+\lambda s\int_{w}^{\bar{w}'}(w'-w)dF(w')\\&+\beta\delta\left\{\lambda s\int_{w}^{\bar{w}'}[V_0(w')]dF(w')+\lambda(1-s)V_0(w^p)+[1-\lambda(1-sF(w))]V_0(w)\right\}\end{aligned} \tag{5.1}$$

where $V_0(w)$, $V_0(w')$ and $V_0(w^p)$ represent the 'lifetime utility' (or the two future periods) when the worker respectively keeps the same job, accepts an external job offer or gets promoted:

$$\begin{aligned}V_0(w)=w-c(s)+\lambda s\int_{w}^{\bar{w}'}\left(w'-w\right)dF(w')\\+\delta\left(\lambda s\int_{w}^{\bar{w}'}w'\,dF(w')+\lambda(1-s)w^p+[1-\lambda(1-sF(w))]w\right)\end{aligned} \tag{5.2}$$

$$\begin{aligned}V_0(w')=w'-c(s)+\lambda s\int_{w'}^{\bar{w}''}\left(w''-w'\right)dF(w')\\+\delta\left(\lambda s\int_{w}^{\bar{w}'}w''\,dF(w')+\lambda(1-s)w'^p+[1-\lambda(1-sF(w'))]w'\right)\end{aligned} \tag{5.3}$$

$$\begin{aligned}V_0(w^p)=w^p-c(s)+\lambda s\int_{w^p}^{\bar{w}'}\left(w'-w^p\right)dF(w')\\+\delta\left(\lambda s\int_{w^p}^{\bar{w}'}w'\,dF(w')+\lambda(1-s)w^{pp}+[1-\lambda(1-sF(w'))]w^p\right)\end{aligned} \tag{5.4}$$

The first line of equation (5.1) represents the (immediate) payoffs in the current period, consisting of the wage (w) minus the costs ($c(s)$) and plus the potential gains of search ($\lambda s\int_{w}^{\bar{w}'}(w'-w)dF(w')$), where λ is a parameter representing the probability to receive an outside (and inside) job offer, w' is the new wage offer and $dF(w')$ the cumulative wage distribution of outside wage offers. The second line denotes future payoffs, which are

discounted according to the quasi-hyperbolic discount function: β is the short-term discount rate and δ represents the long-term discount rate. In the future, workers either move to another employer ($\lambda s\int_{w}^{\bar{w}'}[V_0(w')]dF(w')$), receive a promotion ($\lambda(1-s)V_0(w^p)$) or remain in the same position ($[1-\lambda(1-sF(w))]V_0(w)$). Drago derives the first order condition of equation (5.1):

$$c'(s)=\lambda\int_{w}^{\bar{w}'}(w'-w)dF(w')+\beta\delta\lambda\left(\int_{w}^{\bar{w}'}\left(V_0(w')-V_0(w)\right)dF(w')+\left(V_0(w)-V_0(w^p)\right)\right) \quad (5.5)$$

Note that the part multiplied by $\beta\delta$ is negative. Applying comparative statics, Drago shows that more impatient workers exert less work effort (exhibit less collaborative behaviour), but search more on-the-job and are therefore more likely to move to another job. Moreover, a hyperbolic worker searches more – and thereby exerts less work effort – than an exponential worker with identical δ. This prediction contrasts with DV&P's predictions and findings on search effort of the unemployed, which is negatively related to impatience.

Because the direction of the effect of δ on search and work effort is the same as the direction of the effect of β, these predictions cannot be used to test the exponential model against the hyperbolic model.[2] However, Drago demonstrates that on-the-job search effort and therefore the job arrival rate increases with sophistication[3]: by testing this hypothesis, Drago aims to distinguish exponential from hyperbolic discounting.

Empirical strategy and results

Like DV&P, Drago (2006) makes use of the NLSY for the empirical analysis and applies similar behavioural proxies for time preferences.[4] The study examines the effect of impatience on the hazard rate of voluntary job-job transitions – which are associated with wage increases and are not the result of external reasons (such as firing and plant closing) – by estimating a Cox proportional hazard model. The results indicate that impatient workers are more likely to make voluntary transitions and thus search more intensively. Moreover, the findings show that sophistication has a positive and in most specifications a significant

[2] Drago in fact argues that the predictions can be used to test the models, as most estimates of δ lie in a more narrow range than the estimates of β, so the variation in mobility rates should be the result of variation in β. The validity of this argument is questionable because the estimates of the time preference parameters are averages – providing little information about the heterogeneity of the parameters – and the variation in mobility may be due to other factors (e.g. risk preferences).

[3] Sophistication refers to the individual's belief about β, see Section 4.2.1.

[4] Drago however replaces 'contraceptive use' by cocaine use.

effect on the hazard rate.[5] Next, the study assesses the effect of impatience on collaboration or work effort, using the absence rate as an indicator for effort, and finds that more impatient workers have higher absence rates. Drago therefore concludes that, in line with the predictions of the theoretical model, impatience is positively related with voluntary job-job transitions (and thus with on-the-job search intensity) and negatively related with work effort. Moreover, the results concerning the positive impact of sophistication on the hazard rate provide support for the hyperbolic discounting model.

Shortcomings

There are several theoretical and methodological problems associated with the study of Drago. The first theoretical issue concerns the assumption that total career effort is exogenous and, consequently, that there exists a perfect negative collinear relationship between on-the-job search on the one hand and work effort on the other hand. It can be argued that more impatient workers invest less in their career and that the entire career investments made by hyperbolic workers are smaller than that made by exponential workers. So, the level of total investments is likely to be endogenous and highly dependent on time preferences. The critical assumption of exogenous career effort may thus be invalid.

Second, the model assumes that job search involves immediate net benefits (the immediate wage increase minus search costs) and delayed costs (in terms of foregone promotions). As a result, in Drago's model job search can be characterised as a leisure activity. So, in the theoretical model workers allocate time/energy between a leisure activity (search) and an investment activity (collaboration). Of course, more patient worker will allocate more effort to the investment activity. However, it would be more realistic if the benefits of job search in terms of better job opportunities are delayed too. In that case, on-the-job search can also be defined as an investment activity. One of the general predictions of hyperbolic discounting models is that individuals have a tendency to do soon leisure activities, while they are inclined to procrastinate investment activities. Because the theoretical predictions on the relation between time preferences and search intensity are highly dependent on the timing of costs and benefits of this activity, it is crucial to model this feature of job search accurately.

[5] Sophistication is measured by a dummy indicating whether the worker has accumulated savings in an Individual Retirement Account or a Keogh account. The argument is that only sophisticated individuals will recognize and demand these retirement accounts as commitment mechanism.

Furthermore, there are two methodological problems. First of all, the study examines the effect of impatience on job mobility but does not analyse the impact on search behaviour (the NLSY data actually does not provide information about on-the-job search behaviour). Though job mobility is generally the outcome of the search process, it is not clear whether impatience affects mobility through other factors: for instance, impatient workers (like unemployed job seekers) may be more likely to accept another job offer. A second methodological problem involves the behavioural proxies that are used in the study of Drago (and by DV&P). First, the constructed aggregate patience measure is rather noisy (see 4.2.2: p.70). Moreover, these proxies may reflect other individual traits, such as risk aversion. As most of these proxies are clearly health related (and drug use and smoking have the highest factor loadings), it is rather dubious to use an indicator constructed from these proxies to examine the effect of impatience on absenteeism. A significant positive relation between absenteeism and, for instance, the number of hangovers in the last month or cocaine use, may provide little evidence for the effect of time preferences on work effort. Furthermore, the proxy for sophistication may also measure patience (δ and/or β).

5.2.2 The four period model

In order to accommodate the aforementioned problems of the theoretical model of Drago, an alternative model of job search and work effort will be proposed. To allow the rewards of job mobility to materialize in the future, an additional period ('near future') is added to the model in which workers are able to move to another job, but are not be able to climb the hierarchy within the same organisation. In this four period model, workers (employed at wage w) can increase their wage by investing in respectively work and search effort.

Allocating more time and energy to work effort increases the probability of receiving a promotion or an 'inside' job offer w^p, resulting in a wage increase of $w^p - w$, according to the deterministic function $\Phi(w) = w^p$ ($\Phi'(w) > 0$). This function is assumed to be the same for all jobs. $\Phi(w)$ expresses the wage continuously in $[w, \overline{w}]$ and is restricted by assumption 3 (see below). Work effort (e) may be interpreted as the amount of effort which is in addition to the minimal acceptable work effort: it represents 'extra-role behaviour' (e.g. working overtime hours, accepting temporary impositions without protest, assisting co-workers, building good relationships with supervisors).

On the other hand, increasing the level of on-the-job search intensity (s) positively affects the probability of receiving an 'outside' job offer. Search effort consists of all kinds

of 'screening' (e.g. searching for vacancies in newspapers and on the internet) and application activities (writing applications letters, preparing for and attending job interviews). The worker enters the second upwards mobility route – external job mobility – if he receives a job offer from the cumulative density function $F(w')$ which is higher than his current wage *w*. So, conditional on receiving a wage offer which is higher than the current wage, the expected wage in the new job equals $E(w' \mid w' > w)$.

These are the central assumptions of the theoretical model:

Assumption 1 *A worker allocates total career effort between search (s) and effort on-the-job (e), given the effort constraint* $e + s \leq 1$ *(hereafter, we will refer to the sum of e and s as total career effort or investment).*

Assumption 2 *The costs of search and effort are given by* $c(s,e) = \varphi_1(s) + \varphi_2(e)$*, where* $\varphi_1(s)$ *and* $\varphi_2(e)$ *have the same functional form and are increasing (twice differentiable) convex functions.*

Assumption 3 *The functions* $F(w')$ *and* $\Phi(w)$ *are such that:* $[1 - F(w)]E(w' \mid w' > w) < w^p$*. This implies that the expected rewards from promotion (*w^p*) are higher than the rewards from external mobility (*w'*).*

Assumption 4 *The rewards from a promotion are not as immediate as the rewards of moving to a new job: the rewards from on-the-job search* s_t *materialize in the near future (t+1), whereas the rewards from promotion* e_t *emerge during the period thereafter (t+2).*

Assumption 1 implies that there is a trade-off between work effort and search intensity: there may be time restrictions (e.g. working overtime reduces the amount of time to spent on job search activities) and in some cases searching for a job is simply incompatible with exerting high effort (e.g. attending a job interview during working hours implies absence from work). However, there exists no perfect linear relation between search and effort on-the-job. The residual $(1 - e - s)$ could be interpreted as leisure on-the-job: not all workers make the same level of career investments.

As in the model of Drago, the Assumptions 3 and 4 are crucial in the theoretical model. The long-term rewards from promotion are higher, but more postponed than the rewards from mobility: while the rewards from a promotion will emerge in the distant future, the gains from a new job will already materialize in the near future. So, workers can pursue smaller more immediate rewards, or larger more delayed rewards. This idea is consistent with theoretical models in which a promoted worker enters a steeper income growth path within the organisation (e.g. Gibbons and Waldman, 1999). Workers compete with each other within internal labour markets and the winner of such a tournament receives a promotion (Rosen, 1986). Promoted workers not only receive an immediate wage gain, but also have the option to enter the next stage of the tournament. The tournament model is consistent with the finding that hiring of outside workers is more common for jobs at lower hierarchical levels, whereas higher ranked positions are mainly filled by internal promotions (e.g. Bognanno, 2001). Furthermore, from a human capital perspective, an important channel for wage growth within the firm is firm-specific human capital. This type of skills and knowledge is lost after a move to another employer. Borjas (1981) therefore argues that job mobility has two effects on the earnings profile: first, mobility is likely to lead to an increase in the level of the earnings profile. Second, mobility decreases the slope of the earnings profile. Mobile workers may therefore obtain short-run wage gains, whereas non-mobile workers receive higher wages over the long-run. Empirical findings on promotions and external mobility generally provide support for this prediction (Borjas, 1981; Light and McGarry, 1998; Topel and Ward, 1992; McCue, 1996; Le Grand and Tahlin, 2002; Frederiksen et al., 2010).

A worker with wage w will therefore choose search (s) and effort on-the-job (e) to maximize life-time utility:

$$\begin{aligned}&\overbrace{w-c_0(e_0,s_0)}^{\text{t=0, present}}+\overbrace{\beta\delta\left(w-c_1(e_1,s_1)+\lambda s_0\int_w^{\bar{w}'}(w'-w)dF(w')\right)}^{\text{t=1, near future}}\\&+\underbrace{\beta\delta^2\left(\lambda s_0\int_w^{\bar{w}'}[V_0(w')]dF(w')+\lambda\, e_0V_0(w^p)+\left(1-\lambda s_0[1-F(w)]-\lambda\, e_0\right)V_0(w)\right)}_{\text{t}\geq 2\text{, distant future}}\end{aligned} \tag{5.6}$$

where w denotes the current wage, w^p the wage after promotion, w' the wage of the new job, $c_t(e_t,s_t)$ the cost function of effort and search at time t and the parameter λ, a constant varying between 0 and 1 ($0<\lambda<1$), which represents the probability to receive a job

offer.[6] $F(w')$ represents the cumulative distribution function from which the outside wage offer is drawn. The parameters β and δ are the hyperbolic (short-run) and the exponential (long-run) discount factor respectively. Furthermore, the lifetime utility $V_0(.)$ (i.e. period 2 and 3) when the worker moves to another job at the start of period 1 (5.7), receives a promotion (5.8), or stays in the same job (5.9) are defined as follows:

$$\begin{aligned} V_0(w') = w' &+ \lambda s_1 \int_{w'}^{\bar{w}''} (w'' - w')\, dF(w'') \\ &+ \delta \left(\lambda s_1 \int_{w'}^{\bar{w}''} w''\, dF(w'') + \lambda e_1 w'^{p} + \left(1 - \lambda s_1 [1 - F(w'')] - \lambda e_1\right) w' \right) \end{aligned} \tag{5.7}$$

$$\begin{aligned} V_0(w^p) = w^p &+ \lambda s_1 \int_{w^p}^{\bar{w}'} (w' - w^p)\, dF(w') \\ &+ \delta \left(\lambda s_1 \int_{w^p}^{\bar{w}'} w'\, dF(w') + \lambda e_1 w^{pp} + \left(1 - \lambda s_1 [1 - F(w)] - \lambda e_1\right) w^p \right) \end{aligned} \tag{5.8}$$

$$\begin{aligned} V_0(w) = w &+ \lambda s_1 \int_{w}^{\bar{w}'} (w' - w)\, dF(w') \\ &+ \delta \left(\lambda s_1 \int_{w}^{\bar{w}'} w'\, dF(w') + \lambda e_1 w^p + \left(1 - \lambda s_1 [1 - F(w)] - \lambda e_1\right) w \right) \end{aligned} \tag{5.9}$$

Equation (5.6) consists of three parts: payoffs in the present, the near future and the distant future. The present period can be interpreted as the period from now until the term of notice: a worker is not able to change to another job within this period and therefore receives the wage *w* and makes costs $c_0(e_0, s_0)$. The second period, the near future (the part multiplied by $\beta\delta$), represents a period after the term of notice, during which a worker can move to another job but cannot experience a promotion. The payoffs during this period consist of the wage w, costs $c_1(e_1, s_1)$ and $\lambda s_0 \int_w^{\bar{w}'} (w' - w) dF(w')$, which denoted the gains of mobility multiplied by the probability of receiving a better job offer.

In the distant future (the part multiplied by $\beta\delta^2$ in (5.6); see also equations (5.7)-(5.9)), there are several potential outcomes. With probability ($\lambda s_0 [1 - F(w)]$), the worker moves to another job in period 1 and from period 2 onwards the worker receives $V_0(w')$. From (5.7) it is clear that in that case the worker may receive additional gains by moving to

[6] The same parameter λ is used in both the job offer and the promotion equation: this is of course a simplifying assumption (which is also made in the model of Drago (2006)). Instead, if we assume that workers accept an outside job offer outside job with probability $[1 - F(w)]\lambda s$ and receive a promotion with probability $\mu\lambda e$, the model leads to the same predictions when assumption 3 is replaced by $[1 - F(w)]E(w' \mid w' > w) < \mu w^p$.

another job again ($\lambda s_1 \int_{w'}^{\bar{w}''} (w''-w')\,dF(w'')$). Second, if the worker received a promotion offer (with probability λe_0), the worker receives utility $V_0(w^p)$. Equation (5.8) shows that, even if a promotion offer is received, the worker may move to another employer in period 2 if he finds an offer which is better than the promotion offer. Third, when the worker does neither move to another employer in period 1 nor receives a promotion offer (the part multiplied by probability $(1-\lambda s_0[1-F(w)]-\lambda e_0)$ in (5.6)), the worker may stay in the current job or move to another job in period 2 (5.9). Note that by moving to another employer, the worker forgoes to climb the wage ladder within the current organisation. Assumption 3 implies that the distant future gains of a promotion $(V_0(w^p)-V_0(w))$ are higher than the future gains of external mobility $(V_0(w')-V_0(w))$. So, since $V_0(w^p) > V_0(w')$ moving to another job involves opportunity costs in the distant future.

The fundamental differences between this model and Drago's model are the result of two assumptions: Assumption 1, which does not imply a linear trade-off between search and work effort (i.e. $e+s \leq 1$ rather than $e+s=1$) and Assumption 4, stating that the gains from mobility will materialize in the near future instead of in the present. While the first entails a change in the structure of the model, the latter effectively extends the model of Drago with an additional period. By adapting the framework in this way, the model overcomes the theoretical problems discussed above.

5.2.3 Propositions

Because job search and work effort have different payoff structures, time preferences can be expected to affect both the size and the allocation of the career investment portfolio. So how will time preferences be related to search and work effort under the assumption of hyperbolic or exponential discounting?[7] We will discuss two cases: when the effort constraint is not binding and when the constraint is binding.

[7] Note that the exponential discounting model is nested in the hyperbolic discounting model, that is when $\beta = 1$.

Effort constraint not binding

First, we consider the case where the effort constraint is not binding ($e_0 + s_0 < 1$). Setting the partial derivatives of expression (5.6) with respect to e_0 equal to zero and assuming exponential discounting, leads to the following first order condition:

$$\frac{\partial c_0(e_0, s_0)}{\partial e_0} = \frac{\partial \varphi_2(e_0)}{\partial e_0} = \delta^2 \lambda \left(V_0(w^p) - V_0(w) \right) \tag{5.10}$$

Under hyperbolic discounting, equation (5.10) can be written as:

$$\frac{\partial c_0(e_0, s_0)}{\partial e_0} = \frac{\partial \varphi_2(e_0)}{\partial e_0} = \beta\delta^2 \lambda \left(V_0(w^p) - V_0(w) \right) \tag{5.11}$$

Expression (5.10) and (5.11) show that, in order to maximize lifetime utility, the marginal costs of work effort should be equal to the marginal benefits of work effort. As a result of the convexity of the cost function, e_0 increases with $\frac{\partial \varphi_2(e_0)}{\partial e_0}$. First, as $\lambda \left(V_0(w^p) - V_0(w) \right)$ is positive and $\left(V_0(w^p) - V_0(w) \right)$ increases with δ, work effort e_0 is positively related with δ (equation (5.10)). Second, since $\delta^2 \lambda \left(V_0(w^p) - V_0(w) \right)$ is positive, work effort e_0 is positively related with β. Moreover, hyperbolic agents exert a lower level of work effort than exponential agents with the same δ. This leads to the following propositions:

Proposition 1 *When the effort constraint is not binding, the time preference parameters* δ and β *are positively related to work effort.*

Proposition 2 *The optimal level of work effort* e_0 *is lower for hyperbolic than for exponential workers with the same* δ.

Next, under exponential discounting the first order condition with respect to search intensity s is:

$$\frac{\partial c_0(e_0, s_0)}{\partial s_0} = \delta\lambda \int_w^{\bar{w}'} (w' - w) dF(w') + \delta^2 \lambda \int_w^{\bar{w}'} [V_0(w') - V_0(w)] dF(w') \tag{5.12}$$

Or under hyperbolic discounting:

$$\frac{\partial c_0(e_0, s_0)}{\partial s_0} = \beta\delta\lambda \int_w^{\bar{w}'} (w' - w) dF(w') + \beta\delta^2 \lambda \int_w^{\bar{w}'} [V_0(w') - V_0(w)] dF(w') \tag{5.13}$$

Again, under utility maximization the marginal costs of search effort are equal to the marginal benefits of search effort. Due to the convexity of the cost function, $\frac{\partial c_0(e_0, s_0)}{\partial s_0}$ increases with s_0. First, consider the case of exponential discounting (5.12): $\lambda\int_w^{\bar{w}'}(w'-w)dF(w')$ and $\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w')$ are both positive and $[V_0(w')-V_0(w)]$ raises with the level of δ.[8] Hence, s_0 is positively related to δ. Second, under hyperbolic discounting (5.13), s_0 is positively related to β as $\delta\lambda\int_w^{\bar{w}'}(w'-w)dF(w')$ and $\delta^2\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w')$ are positive. Furthermore, expression (5.12) and (5.13) also show that hyperbolic agents search less intensively than exponential agents with the same δ. This leads to the following propositions:

Proposition 3 *When the effort constraint is not binding, the time preference parameters* δ and β *are positively related to on-the-job search intensity* s_0.

Proposition 4 *The optimal level of on-the-job search intensity* s_0 *is lower for hyperbolic than for exponential workers with the same* δ.

So, search and work effort increase with both β and δ. How do the time preference parameters affect the optimal allocation between these two investment activities? Dividing expression (5.13) by expression (5.11) leads to:

$$\frac{\frac{\partial\varphi_1(s_0)}{\partial s_0}}{\frac{\partial\varphi_2(e_0)}{\partial e_0}} = \frac{\lambda\int_w^{\bar{w}'}(w'-w)dF(w')}{\delta\lambda\left(V_0(w^p)-V_0(w)\right)} + \frac{\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w')}{\lambda\left(V_0(w^p)-V_0(w)\right)} \tag{5.14}$$

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[8] $V_0(w')-V_0(w) = w'-w+\lambda s_1\int_{w'}^{\bar{w}''}(w''-w')dF(w'')-\lambda s_1\int_w^{\bar{w}'}(w'-w)dF(w')$
$+\delta\begin{pmatrix}\lambda s_1\int_{w'}^{\bar{w}''}w''dF(w'')+\lambda e_1 w'^p+\left(1-\lambda s_1[1-F(w'')]-\lambda e_1\right)w'\\ -\lambda s_1\int_w^{\bar{w}'}w'dF(w')-\lambda e_1 w^p-\left(1-\lambda s_1[1-F(w)]-\lambda e_1\right)w\end{pmatrix}$
The part multiplied by δ is positive, therefore $V_0(w')-V_0(w)$ increases with δ.

Equation (5.14) demonstrates that the optimal division between search and work effort is independent of β. An increase in δ on the other hand implies a relative increase in work effort.[9]

Proposition 5 *The optimal division between search and work effort* $\frac{s_0^*}{e_0^*}$ *is independent of* β *but decreases with* δ.

Finally, combining proposition 1 and 3 (2 and 4) leads to Corollary 1 (2):

Corollary 1 *The effort constraint* $e+s\leq 1$ *is more likely to be binding for more patient individuals (higher* β *and/or* δ*).*

Corollary 2 *The effort constraint* $e+s\leq 1$ *is more likely to be binding for exponential workers than for hyperbolic workers with the same level of* δ.

Binding effort constraint

Now consider the case when the effort constraint is binding ($e_0+s_0=1$). There is a perfect trade-off between work and search effort when workers are effort constrained. An increase in work effort implies an equal decrease in job search intensity and vice versa. We can therefore impute $e_0=1-s_0$ in equation (5.6), which leads to:

$$\begin{aligned} & w-c_0(s_0)+\beta\delta\left(w-c_1(e_1,s_1)+\lambda s_0\int_w^{\bar{w}'}(w'-w)dF(w')\right) \\ & +\beta\delta^2\begin{pmatrix}\lambda s_0\int_w^{\bar{w}'}[V_0(w')]dF(w')+\lambda\left(1-s_0\right)V_0(w^p)\\ +\left(1-\lambda s_0[1-F(w)]-\lambda\left(1-s_0\right)\right)V_0(w)\end{pmatrix}\end{aligned} \tag{5.15}$$

Under exponential discounting (5.16) and hyperbolic discounting (5.17) respectively, the first order condition with respect to search intensity s_0 is:

[9] Both the first and second part on the right hand side of equation (5.13) decrease with δ.

$$c'_0(s_0) = \delta\lambda\int_w^{\bar{w}'}(w'-w)dF(w') + \delta^2\left(\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w') - \lambda\left(V_0(w^p)-V_0(w)\right)\right) \tag{5.16}$$

$$c'_0(s_0) = \beta\delta\lambda\int_w^{\bar{w}'}(w'-w)dF(w') + \beta\delta^2\left(\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w') - \lambda\left(V_0(w^p)-V_0(w)\right)\right) \tag{5.17}$$

$$c'_0(s_0) = \frac{\partial\varphi_1(s_0)}{\partial s_0} + \frac{\partial\varphi_2(1-s)}{\partial s_0} \tag{5.18}$$

When $e_0 + s_0 = 1$, the cost function is actually $c_0(s_0) + c_0(1-s_0)$, or $\varphi_1(s) + \varphi_2(1-s)$. As $\varphi_1(s)$ and $\varphi_2(e)$ are both increasing convex functions, the cost function $c_0(s_0) + c_0(1-s_0)$ is an U-shaped convex function of s_0.[10]

First consider the case of exponential discounting. Since $0 < \delta \leq 1$, equation (5.16) is negative for sufficiently high δ if:

$$\left(\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w') - \lambda\left(V_0(w^p)-V_0(w)\right)\right) > \lambda\int_w^{\bar{w}'}(w'-w)dF(w') \tag{5.19}$$

On the left side of this inequality are the long-run costs of job mobility (which are positive according to assumption 3), whereas the right hand side presents the short-run benefits of job mobility. So, this inequality holds when the long-run costs of search outweigh the short-term benefits of search. If the model is extended to an N-finite model and N is sufficiently large, this condition is satisfied for sufficiently high values of δ (which is likely in the constrained case).[11] Therefore:

$\frac{\partial c'_0(s_0)}{\partial\delta} < 0$; $\frac{ds_0}{d\delta} < 0$ and hence $\frac{de_0}{d\delta} > 0$

Proposition 8 *When the effort constraint is binding, the time preference parameter δ is negatively related to on-the-job search intensity s_0 and positively to work effort e_0.*

[10] This is the same functional form as in the model of Drago, where the effort constraint is by definition binding.

[11] Basically, there are net gains of job mobility in just one period, whereas there are net costs of job mobility (i.e. by forgoing promotion) in N-2 periods. So, when δ and N are sufficiently large, the discounted future costs of outside mobility outweigh the benefits.

The intuition is that for more patient workers (higher δ), the near future benefits of search are relatively less important, whereas more weight is attached to the long-run costs of mobility due to forgone promotions. Note that this proposition is consistent with proposition 5: in the unconstrained case, more patient workers invest *relatively* less time and energy in job search.

Next, under hyperbolic discounting, taking the derivative of (5.17) with respect to β leads to:

$$\begin{aligned}\frac{\partial c'_0(s_0)}{\partial \beta} &= \delta\lambda\int_w^{\bar{w}'}(w'-w)dF(w') \\ &+\delta^2\left(\lambda\int_w^{\bar{w}'}[V_0(w')-V_0(w)]dF(w')-\lambda\left(V_0(w^p)-V_0(w)\right)\right)\end{aligned} \tag{5.20}$$

Thus, whether $\frac{\partial c'_0(s_0)}{\partial \beta}$ is positive or negative is independent of β but depends on δ. For sufficiently low δ, $\frac{\partial c'_0(s_0)}{\partial \beta} > 0$; for sufficiently high δ, $\frac{\partial c'_0(s_0)}{\partial \beta} < 0$. The impact of β on work and search effort is thus ambiguous.

Proposition 9 *When the effort constraint is binding, the relation between time preference parameter β and on-the-job search intensity s_0 and to work effort e_0 is ambiguous.*

5.2.3 Hypotheses

We have demonstrated that the impact of patience on the level and allocation of career investments is dependent on whether exponential or hyperbolic discounting is assumed and whether the effort constraint is binding. In both the constrained and unconstrained case work effort increases with δ (proposition 1 and 8).

Hypothesis EXPO1 *Patience (δ) is positively related to work effort.*

However, search effort increases with δ in the unconstrained case but decrease with δ when the effort constraint is binding (proposition 3 and 8). Moreover, when δ is higher, the worker invests relatively less in search activities (proposition 5) and the effort constraint is more likely to be binding (proposition 6). Therefore, the following hypothesis can be formulated:

Hypothesis EXPO2 *There is an inverse U-shaped relation between patience (δ) and on-the-job search intensity.*

Next, what is the expected relation between work effort and on-the-job search and hyperbolic time preferences? Work effort and search intensity are positively related to β when the constraint is not binding (proposition 1). When the constraint is binding, however, the relation between β and the two types of career investments is ambiguous (proposition 9). Comparing exponential and hyperbolic discounters, it is important to stress that hyperbolic discounters ($\beta < 1$) exert less total effort than exponential discounters (given the same δ) and therefore are less likely to face a binding effort constraint (proposition 7). This is consistent with the general literature on hyperbolic discounting: individuals procrastinate investment activities such as searching for a job or exerting high effort on-the-job, since they are present-biased and particularly sensitive to the immediate costs associated with these activities. The higher the degree of present-biasedness (the lower β), the lower is the value attached to the future gains of search and work effort and the higher the tendency to avoid the immediate investment costs.

However, in case of a binding effort constraint, there exists no clear relation between β and the specific allocation between work and search effort. The rationale is that β determines the degree of procrastination of career investments. Of course, this procrastination problem is absent when the worker exerts the maximum amount of effort. For that reason, it can be argued that for hyperbolic discounters the unconstrained case is relevant. This leads to the following hypotheses:

Hypothesis HYPO1 *Patience (β) is positively related to work effort.*
Hypothesis HYPO2 *Patience (β) is positively related to on-the-job search intensity.*

Comparing EXPO1-2 with HYPO1-2, the expected relation between work effort and time preferences is positive both under exponential and under hyperbolic discounting. However, an inverse U-shaped relation between exponential time preferences and on-the-job search intensity is expected, whereas the model predicts a positive relation between hyperbolic time preferences and on-the-job search intensity.

Finally, consider the relation between time preferences and job-job transitions. The probability that you move to another job equals $\lambda s_0[1-F(w)]$: basically, it is the

probability that you find another job times the probability that the job offer is better than your current job. For exponential discounters, work effort and hence promotion opportunities increase with patience δ (EXPO1). Given the nature of the wage distribution, the probability of receiving an acceptable outside option thereby diminishes: patience has a negative job acceptance effect which decreases the probability of job mobility. Furthermore, for low levels of patience, job search intensity increases with δ (EXPO2), thereby having a positive effect on the job arrival rate. The latter implies a rise of the chance of moving to another employer. Consequently, the overall effect is ambiguous (positive or negative) for low δ. However, for high δ there is not only a negative job acceptance effect but also a negative job arrival effect (EXPO2), implying a positive relation between δ and the probability of job mobility.

Hypothesis EXPO3 *There is a negative or inverse U-shaped relation between patience (δ) and the probability of job mobility.*

Under hyperbolic discounting, promotion opportunities also increase with patience β (HYPO1), resulting in a negative job acceptance effect. On the other hand, hyperbolic time preferences are positively related with on-the-job search intensity (HYPO2), which implies a positive job arrival effect. Hence, the overall impact of β on the probability of job mobility is ambiguous.

A comparison with Drago

The model described above leads to different predictions than the model of Drago (2006) for two reasons. First, we have introduced the case in which the effort constraint is nonbinding. Especially under hyperbolic discounting, this is a vital contribution. Second, the hypotheses under the constrained case are also different than those derived by Drago, since in his model there are immediate gains and future costs related to job search effort, while there are immediate costs and future benefits associated with work effort. This is fundamentally different from our model, where both types of activities involve immediate costs and future benefits. Moreover, when the effort constraint is binding both activities entail future costs as well. The timing and the size of these future costs and benefits, however, differs between the two type of investment activities: job search leads to (small) near future gains and (large) distant future losses (due to forgone promotion opportunities),

whereas work effort involves (small) near future costs (due to forgone mobility opportunities) and (large) distant future gains.

5.2.4 Potential extensions

Unemployment

The model assumes that staying in the same job is the outcome that results in the lowest potential payoffs. Of course, one can argue that workers may lose their job and become unemployed. Incorporating unemployment in the theoretical model is especially relevant from a policy perspective, because such a model may clarify the relation between patience and activities that decrease the probability to become unemployment (i.e. search and work effort). When the state of unemployment is introduced, the utility function (5.6) changes to:[12]

$$\begin{aligned} & w - c_0(e_0, s_0) + \beta\delta\left(w - c_1(e_1, s_1) + \lambda s_0 \int_w^{\bar{w}'} (w' - w) dF(w')\right) \\ & + \beta\delta^2 \begin{pmatrix} \lambda s_0 \int_w^{\bar{w}'} [V_0(w')] dF(w') + \lambda e_0 V_0(w^p) + a(1-e_0) V_0(u) \\ + \left(1 - \lambda s_0 [1 - F(w)] - \lambda e_0 - a(1-e_0)\right) V_0(w) \end{pmatrix} \end{aligned} \tag{5.21}$$

Where $V_0(u)$ represents the lifetime utility when the worker loses his job and $a(1-e_0)$ denotes the probability that the worker is dismissed (assume that $V_0(w) > V_0(u)$). By increasing the chance of moving to another employer or obtaining a promotion, the level of both on-the-job search and work effort affect the probability to enter unemployment indirectly. However, one can argue that the layoff probability is dependent on the level of work effort and thereby work effort decreases the chance to become unemployed directly. Therefore, introducing the state of unemployment in the model amplifies the existing difference between the distant future gains of work effort and the distant future gains of search effort. Consequently, the model leads to the same theoretical predictions on the relation between patience and work and search effort.

Sophistication

As discussed in section 4.2.1 (pp.64-66), sophistication refers to the individuals beliefs about β. In the context of career investments, a sophisticated worker believes that his 'future selves' will exert too little work and search effort. For that reason, this worker is

[12] We assume here that workers cannot lose their jobs in the near future. A rationale for this could be the existence of a term of notice.

willing to commit his future selves to the behaviour that is optimal from the present self perspective. Other studies (O'Donoghue and Rabin, 1999; 2001) have shown that sophistication may mitigate the problems of procrastination of investment activities. So, theoretically both sophistication and hyperbolic patience have a positive effect on the level of work and on-the-job search effort.[13] However, the degree of sophistication has no effect on the relation between δ or β on the one hand, and work effort and job search on the other hand. Moreover, it is difficult to distinguish empirically between β and sophistication. This chapter therefore does not examine sophistication effects.

5.3 Data

5.3.1 The sample

To examine the relations between patience, career investments and mobility, we make use of the DHS data, a Dutch longitudinal survey which has been collected by since 1993 (see Section 4.3.1 for a more detailed description of the DHS data). As the questions about time preferences (see next subsection) are asked in the years 1996-2007, the sample is restricted to these years.[14] Moreover, we select male employees who have not just (re)entered the labour market by excluding workers who were non-employed in the previous year. The rationale is that workers who just (re)entered the labour market may have rather distinctive job search behaviour: they may for instance accept a job which they regard as transitory/temporary. Moreover, many questions refer to the period two months prior to the interview (e.g. how many job applications in the past two months). In this period the entrants could be unemployed and thereby indicating search effort while they were unemployed. Due to panel attrition and refreshment, we make use of an unbalanced panel, consisting of around 5000 observations and over 1900 individuals.

5.3.2 Time preferences

As in Chapter 4, time preferences are captured using general statements about time preferences and orientation towards the future (see Table 5-1 for details). These statements represent the Consideration of Future Consequences (CFC) Scale, a psychological construct to measure how an individual weighs immediate and future outcomes of

[13] Note that sophistication has no theoretical meaning under exponential discounting.
[14] The questions on time preferences are not asked in 2008. However, we use information from this year to construct a dummy for a job-job transition between 2007 and 2008 (see section 4.4).

behaviour (Strathman et al., 1994).[15] Respondents indicate to which extent they agree with the statement using a 7-point scale (1=completely disagree; 7=completely agree). We recode the group of variables that are expected to be negatively correlated with patience (1 is recoded to 7, 2 is recoded to 6, etcetera), so all eleven FUTURE variables are expected to be positively correlated with one another.

As in Chapter 4, we examine the internal consistency of the FUTURE items. Instead of including the entire male sample (employed and non-employed) in the analyses (see Section 4.3.2), here we focus on the sample of employed men. However, the values of the measures of internal consistency and reliability are similar to those discussed in the previous chapter. Using the worker sample, the average covariance (correlation) between the items is 0.402 (0.200) and the Cronbach reliability measure of these eleven items equals 0.746.[16] Correlations between these items, KMO measures and results from factor analysis are presented in Appendix 5A. The KMO measures vary between 0.71 and 0.82 (overall KMO of 0.77) and overall the correlations between the variables are positive and highly significant: the exceptions seem to be FUTURE04 and FUTURE05. This is consistent with the results from the factor analysis: all loadings are positive, but the 04-05 items have the lowest loading. Given these findings, we conclude that the FUTURE items are internally consistent and capture the same underlying individual trait.

Table 5-1 Time preferences: descriptive statistics

Name	Mean	St. Dev.	Patience
FUTURE01	4.10	1.49	+
FUTURE02	3.64	1.55	+
FUTURE03	3.62	1.51	-
FUTURE04	3.56	1.53	-
FUTURE05	4.40	1.34	-
FUTURE06	3.69	1.41	+
FUTURE07	4.97	1.26	+
FUTURE08	4.29	1.28	+
FUTURE09	3.32	1.33	-
FUTURE10	3.75	1.37	-
FUTURE11	3.66	1.41	-

Note: For the description of the FUTURE items and a comparison with the entire male sample, see Table 4-1 (p.72). The means and standard deviations of the non-rescaled items are presented for the group of workers used in the job search analyses (N=4965; see section 5.4.2)

[15] See also Section 4.3.2 (p.71).

[16] The Cronbach reliability measure and the average interitem correlation are considerably larger than the ones obtained in the study of Drago (0.269 and 0.052 respectively) and DV&P (0.278 and 0.059 respectively).

An aggregate measure of patience was created by summing the answers to these eleven questions and dividing this sum by eleven.[17] Table 5-2 shows some descriptives of this measure. The average (median) patience level is 4.22 (4.18). Over 80 percent of the individuals are within a one unit range of the average and median.

Table 5-2 Patience measure: summary statistics

	Mean	Std. Dev.	Percentiles				
			10	25	50	75	90
Patience [N=4965]	4.22	0.74	3.27	3.73	4.18	4.64	5.18

Table 5-3 illustrates to what extent this measure of patience is correlated with behavioural outcomes (such as smoking), statements about spending behaviour and statements about the financial position. All correlations between the patience variable and the behavioural proxies are significant and have the expected sign, suggesting that that the measure is a reliable indicator for the individual's time preference.

Table 5-3 Correlation between patience, behavioural proxies and statements

	Coefficient
Behavioural outcomes	
Life insurance	0.0619**
Savings account	0.0251*
Smoker	-0.0610**
Drinker	-0.0275*
Credit card debt	-0.0553**
Statements about spending behaviour and financial situation	
Spend (1-7)	0.2419**
Planning (1-7)	-0.0956**
Period (1-5)	0.3136**
Financial situation (1-5)	0.1369**
Manage on income (1-5)	0.1229**

Note: See Appendix 4B (p.89) for details on the items. The entries presented here are for the group of workers used in the job search analyses (N=4965; see section 5.4.2). For a comparison with the entire male sample, see Table 4-3 (p.75). ** $p<0.001$, * $p<0.1$

[17] This measure differs from the central patience measure used in Chapter 4. As a robustness check, several alternative measures – including the ones used in Chapter 4 – have been used in the empirical analyses (see Section 5.4.4).

The patience measure used here is fundamentally different from those used by many other studies as it is based on self-assessed statements. In order to facilitate the comparison between our results and the results of Drago, a patience measure is created using similar methods and comparable (though a smaller number of) behavioural proxies: dummies indicating whether the individual has a life insurance, holds a savings account, smokes cigarettes, and frequently consumes alcoholic beverages (see Appendix 5B). The smoking and drinking dummies are recoded so that a higher number indicates a higher level of patience (i.e. the dummy is one if the individual does not smoke). Furthermore, the proxies are standardized to have a mean of zero and a standard deviation of one for the entire male population.[18] As an aggregate patience proxy measure, we retain the first factor scores of a factor analysis, estimated through maximum likelihood (see Appendix 5B). The proxy that receives the most weight is smoking. The correlation between the patience measure based on the FUTURE items and the patience proxy measure is positive (0.065) and highly significant ($p<0.0001$).

5.3.3 Work effort

The effort exerted by workers can be measured in several ways. As work effort is an input factor, we should consider indicators that measure individual input rather than individual performance measures (output). Drago (2006) for instance uses information on employee absenteeism and reviews several studies pointing out that absenteeism is negatively related to promotion opportunities. We rely on two different indicators for work effort: statement about individual shirking behaviour and overtime.

In the years 2004-2008 workers are asked to what extent they agree (on a 5-point scale) with the following statement: 'I shirk my duties'. Although this question refers to the individual's behaviour in general and not specifically in the work environment, it can be argued that individuals who agree with this statement have a tendency to shirk at work. Table 5-4 shows that almost three quarters of the workers disagree with this statement: about 12 per cent however state that they are 'shirkers'.

Next to the shirking measure, we make use of average overtime work as an indicator for work effort. Landers et al. (1996) demonstrated that long working hours may be used as indicators of work effort in promotion decisions, leading to a 'rat-race'.

[18] The Cronbach alpha is 0.225, reflecting an interitem correlation of 0.068. These numbers are low: this suggests that the measures are noisy. However, they are comparable to the ones reported by Drago and DV&P.

Numerous empirical studies examined the investment character of working hours. Francesconi (2001) and Booth et al. (2003), using UK data, find a positive relationship between overtime hours and the incidence of promotion. Several studies focused on unpaid overtime: Anger (2008) and Pannenberg (2005) used German data to examine the career effects of unpaid working hours. Whereas Anger found limited evidence for unpaid overtime as career investment in the short-term, the results of Pannenberg indicate that unpaid overtime is indeed a long-term career investment. This seems to be consistent with the theoretical model: the future gains of high work effort are in the more distant future. Moreover, it could be argued that there is a trade-off between working overtime hours and job search intensity as both require the same resources (time and effort).

Table 5-4 Work effort

	Freq.	Percent
Statement: 'I shirk my duties'		
Very Inaccurate	635	36.85
	645	37.43
	239	13.87
	154	8.94
Very Accurate	50	2.90
Total	1723	100
Overtime hours		
$Hours_{contract}>Hours_{actual}$	209	4.41
$Hours_{contract}=Hours_{actual}$	1743	36.79
$Hours_{contract}<Hours_{actual}$	2786	58.80
Total	4738	100
	Mean	Std. Dev.
Actual hours – contract hours	3.275	4.489

The overtime variable is constructed using the difference between the actual (average) weekly working hours and the contractual weekly working hours (see Table 5-4 for descriptives). The overtime variable equals 0 if the individual on average works less than the contractual hours, 1 if actual working hours are equal to the contractual hours and 2 if the worker works more than the contractual hours. The majority of the employees report that they work overtime hours: individuals work on average over three hours more than their contract specifies. Less than 5 per cent of the workers state that on average they work less than their contractual working hours. On average, individuals report to work more than 3 hours per week more than their contract specifies.

The correlation between the shirking variable and overtime hours (actual minus contractual hours) is insignificant though it has the expected sign (-0.0288). This may indicate that the two measures reflect different aspects of work effort.

5.3.4 On-the-job search intensity and transitions

A variety of indicators for job search effort has been used in previous studies (see Section 4.3.3: p.75). However, the lion's share of this literature deals with job search behaviour by the unemployed. Studies that empirically examine on-the-job search are scarce. An exception is the study of Bloemen (2005), who assesses search behaviour of both the unemployed and the employed. Bloemen makes use of the three following measures for search effort: job search attitude (seriously searching or not); 'screening' (looked for a job in the past two months); and the number of applications the job seeker made in the past two months. In the empirical analysis, the following indicators of search effort are used[19]:

- Search attitude: this variable equals 0 if the worker is not searching for a job, 1 if he is considering looking for another job and 2 if he reports to be seriously searching for another job;
- A dummy indicating whether the worker has applied for a job in the last two months;
- The number of job applications made by the worker during the last two months;
- The number of job search channels or methods used by the worker during the last two months.

Table 5-5 and Table 5-6 provide information about these search effort variables. About 18 per cent of the workers is either thinking about looking for or seriously searching for another job. Over a quarter of these 873 employed 'job searchers' report that they are seriously searching for another job. One out of 13 workers applied for a job in the last two months; over 40 per cent of the job seekers applied for a job during the previous months. About 2 per cent of the employees applied more than 2 times for a job.

[19] Respondents are asked the question: "Are you currently looking for a(nother) job?" Potential answers are: "Yes, I am seriously searching for a(nother) job"; "Yes, I am considering searching for a(nother) job"; "No, I just found another job"; "No, I am not looking". We make use of the answer to this question to construct the job search attitude variable. When the respondent answered this question positively, several additional questions will be asked. Information for the other three variables is obtained from the questions "How many times have you applied for a job during the last two months" and "How have you searched for a job during the last two months?" (up to eight different methods).

Table 5-5 Job search effort

	Frequency (N=4965)	Percentage all workers (N=4965)	Percentage job seekers (N=873)
Search attitude			
Not looking for another job	4092	82.42	-
Considering looking for another job	641	12.91	73.42
Seriously searching for another job	232	4.67	26.58
Applied for a job in the past two months			
No	4584	92.33	56.36
Yes	381	7.67	43.64
Number of applications in the past two months			
0	4584	92.33	56.36
1	198	3.99	22.68
2	86	1.73	9.85
3	30	0.60	3.44
4	28	0.56	3.21
5	12	0.24	1.37
6	7	0.14	0.80
7	1	0.02	0.11
8	5	0.10	0.57
9	1	0.02	0.11
10	6	0.12	0.69
12	2	0.04	0.23
>=13	5	0.10	0.57
Different search channels			
Answered advertisements	297	5.98	34.02
Placed advertisements	7	0.14	0.80
Asked employers	88	1.77	10.08
Asked friends/relatives	172	3.46	19.70
Through job center	34	0.68	3.89
Temporary employment agency	30	0.60	3.44
Reading advertisements	415	8.36	47.54
Other way	161	3.24	18.44
Number of search channels			
0	4254	85.68	18.56
1	389	7.83	44.56
2	198	3.99	22.68
3	89	1.79	10.19
4	25	0.50	2.86
5	8	0.16	0.92
6	2	0.04	0.23

Considering the number of different search methods, it appears that reading advertisements is the most commonly used channel – almost 50 per cent of the job searchers uses this channel. Next, answering advertisements, directly contacting employers and asking friends and relatives are also frequently used job search methods. Just a small minority of the on-the-job searchers uses more than one search channels: on average, workers use one search channel.

Table 5-6 Number of channels and applications

Variable	Obs	Mean	Std. Dev.
# channels (all workers)	4965	0.2425	0.6898
# channels (job seekers)	873	1.3791	1.0674
# applications (all workers)	4965	0.1780	0.8946
# applications (job seekers)	873	1.0126	1.9261

Table 5-7 presents the correlation coefficients between the different indicators of search intensity. If the various indicators indeed capture job search intensity, we would expect the correlations between the indicators to be positive. The table shows that all correlations are positive and highly significant. This holds not just for the entire sample, but also for the subsample of workers who report to be searching for another job. For instance, those workers who report to search seriously apply more frequently for another job and use more search channels. This indicates that the four measures represent the same underlying variable: search effort.

Table 5-7 Correlation between search effort variables

	Search attitude	Applied	# applications	# channels
Search attitude	1			
Applied	0.6863* (0.3699*)	1		
# applications	0.5288* (0.3908*)	0.6904* (0.5978*)	1	
# channels	0.7954* (0.3647*)	0.7017* (0.4472*)	0.5979* (0.4612*)	1

Note: Entries are correlation coefficients based on all workers (N=4965) (and based on job seekers (N=873) between parenthesis). * $p<0.0001$

Finally, we create a dummy indicating whether the worker has moved to another job between t and t+1. Respondents are not asked directly whether or not they moved to another job. We therefore exploit information on tenure in year t+1 (month and year they started working for their current employer). Accordingly, between the years 1996 and 2008 266 (7.2 per cent) 'movers' and 3409 (92.8 per cent) 'stayers' can be identified.

5.4 Results

5.4.1 Work effort

According to both the exponential and hyperbolic discounting model, a positive relation between patience and work effort can be expected. In order to assess this relation empirically, two equations are estimated using different dependent variables: a self-assessed measure of shirking and a variable indicating whether the employee works less, equal or more than his contractual hours ('overtime'). Both equations are estimated with an ordered probit model and include various controls: demographic variables (age, age squared, marital status, number of children, educational level), employment related factors (type of contract, civil servant dummy, tenure), the unemployment rate (province level), three regional dummies and year dummies (see Appendix 5C for descriptive statistics of the controls).

The results are shown in Table 5-8. In the model where shirking is the dependent variable (column (1)), the coefficient of patience is negative and highly significant. This result indicates that more patient workers have a lower tendency to shirk their duties. The coefficients of almost all the other coefficients are insignificant. A potential problem is that the question about shirking may reflect the personality trait 'conscientiousness', which is related to time preferences (Borghans et al., 2008). It could therefore be the case that the dependent variable and the patience measure indicate the same personality characteristic.

The estimation results where overtime categories are used as dependent variable are shown in column (2) of Table 5-8. The results are very similar. First of all, the main result is that patience is positively related with the probability of overtime work.[20] The findings provide support for both the EXPO and the HYPO hypotheses. Note that this result is in line with the theoretical predictions and empirical findings of Drago (2006). Moreover, if

[20] In addition of the overtime categories, the difference between actual and contractual hours has been used as a dependent variable. This alternative specification (estimated with OLS) leads to the same qualitative results.

Table 5-8 Effort on the job

	Shirking (Ordered probit) (1)	Overtime (Ordered probit) (2)
Patience	-0.122**	0.184***
	(0.0485)	(0.0325)
Age	0.00448	0.00278
	(0.0341)	(0.0245)
Age squared	-0.00611	-0.0112
	(0.0383)	(0.0281)
Married	-0.0668	0.109
	(0.0929)	(0.0736)
Nr of children	-0.0175	-0.0174
	(0.0350)	(0.0278)
Education†: pre-university	-0.128	0.267***
	(0.124)	(0.103)
Education: senior vocational	0.135	0.239***
	(0.0958)	(0.0741)
Education: vocational college	-0.0259	0.532***
	(0.0990)	(0.0781)
Education: university	-0.0506	0.696***
	(0.112)	(0.0980)
Unemployment rate	0.0633	0.00368
	(0.0458)	(0.0382)
Permanent contract	0.0828	0.0226
	(0.151)	(0.106)
Civil servant	-0.00459	-0.0887
	(0.0902)	(0.0646)
Tenure	-0.00338	-0.00635**
	(0.00344)	(0.00306)
Region: north	-0.251*	-0.139
	(0.133)	(0.114)
Region: east	-0.127	-0.0490
	(0.0910)	(0.0734)
Region: south	-0.164*	0.0436
	(0.0865)	(0.0723)
cut1	-0.469	-0.956
	(0.799)	(0.602)
cut2	0.533	0.606
	(0.800)	(0.597)
cut3	1.071	
	(0.801)	
cut4	1.788**	
	(0.806)	
Pseudo-R^2	0.0081	0.0480
Log pseudo-likelihood	-2270	-3689
N	731	1804
NT	1723	4738

Note: The shirking variable is available in the years 2004–2007, which implies a substantial reduction in the number of observations. The coefficients on year dummies are suppressed in the table. Robust and clustered standard errors in parentheses.

† Reference category: Pre-vocational (VMBO) or below.

*** p<0.01, ** p<0.05, * p<0.1

patience and conscientiousness are indeed related, this result is consistent with the (in the psychological literature) well documented positive relation between work effort and this psychological trait (e.g. Ilies et al., 2009).

However, when the alternative indicator of patience – the patience proxy measure – is used instead, the coefficients have the right sign but are insignificant (results are not shown in the table). This may suggest that the two alternative patience indicators do not measure the same underlying individual characteristic.

5.4.2 On-the-job search intensity

The hyperbolic discounting model predicts that, depending on the degree of present-biasedness, people have a tendency to procrastinate investment activities. Short-term patience (β) can therefore be expected to be positively related to on-the-job search intensity. Under exponential discounting, there is also a positive relation between patience (δ) and search intensity when they do not face a binding effort constraint. However, for high δ, workers are likely to be effort constrained and δ is negatively related to search intensity. To test for this nonlinearity in patience, several strategies are applied: (bivariate) nonparametric analyses and multivariate analyses including a quadratic patience term or dummies that indicate a high patience level.

First of all, for each of the four job search effort measures (search attitude; applied for a job; number of applications; number of search channels), we estimate a local polynomial Kernel regression of job search effort on patience (see Appendix 5D). In some estimations, search effort is decreasing for very low (below 2) and very high (above 6) values. However, the estimates around the endpoints are imprecise: in general Kernel regressions perform poor around the boundaries. As about 99 percent of the observations have a patience level between 2 and 6, the nonparametric analyses show that job search intensity is increasing in patience for almost all individuals and thus provide no evidence for a hump-shaped relation.

Second, regression analyses have been performed to examine the relation between time preferences and search effort. Different estimation methods have been used depending on the search effort measure. The models using search attitude and a dummy indicating whether the worker applied for another job as the dependent variable are estimated by ordered probit and binary probit respectively. The equations where the number of job applications or the number of search channels is the dependent variable are estimated by

poisson regressions.[21] The findings are presented in Table 5-9 and Appendix 5E (marginal effects). In the models that do not include a squared term of patience, the coefficients of the patience variable are positive and significant in all four specifications. Table 5E-1 (Appendix 5E) also shows that the average marginal effects of patience on the various job search indicators are positive and significant. Moreover, the marginal effects are also estimated at different patience levels: the results do not indicate a negative effect of patience when evaluated at higher levels of patience. Under hyperbolic discounting, (short-term) patience is positively related to the level of on-the-job search effort. Thus, this empirical finding supports the hypothesis derived from the hyperbolic discounting model.

Next, consider the results when patience squared is included in the analyses. The exponential discounting model predicts an inverse U-shaped relation between the worker's degree of patience and the level of on-the-job search intensity. Therefore, under exponential discounting a positive coefficient of the patience variable and a negative coefficient of patience squared can be expected. This appears to be the case in just one of the specifications (Table 5-9, column (6)): in fact, a U-shaped relation is found for the three other specifications. Moreover, in all four specifications the patience coefficients are individually insignificant (except for the positive coefficient of patience squared in the model where search attitude is the dependent variable; column (2)). However, the coefficients of the specifications indicating a U-shaped relation are jointly significant (column (2), (4) and (8); see chi-square statistics in Table 5-9). Furthermore, Table 5E-2 (Appendix 5E) shows the marginal effects of patience (including the squared term) on job search intensity: these estimation results do not indicate any significant negative effects of patience on job search intensity. Actually, the results point out positive, though not always significant, marginal effects when evaluated at higher levels of patience. There is thus no evidence for a negative or inverse U-shaped relation between patience and search effort. These findings are therefore inconsistent with the predictions derived from the exponential discounting model.

As an alternative test, instead of the level and squared patience as independent variables we used a dummy indicating a high level of patience in the model. Dummies indicating whether patience is above the 50^{th}, 75^{th}, 90^{th} or 95^{th} percentile are constructed. Separate regressions are estimated for the four different dummies and for each of the four

[21] In the latter two models count data is used and therefore these are also estimated with a negative binomial regression model. This leads to similar results.

different search effort variables (i.e. 16 different models in total). The estimation results (not shown in the table) point out that the coefficients of the dummies are positive and in some cases significant. Hence, again we have good grounds to accept hypothesis HYPO2 and reject the hypothesis EXPO2: hyperbolic instead of exponential patience can explain the empirical relation between time preferences and on-the-job search effort.

Do the results change when we use the behavioural proxies measure of patience? The results (not shown in the table) point out that the signs of the coefficient of this patience indicator are inconsistent across specifications. The coefficient is positive in the specification where search attitude or the number of channels is used as a dependent variable, but negative when the number of job applications (dummy or number) is used as a dependent variable. Furthermore, the coefficients are insignificant in all specifications.[22]

Concerning the other empirical results, the directions of the coefficients are generally consistent across the different specifications. This indicates that the different independent variables measure the same behavioural outcome (search effort). The results indicate an inverse U-shaped relation between age and search effort. The coefficients of the marital status dummy, the number of children, unemployment rate, and the civil servant dummy are negative but insignificant in most cases. As expected, tenure and having a permanent contract decreases workers' on-the-job search intensity significantly. The effect of educational level seems to be positive in some specifications, but is not clear in others. Search effort seems to be dependent on human capital, but we found no evidence of a (positive) linear relationship.

5.4.3 Job-job transitions

The final test of the hyperbolic versus the exponential model concerns the relation between patience and job mobility. The exponential model predicts an inverse U-shaped relation between patience and job mobility (EXPO3). First, the hypothesis is tested using nonparametric regressions. The results of a polynomial Kernel regression of job mobility on patience indicate a U-shaped rather than an inverse U-shaped relation between patience and mobility (see Appendix 5D).

[22] Moreover, the estimation results using the proxy measure do not indicate an inverse U-shaped relation between patience and job search intensity.

Table 5-9 On-the-job search intensity

	Search attitude (ordered probit)		Applied for job (probit)		# applications (poisson reg.)		# channels (poisson reg.)	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Patience	0.0911**	-0.371	0.0931**	-0.341	0.191*	0.244	0.137**	-0.252
	(0.0372)	(0.231)	(0.0468)	(0.326)	(0.106)	(0.728)	(0.0656)	(0.445)
Patience squared		0.0543**		0.0506		-0.00611		0.0449
		(0.0271)		(0.0378)		(0.0845)		(0.0504)
Age	0.133***	0.134***	0.143***	0.146***	0.164**	0.164**	0.224***	0.226***
	(0.0312)	(0.0313)	(0.0382)	(0.0379)	(0.0784)	(0.0781)	(0.0603)	(0.0606)
Age squared (/100)	-0.182***	-0.184***	-0.184***	-0.186***	-0.203**	-0.203**	-0.293***	-0.295***
	(0.0375)	(0.0376)	(0.0450)	(0.0447)	(0.0946)	(0.0944)	(0.0732)	(0.0734)
Married	-0.176**	-0.179**	-0.120	-0.123	-0.0671	-0.0668	-0.201	-0.203*
	(0.0724)	(0.0720)	(0.0864)	(0.0861)	(0.256)	(0.256)	(0.122)	(0.122)
Nr of children	-0.0161	-0.0148	-0.0174	-0.0166	-0.0717	-0.0717	-0.0612	-0.0613
	(0.0277)	(0.0276)	(0.0327)	(0.0326)	(0.0785)	(0.0785)	(0.0485)	(0.0485)
Education[†]: pre-university	0.196*	0.194*	0.167	0.164	0.128	0.128	0.0121	0.0119
	(0.108)	(0.107)	(0.125)	(0.125)	(0.389)	(0.388)	(0.181)	(0.181)
Education: senior vocational	0.150*	0.153*	0.215**	0.217**	0.0285	0.0280	0.178	0.182
	(0.0799)	(0.0800)	(0.0935)	(0.0937)	(0.259)	(0.260)	(0.144)	(0.144)
Education: vocational college	0.175**	0.177**	0.182*	0.182*	0.0196	0.0192	0.319**	0.323**
	(0.0809)	(0.0810)	(0.0937)	(0.0939)	(0.260)	(0.261)	(0.137)	(0.137)
Education: university	0.174*	0.169*	0.215*	0.209*	-0.206	-0.205	0.251	0.250
	(0.0974)	(0.0969)	(0.111)	(0.111)	(0.289)	(0.288)	(0.164)	(0.164)
Unemployment rate	-0.0120	-0.0142	-0.0950**	-0.0973**	-0.242**	-0.242**	-0.0581	-0.0603
	(0.0396)	(0.0396)	(0.0466)	(0.0468)	(0.106)	(0.106)	(0.0690)	(0.0691)
Permanent contract	-0.363***	-0.364***	-0.312**	-0.313**	-0.922***	-0.922***	-0.444***	-0.443***
	(0.106)	(0.106)	(0.139)	(0.140)	(0.291)	(0.291)	(0.171)	(0.171)
Civil servant	-0.0122	-0.0167	-0.00622	-0.0100	-0.322*	-0.322*	-0.0467	-0.0518
	(0.0688)	(0.0689)	(0.0772)	(0.0775)	(0.171)	(0.172)	(0.110)	(0.110)
Tenure	-0.0161***	-0.0162***	-0.0179***	-0.0181***	-0.0517***	-0.0517***	-0.0381***	-0.0381***
	(0.00377)	(0.00376)	(0.00444)	(0.00441)	(0.0134)	(0.0134)	(0.00714)	(0.00713)
Region: north	0.138	0.138	0.306**	0.307**	0.495	0.495	0.353*	0.353*
	(0.117)	(0.117)	(0.137)	(0.138)	(0.340)	(0.340)	(0.192)	(0.193)
Region: east	0.0353	0.0354	0.0751	0.0747	-0.0294	-0.0291	0.146	0.145
	(0.0762)	(0.0761)	(0.0869)	(0.0867)	(0.210)	(0.210)	(0.125)	(0.125)
Region: south	-0.00408	-0.00452	0.0568	0.0550	-0.0256	-0.0256	-0.0359	-0.0355
	(0.0703)	(0.0702)	(0.0788)	(0.0786)	(0.207)	(0.207)	(0.117)	(0.118)
Constant			-3.404***	-2.529**	-2.453	-2.562	-4.749***	-3.954**
			(0.907)	(1.142)	(1.881)	(2.368)	(1.330)	(1.541)
cut1	2.866***	1.923**						
	(0.712)	(0.830)						
cut2	3.671***	2.729***						
	(0.717)	(0.834)						
Pseudo-R^2	0.0719	0.0727	0.0718	0.0727				
Log pseudo-likelihood	-2612	-2610	-1248	-1246	-2781	-2781	-3068	-3067
Chi-square[‡]		9.93***		6.32**		3.27		5.89*
N	1896	1896	1896	1896	1896	1896	1896	1896
NT	4965	4965	4965	4965	4965	4965	4965	4965

Note: The coefficients on year dummies are suppressed in the table. Robust and clustered standard errors in parentheses.
[†] Reference category: Pre-vocational (VMBO) or below.
[‡] The Chi-square statistics reported here refer to the joint significance of the patience and patience squared variables.
*** p<0.01, ** p<0.05, * p<0.1

Table 5-10 Job-job transition

	(1)	(2)	(3)
Patience	-0.0248	-0.344	
	(0.0478)	(0.342)	
Patience squared		0.0375	
		(0.0396)	
Patience (proxies)			-0.117***
			(0.0445)
Age	-0.0756**	-0.0756**	-0.0708**
	(0.0369)	(0.0369)	(0.0358)
Age squared	0.0520	0.0519	0.0501
	(0.0442)	(0.0442)	(0.0427)
Marital status	-0.0192	-0.0232	0.0552
	(0.101)	(0.101)	(0.0984)
Nr of children	0.0718**	0.0731**	0.0546
	(0.0357)	(0.0359)	(0.0342)
Education†: pre-university	0.0539	0.0504	0.0696
	(0.131)	(0.131)	(0.130)
Education: senior vocational	0.117	0.121	0.157
	(0.110)	(0.110)	(0.108)
Education: vocational college	0.110	0.111	0.163
	(0.108)	(0.108)	(0.104)
Education: university	0.330***	0.326***	0.395***
	(0.121)	(0.121)	(0.118)
Unemployment rate	-0.00148	-0.00332	-0.0544
	(0.0525)	(0.0525)	(0.0530)
Permanent contract	-0.633***	-0.634***	-0.638***
	(0.147)	(0.148)	(0.140)
Civil servant	-0.0517	-0.0528	-0.161*
	(0.0858)	(0.0857)	(0.0873)
Region: north	-0.278*	-0.278*	-0.275*
	(0.161)	(0.162)	(0.163)
Region: east	-0.148	-0.148	-0.120
	(0.102)	(0.102)	(0.101)
Region: south	-0.141	-0.140	-0.132
	(0.0874)	(0.0875)	(0.0885)
Constant	1.553*	2.224**	1.563*
	(0.879)	(1.123)	(0.810)
Pseudo-R^2	0.0787	0.0792	0.0779
Log pseudo-likelihood	-879	-879	-898
Chi-square‡		1.15	
N	1352	1352	1454
NT	3675	3675	3860

Note: The coefficients on year dummies are suppressed in the table. Robust and clustered standard errors in parentheses.
† Reference category: Pre-vocational (VMBO) or below.
‡ The Chi-square statistics reported here refer to the joint significance of the patience and patience squared variables.
*** p<0.01, ** p<0.05, * p<0.1

Next, a probit model is estimated with a dummy as dependent variable indicating whether the worker has made a job-job transition between year t and t+1. The estimation results are presented in Table 5-10 (see Appendix 5E for marginal effects). In the

specification excluding patience squared (Table 5E-1), the coefficient and the marginal effects of the patience variable are negative and insignificant. Furthermore, the results using high patience dummies all have insignificant coefficients. The results of the estimations including patience squared (Table 5E-2) point out a negative coefficient of patience and a positive coefficient of patience squared. However, the coefficients are individually and jointly insignificant. Interestingly, although the marginal effects of patience (including patience squared) are generally insignificant, the marginal effects are negative and significant for high patience levels. Hence, there seems to be some evidence for an inverse U-shaped relation between patience and the probability of job mobility, though the evidence is rather weak.

Although this finding is consistent with EXPO3, it can also be rationalized by the hyperbolic discounting model, which leads to ambiguous predictions about the effect of patience on job mobility probability: patience has a positive job arrival effect and a negative job acceptance effect. An explanation for this negative relation between patience and job mobility may be that the job acceptance effect dominates the job arrival effect for higher patience levels. Finally, it should be stressed that there is no evidence that supports the mechanism underlying EXPO3. As discussed in the previous section, job search effort increases with patience, even at higher patience levels. A negative relation between patience and job mobility can therefore not be explained through a job search effect.

Other results are in line with general predictions: age and having a permanent contract negatively affects the probability to move to another job, while living in the most economically dynamic region of the Netherlands (West) has a positive impact on job mobility.

Finally, if a patience measure that is based on behavioural proxies is used instead, the coefficient of patience is negative and significant (Table 5-10, column (3)).[23] This is consistent with the predictions and results of Drago. This finding points out that the way patience is measured may affect the results considerably.

5.4.4 Robustness checks

We have performed several robustness tests of the empirical results presented in this chapter. First of all, several alternative patience measures are created. For instance, an aggregate measure excluding the items FUTURE04 and FUTURE05 was constructed.

[23] There is some evidence of a U-shaped relation between the patience proxy measure and job mobility.

These two items are negatively correlated with some of the other FUTURE variables and have low factor loadings (see Appendix 5A). Moreover, Cronbach reliability scale increases to 0.767 when these items are excluded (in that case, the average interitem covariance equals 0.528). Alternatively, instead of the sum of the FUTURE variables, the factor scores of the first factor of the 11 or 9 (excluding FUTURE04 and FUTURE05) can also be interpreted as an aggregate measure of patience. In addition, a five year average of the patience variable can be constructed (as in Chapter 4, see 4.3.2: p.71). Estimating the central relations using such alternative measures of patience leads to similar results.

Next, until now we have assumed that workers search on-the-job as a means to increase their wages (at least in the short-run). However, job search may not always be voluntary: some employees may search for other job opportunities because they anticipate a job loss in the near future. Since the DHS asks job searchers directly why they are looking for another job, it can be tested whether involuntary job search drives the results.[24] It appears that the results do not change substantially when involuntary job searcher are excluded from the analyses.

Finally, we included some additional controls in the regressions. First, the worker's health condition is likely to be positively related to patience but may affect work effort, job search intensity and job mobility. We therefore included self-reported health status as an additional control. Second, risk preferences may be related to time preferences. Even though it is neither clear whether patience is positively or negatively related to risk aversion nor whether moving or staying is more risky, our patience measure could in principle capture variation in risk preferences (see Section 4.4.4: p.84). Therefore, we constructed a measure of risk preferences and included this measure in the analyses as an additional control.[25] When measures for health, risk preferences or financial conditions are included separately, the estimates of the effects of patience are hardly affected. However, when all these additional controls are included simultaneously, the number of observation drops considerably due to missing variables. Although the overall pattern of the effects of patience does not change, the relations become less significant. In general, the results obtained in this study seem to be rather robust.

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[24] The DHS asks job searchers the question: "For what reason(s) are you looking for another job opportunity? (more than one answer is allowed)". A worker is considered as an involuntary job searcher when he reports the following reason for job search: "I will (probably) lose my current job".

[25] The DHS includes several questions indicating an individual's risk preference, such as: "I am prepared to take the risk of losing money when there is a chance that I will gain money as well", which is answered using a 7-point scale. We use six of such questions to create an aggregate risk preference indicator.

5.5 Conclusion and discussion

By investing in their career, workers can pursue different career paths. Some career paths may lead to smaller more immediate rewards, while others may result in larger more delayed benefits. In this chapter, we proposed a theoretical model in which workers can allocate time and energy between two types of career investments: work effort and on-the-job search. Workers can exert high work effort in order to climb the wage ladder within the same organisation. In addition, workers can increase the probability of receiving an outside job offer by engaging in job search activities. The central assumption is that internal promotion leads to larger more delayed rewards, while the gains of external mobility are smaller but more immediate.

Several theoretical predictions are exploited to test the exponential versus the hyperbolic discounting model. Under exponential discounting, patience is positively related to work effort but has an inverse U-shaped relation with on-the-job search effort. However, assuming workers are hyperbolic discounters, (short-term) patience has a positive effect on both work and job search effort. Basically, the short-term discount rate determines the individual's tendency to procrastinate these activities. Furthermore, a negative or inverse U-shaped relation between long-term (exponential) patience and the probability of a job transition can be expected, whereas the theoretical relation between the hyperbolic discount rate and external job mobility is ambiguous.

Using detailed information on individual time preferences, various indicators of work effort and several proxies for on-the-job search intensity, we tested these predictions empirically. The results provide support for the hyperbolic discounting model: patience is positively related to both types of career investment. These findings appear to be consistent across different model specifications. Furthermore, we found only weak evidence of a nonlinear relation between patience and job mobility as predicted by the exponential discounting model. This evidence could also be rationalized by the hyperbolic discounting model.

These results contrast with the central hypothesis and main empirical results of Drago (2006). He predicts a negative relation between patience and search intensity and finds a negative effect of patience on the hazard rate of moving to another job. A potential explanation for this inconsistency is that behavioural proxies are noisy and may not capture patience accurately but rather measure other individual characteristics which are positively related to job-job mobility. When we rely on a patience measure that is based on

behavioural proxies, the models estimating work and search effort lead to insignificant patience effects. However, in line with Drago (2006), the coefficient of this patience measure is negative and significant in a model estimating the probability of job mobility. So, workers who score high on this indicator move less frequently from one job to another, while there is no evidence that they search less intensively.

The empirical findings have several methodological implications. First, relying on behavioural proxies to measure patience may generate misleading outcomes. Instead, future research could exploit more general, self-assessed information such as the psychological CFC scale. Second, although on-the-job search effort is a critical variable in job search models, the empirical labour economics literature has ignored this variable almost completely and instead focused on job duration and mobility data. However, evidence on job mobility cannot be interpreted as evidence on on-the-job search.

The results have important policy implications: (on-the-)job search models that were used in previous work as a frame of reference for policy analyses assume exponential discounting. The behaviour of exponential discounters could be substantially affected by long-term incentives, whereas hyperbolic agents are mainly responsive to immediate costs and benefits. Therefore, it can be expected that the effectiveness of labour market policies depends on whether workers discount future payoffs exponentially or hyperbolically. Moreover, introducing commitment mechanisms may be an irrelevant policy strategy when workers are exponential discounters, but may improve the welfare of hyperbolic discounters substantially. Policy makers should take this into account when designing policies directed at encouraging employees to search on-the-job to avoid unemployment or at motivating workers to engage in employability enhancing activities. Furthermore, employers could use these insights to improve their recruitment and retention policies.

Appendix 5A FUTURE items

Table 5A-1 Correlation matrix

	future01	future02	future03	future04	future05	future06	future07	future08	future09	future10	future11
future01	1										
future02	0.6243*	1									
future03	0.3183*	0.4602*	1								
future04	0.0141	0.0723*	0.3354*	1							
future05	-0.0726*	-0.0293	0.1704*	0.2876*	1						
future06	0.2628*	0.2946*	0.1309*	-0.0663*	-0.0889*	1					
future07	0.2923*	0.2332*	0.1488*	-0.0088	-0.1934*	0.2527*	1				
future08	0.3075*	0.3400*	0.1674*	0.0293	-0.0972*	0.2999*	0.4140*	1			
future09	0.1628*	0.1741*	0.3694*	0.1915*	0.1022*	0.0259	0.1916*	0.1178*	1		
future10	0.1495*	0.1901*	0.3790*	0.1853*	0.1544*	0.2134*	0.0995*	0.1248*	0.4673*	1	
future11	0.1953*	0.2566*	0.4772*	0.2676*	0.1741*	0.1341*	0.1401*	0.1450*	0.4495*	0.5464*	1

Note: The correlation coefficients are based on the group of workers used in the job search analyses (N=4965). When all respondents are included, a similar pattern arises. * p<0.0001

Table 5A-2 KMO measures

future01	0.7438
future02	0.7132
future03	0.8150
future04	0.7439
future05	0.7168
future06	0.7667
future07	0.7311
future08	0.7888
future09	0.8016
future10	0.7634
future11	0.8173
Overall	0.7681

Table 5A-3 Factor analysis: all FUTURE items

Variable	Factor loadings	Uniqueness	Scoring coef.
future01	0.4785	0.7711	0.12566
future02	0.5628	0.6833	0.16679
future03	0.6950	0.5170	0.27224
future04	0.3107	0.9035	0.06964
future05	0.1422	0.9798	0.02939
future06	0.2939	0.9136	0.06515
future07	0.3120	0.9026	0.07000
future08	0.3453	0.8808	0.07937
future09	0.5450	0.7030	0.15698
future10	0.5957	0.6452	0.18694
future11	0.6680	0.5537	0.24428

Note: All eleven FUTURE items are included in the factor analysis, which is estimated with maximum likelihood. The eigenvalue of the first factor (retaining 4 factors) is 2.68, explaining 51 percent of the total variance. The results presented in the table represent estimates retaining only the first factor.

Table 5A-4 Factor analysis: excluding FUTURE04 and -05

Variable	Factor loadings	Uniqueness	Scoring coef.
future01	0.5663	0.6794	0.17731
future02	0.6452	0.5838	0.23509
future03	0.6587	0.5661	0.24749
future06	0.3487	0.8784	0.08442
future07	0.3650	0.8668	0.08957
future08	0.4042	0.8367	0.10274
future09	0.4910	0.7589	0.13762
future10	0.5341	0.7147	0.15896
future11	0.5942	0.6469	0.19535

Note: Nine FUTURE items are included in the factor analysis (FUTURE01-FUTURE03 and FUTURE06-FUTURE11), which is estimated with maximum likelihood. The eigenvalue of the first factor (retaining 4 factors) is 2.42, explaining 48 percent of the total variance. The results presented in the table represent estimates retaining only the first factor.

Appendix 5B Proxies patience measure

Table 5B-1 Factor analysis: proxies

Variable	Factor loadings	Uniqueness	Scoring coef.
Life insurance	0.0476	0.9977	0.02234
Savings account	0.1557	0.9758	0.07479
Non-smoker	0.7181	0.4843	0.69493
Non-drinker	0.1999	0.9600	0.09761

Table 5B-2 Patience measure: summary statistics

	Mean	Std. Dev.	Percentiles				
			10	25	50	75	90
Patience [N=5253]	-0.04	0.75	-1.16	-1.01	0.38	0.53	0.53

Appendix 5C Controls

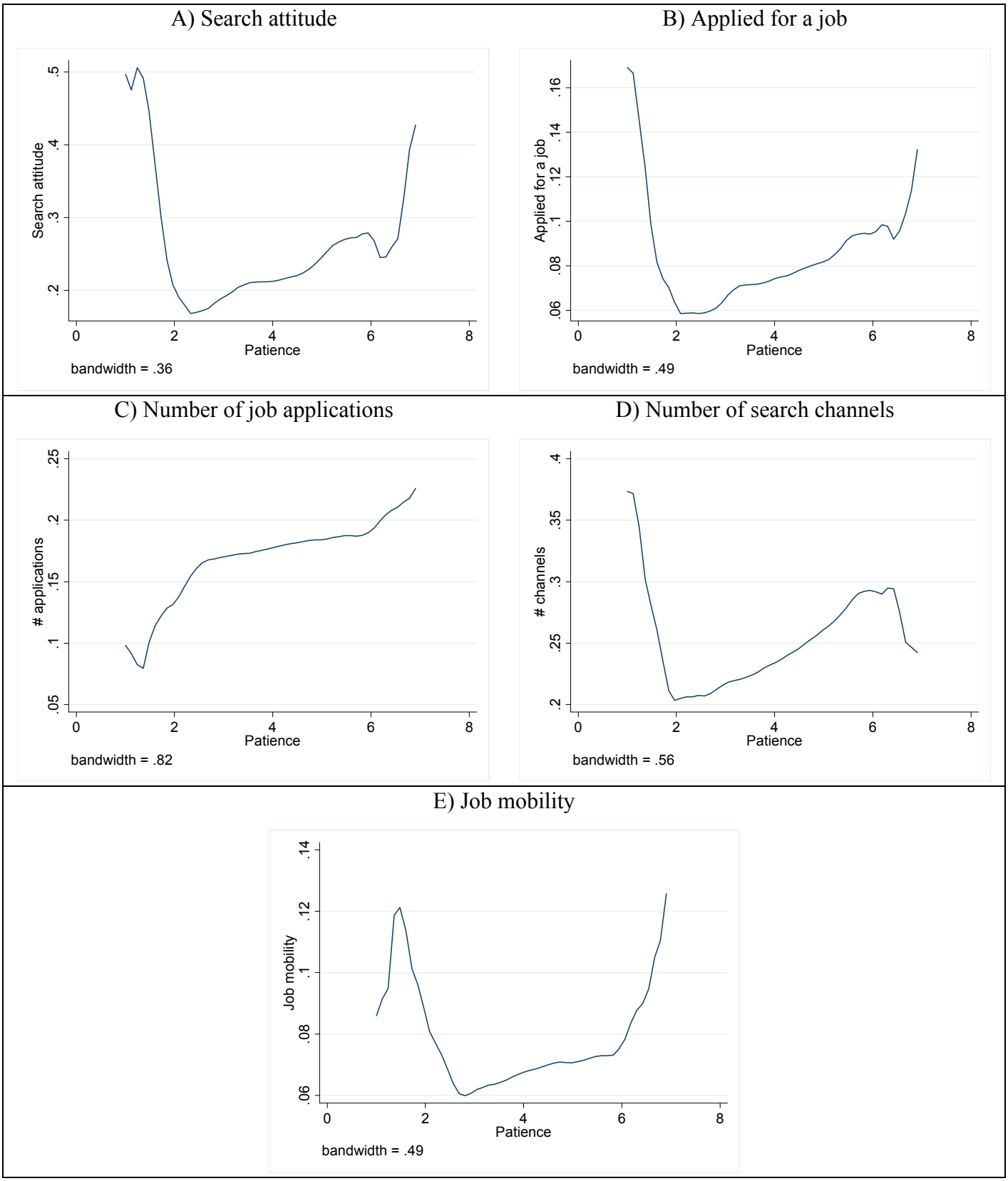
Table 5C-1 Controls: descriptives

Variable	Mean	Std. Dev.
Age	44.57	9.15
Nr of children	1.10	1.20
Unemployment rate	5.56	1.49
Tenure	14.01	10.78
	Freq.	Percentage
Married	3499	70.47
Education level:		
Pre-vocational (VMBO) or below	1208	24.33
Pre-university (HAVO/VWO)	471	9.49
Senior vocational (MBO)	1220	24.57
Vocational college (HBO)	1387	27.94
University	679	13.68
Permanent	4789	96.46
Civil servant	1074	21.63
Region:		
North	509	10.25
East	1008	20.30
South	1397	28.14
West	2051	41.31

Note: The descriptives presented here are for the sample used in the job search intensity analyses (N=4965; see Table 5-5).

Appendix 5D Nonparametric analyses

Figure 5D-1 Kernel regressions: Search effort and job mobility



Note: The graphs are based on Epanechnikov kernel (degree = 0). About 99% of the observations lie in the patience range 2-6.

Appendix 5E Marginal effects

Table 5E-1 Marginal effects of patience: search intensity and transitions

	Search attitude					
	Not searching	Seriously searching	Applied for a job	# applications	# channels	Transitions
Average ME	-0.0215**	0.00827**	0.0125**	0.0341*	0.0331**	-0.00316
	(0.00885)	(0.00344)	(0.00630)	(0.0192)	(0.0160)	(0.00609)
ME at means	-0.0216**	0.00824**	0.0125**	0.0339*	0.0329**	-0.00316
	(0.00885)	(0.00341)	(0.00626)	(0.0188)	(0.0158)	(0.00609)
ME at patience level percentile:						
1	-0.0186***	0.00636***	0.00993***	0.0242***	0.0259***	-0.00335
	(0.00645)	(0.00194)	(0.00377)	(0.00898)	(0.00942)	(0.00683)
5	-0.0195***	0.00691***	0.0107**	0.0269**	0.0279**	-0.00329
	(0.00719)	(0.00235)	(0.00448)	(0.0115)	(0.0111)	(0.00660)
10	-0.0200***	0.00719***	0.0111**	0.0283**	0.0289**	-0.00326
	(0.00757)	(0.00257)	(0.00486)	(0.0129)	(0.0121)	(0.00649)
25	-0.0207**	0.00769***	0.0117**	0.0309**	0.0308**	-0.00321
	(0.00819)	(0.00296)	(0.00551)	(0.0156)	(0.0138)	(0.00630)
50	-0.0215**	0.00820**	0.0124**	0.0337*	0.0328**	-0.00316
	(0.00880)	(0.00337)	(0.00620)	(0.0186)	(0.0156)	(0.00611)
75	-0.0222**	0.00874**	0.0132*	0.0367*	0.0349**	-0.00311
	(0.00942)	(0.00382)	(0.00692)	(0.0220)	(0.0177)	(0.00592)
90	-0.0231**	0.00941**	0.0140*	0.0408	0.0376*	-0.00306
	(0.0101)	(0.00438)	(0.00782)	(0.0268)	(0.0204)	(0.00570)
95	-0.0236**	0.00976**	0.0145*	0.0430	0.0390*	-0.00303
	(0.0105)	(0.00468)	(0.00828)	(0.0295)	(0.0218)	(0.00560)
99	-0.0244**	0.0105**	0.0154*	0.0477	0.0420*	-0.00297
	(0.0112)	(0.00529)	(0.00923)	(0.0355)	(0.0250)	(0.00538)

*** p<0.01, ** p<0.05, * p<0.1

Table 5E-2 Marginal effects of patience and patience squared: search intensity and transitions

	Search attitude					
	Not searching	Seriously searching	Applied for a job	# applications	# channels	Transitions
Average ME	-0.0216**	0.00867**	0.0125**	0.0342*	0.0325**	-0.0438
	(0.00878)	(0.00358)	(0.00627)	(0.0191)	(0.0160)	(0.0435)
ME at means	-0.0201**	0.00751**	0.0111*	0.0343*	0.0298*	-0.0452
	(0.00818)	(0.00308)	(0.00570)	(0.0192)	(0.0153)	(0.0471)
ME at patience level percentile:						
1	0.0243	-0.00920	-0.0120	0.0266	-0.00681	-0.0846
	(0.0254)	(0.0102)	(0.0209)	(0.0330)	(0.0451)	(0.123)
5	0.0101	-0.00373	-0.00461	0.0289	0.00378	-0.0719
	(0.0171)	(0.00642)	(0.0136)	(0.0295)	(0.0323)	(0.0993)
10	0.00344	-0.00126	-0.00117	0.0301	0.00913	-0.0656
	(0.0139)	(0.00510)	(0.0109)	(0.0269)	(0.0270)	(0.0870)
25	-0.00763	0.00280	0.00452	0.0321	0.0185	-0.0554
	(0.00979)	(0.00357)	(0.00745)	(0.0219)	(0.0197)	(0.0670)
50	-0.0191**	0.00715**	0.0106*	0.0341*	0.0290*	-0.0459
	(0.00815)	(0.00306)	(0.00572)	(0.0191)	(0.0154)	(0.0484)
75	-0.0318***	0.0123***	0.0176**	0.0361	0.0412**	-0.0373
	(0.0104)	(0.00414)	(0.00720)	(0.0246)	(0.0176)	(0.0323)
90	-0.0493***	0.0203***	0.0281**	0.0385	0.0592*	-0.0283*
	(0.0175)	(0.00769)	(0.0135)	(0.0431)	(0.0311)	(0.0168)
95	-0.0593***	0.0254**	0.0345*	0.0397	0.0702*	-0.0245**
	(0.0224)	(0.0105)	(0.0183)	(0.0559)	(0.0420)	(0.0107)
99	-0.0821**	0.0387**	0.0504	0.0420	0.0977	-0.0178***
	(0.0347)	(0.0189)	(0.0320)	(0.0877)	(0.0738)	(0.00185)

*** p<0.01, ** p<0.05, * p<0.1

Chapter 6
Wealth and Working Hours: A Panel Data Analysis

6.1 Introduction

Wealth plays an important role in many economic models. In the life-cycle framework – one of the cornerstones of modern economics – wealth, consumption and labour supply behaviour are all interrelated. Whereas many studies have examined how saving behaviour is affected by anticipated and unanticipated variation in labour supply and income (e.g. retirement; unemployment), the evidence on the effects of wealth on labour marker behaviour is rather scarce. Theoretically, wealth gains reduce the individual's marginal utility of wealth and can thus be expected to create labour supply disincentives. In reality however, workers may not reduce hours when working hours restrictions are present. The wealth effects on labour supply therefore remain an empirical question, which is investigated in this study.

Various studies have examined the impact of wealth on labour supply behaviour.[1] The lion's share of this research focuses on discrete transitions, mainly the impact of wealth on the timing of retirement (e.g. Coile and Levine, 2006; Brown et al., 2010; Van Ooijen et al., 2010) and the probability to move from unemployment to employment (e.g. Bloemen, 2002; Chetty, 2008). Furthermore, in a somewhat different strand of literature, the effects of wealth and liquidity constraints on the transition from dependent employment to self-employment have been studied extensively (Hurst and Lusardi, 2004). However, wealth effects on the intensive margin of labour supply are generally ignored. Exceptions are the studies of Holtz-Eakin et al. (1993) and Joulfaian and Wilhelm (1994), who use US data to estimate effects of inheritances on labour supply and find small disincentive effects. The papers of Henley (2004) and Benito and Saleheen (2011) are, to our knowledge, the only studies that examine wealth effects on labour supply behaviour using European data (both use data from the British Household Panel Survey). Henley (2004) exploits various windfalls (e.g. inheritances, housing price developments) as exogenous changes in wealth to test the wealth effects on working hours adjustments, focusing explicitly on the intensive

[1] See Section 3.4.2 (p.55) for a more extensive review of the literature on wealth effects on labour supply.

margin. His empirical findings also point to rather small wealth effects.[2] Benito and Saleheen (2011) also found some significant effects of experiencing a financial wealth shocks on working hours.

A reason why most empirical studies on this issue limit their attention to discrete labour supply transitions and disregard changes in the intensive margin is that, in general, working hours constraints are present (e.g. Van Soest et al., 1990; Bryan, 2007). When participation essentially implies a 40 hours working week, alternative working time options are non-existent and therefore changes in the intensive margin will not occur.[3] In case there are significant working hours restrictions, wealth shocks may affect the extensive but not the intensive margin of labour supply. The lack of hours flexibility could also explain the rather small wealth effects typically found in empirical work: in order to induce a worker to adjust labour supply, a rather large wealth shocks is required.

This study examines the wealth effects on working hours for the Netherlands, a country where working hours flexibility is very high. Overall, part-time employment is common and the barriers to move between full-time and part-time jobs are rather small. Such transitions are facilitated through various institutional arrangements (e.g. WAA: 'Working Hours Adjustment Act', a legal right to adjust working hours). In addition, high quality part-time jobs are available: whereas in some countries a move to part-time employment implies a (substantial) decrease in job quality, this is not necessarily the case in the Netherlands (Visser, 2002). Here, part-time employment is generally voluntary (especially for women) and part-time employees are generally satisfied with their jobs (Booth and Van Ours, 2010; Bosch et al., 2010). So, even though hours restrictions may not be fully absent in the Netherlands[4], there are relatively low barriers to adjustments at the intensive margin.

The wealth effects are estimated using the DNB Household Survey (DHS). In addition to actual (and contractual) working hours, this longitudinal survey contains data on desired working hours. We exploit this information as desired hours may be a better approximation for optimal working hours than actual hours when there is a lack of working hours flexibility. Another specific feature of the DHS is that it includes detailed

[2] Henley (2004: p.454) concludes that "[a]n unanticipated £10,000 windfall gain reduces total hours of work by just over half an hour per week for men and by over two and half hours per week for women".
[3] For example, in their study on the effects of liquidity constraints on labour supply, Del Boca and Lusardi (2003: p.689) state: "Given that the choice of working hours for Italian workers is basically 0 or 35 (or 40) hours a week, we do not consider female labour supply but instead the participation rate".
[4] Based on data from the Netherlands (1987-89), Euwals (2001) finds hours evidence of hours constraints. It is not clear whether these constraints were still present in more recent years.

information on assets and liabilities as well as a large section on psychological aspects of saving behaviour. From the latter we utilize several indicators of perceived wealth changes. An important innovation of this study is that we directly include these indicators in the first difference estimations to assess the wealth effects.

The analysis of the effects of wealth on labour supply involves several identifications issues, as saving and labour market behaviour are interrelated. In a life-cycle model, wealth and labour supply are jointly determined: workers may save to finance planned reductions in labour supply and may draw upon their savings when they expect to work more hours in the future. Like several other studies on wealth and labour supply, we use data on windfalls (inheritances, house price developments) to address the endogeneity of wealth. In addition, we draw on information on planned and realised wealth accumulation to construct a variable indicating whether the worker received a positive or negative unanticipated wealth shock. To our knowledge, this study is the first to use this type of data to assess wealth effects on labour supply.

The remainder of the chapter is set out as follows. Section 6.2 discusses the main theoretical mechanisms. In Section 6.3 we describe the data and methodology. The empirical results are presented in Section 6.4. The final section provides a summary of the main findings and concludes.

6.2 Theoretical framework

6.2.1 Life cycle model

The life-cycle model provides the most general tool in economics to study the intertemporal allocation of money, time and effort. In such a model, the main reasons to accumulate assets are anticipated and unanticipated decreases in future income (i.e. the life-cycle motive and the precautionary savings motive, respectively). Although there are many different types of life-cycle models, as a general starting point individuals choose the level of consumption and leisure for each time period of life in order to maximize (expected) lifetime utility, where utility at time t is a function of consumption C_t and leisure L_t, that is $U[C_t, L_t]$. Here we follow the model of MaCurdy (1981), which assumes that agents live for $T+1$ periods and can freely borrow and lend at the real interest rate r_t (perfect capital markets), implying an interest factor:

$$R_t \equiv 1/\{[1+r_1][1+r_2]...[1+r_t]\} \tag{6.1}$$

The agent now chooses the level of consumption C_t and leisure L_t to maximize expected lifetime utility:[5]

$$\max E_t \sum_{t=0}^{T} \frac{1}{(1+\rho)^t} U[C_t, L_t] \tag{6.2}$$

subject to the wealth constraint

$$A_0 + \sum_{t=0}^{T} R_t N_t W_t = \sum_{t=0}^{T} R_t C_t \tag{6.3}$$

where ρ denotes the individual's time preference and A_0 the level of initial wealth. Labour income in period t is determined by the hourly wage rate W_t and working hours N_t, which is defined a $L^* - L_t$ where L^* is the total time endowment available in each period.

As equation (6.3) shows, wealth accumulated during the life cycle functions as a constraint to the maximisation problem. Higher wealth levels increase the individual opportunity set and thereby wealth gains result in an increase in consumption, leisure or both. The crucial question, however, of course is when individuals respond to changes in wealth. Assume that the utility received by individual i at time t can be described as:

$$U_i[C_{it}, L_{it}] = \Upsilon_{1it}[C_{it}]^{\omega_1} - \Upsilon_{2it}[N_{it}]^{\omega_2} \tag{6.4}$$

where ω_1 $(0 < \omega_1 < 1)$ and ω_2 $(\omega_2 > 1)$ are constant parameters, and Υ_{1it} and Υ_{2it} $(\Upsilon_{1it}, \Upsilon_{2it} > 0)$ represent time-specific changes in "tastes" that depend on the individual's characteristics at time t (e.g. education, number of children). Assuming an interior solution ($N_{it} > 0$), the Frisch labour supply function can be written in natural logs:

$$\ln N_{it} = \frac{1}{\omega_2 - 1}\left\{\ln \lambda_{it} - \ln \Upsilon_{2it} - \ln \omega_2 + \ln\left[R_t(1+\rho)^t\right] + \ln W_{it}\right\} \tag{6.5}$$

Following MaCurdy (1981), we make the following approximations and assumptions: $\ln(1+r_t) \approx r_t$, $\ln(1+\rho) \approx \rho$ and $\ln \Upsilon_{2it} = \sigma_i + \gamma X_{it} + u^*_{it}$. The latter implies that tastes for work are randomly distributed (according to the random term u^*_{it} with zero mean),

[5] Some (standard) assumptions are made (e.g. utility is a strictly separable and additive function). Here we provide a short discussion of the model: for more extensive and formal discussions see MaCurdy (1981; 1985) and Altonji (1986).

conditional on a time-invariant component σ_i and time-varying (observable) determinants of tastes X_{it}. Equation (6.5) can now be formulated as:

$$\ln N_{it} = -\delta\left(\sigma_i + \ln \omega_2\right) + \delta(\rho - r)t + \delta \ln \lambda_{it} + \delta \ln W_{it} + \delta\gamma X_{it} + u_{it} \tag{6.6}$$

where $\delta = 1/\left(\omega_2 - 1\right)$ and $u_{it} = \delta u_{it}^*$. Next, following Joulfaian and Wilhelm (1994), marginal utility of wealth λ_{it} changes over time according to:

$$\ln \lambda_{it} = \ln \lambda_{it-1} + a + \phi_{it} \tag{6.7}$$

and $\ln \lambda_{it-1}$ is assumed to be

$$\ln \lambda_{it-1} = \theta Z_i + \zeta \ln\left(E_{t-1}\left[G_i\right]\right) + \varepsilon_i \tag{6.8}$$

where a is a factor that is determined by the discount and interest rates, ϕ_{it} denotes the forecast error (with a conditional expectation equal to zero, i.e. $E_{it}\left[\phi_{it+1}\right] = 0$), Z_i consists of time-invariant background characteristics, $E_{t-1}\left[G_i\right]$ represents the anticipated present value of changes in the level of assets and ε_i signifies the unobserved heterogeneity in the marginal utility of wealth. After imputation of equations (6.7) and (6.8) in equation (6.6), we obtain:

$$\begin{aligned} \ln N_{it} = {} & \delta\left(\varepsilon_i - \sigma_i\right) + \delta\theta Z_i + \delta\left(a - \ln \omega_2\right) + \delta(\rho - r)t \\ & + \delta \ln W_{it} + \delta\gamma X_{it} + \delta\zeta \ln\left(E_{t-1}\left[G_i\right]\right) + \delta\phi_{it} + u_{it} \end{aligned} \tag{6.9}$$

From equation (6.9) it is clear that the effect of future wealth gains and losses depends crucially on whether they are expected. When wealth shocks are completely unanticipated ($E_{t-1}\left[G_i\right] = 0$) there is a wealth effect through the forecast error. Given that the forecast error depends on the unexpected asset change G_{it} according to $\phi_{it} = \mu G_{it}$ ($\mu < 0$), the impact of the wealth shock will be $\delta\mu$. However, when wealth shocks are completely anticipated ($E_{t-1}\left[G_i\right] = G_i$ and $\phi_{it} = 0$), marginal utility of wealth would have decreased before period t and the agent would not respond to the wealth gain or loss at the time it is experienced.

Hence, in this life-cycle model the wealth effect on labour supply operates only through the forecast error. Of course, in reality many wealth gains and losses are to some extent unexpected. For example, in the case of inheritances or housing equity gains, either

the timing or the size of the windfall is not fully anticipated, and these windfalls would thereby have at least some effect on labour supply when they are actually realised.

6.2.2 Alternative mechanisms

In the life-cycle model discussed above it is assumed that workers can freely borrow at the real interest rate. However, capital markets may be imperfect and agents may face liquidity constraints, implying that the maximization problem (6.2) is subject to the wealth constraints (6.3) and additionally to the liquidity constraint $A_t \geq \mathrm{K}$ (where the liquidity constraint K is not necessary equal to zero). When liquidity constraints are binding, current labour supply is not affected by (fully) anticipated future wealth gains: even though individuals prefer to increase leisure (and consumption) before the realisation of the gain, they are unable to do since borrowing is restricted. The labour supply reduction will then occur after receiving the wealth gain. Basically, labour supply functions as a buffer to smooth marginal utility of consumption over time (Low, 2005; Benito and Saleheen, 2011). So, if liquidity constraints are important and prevalent, the effects of unexpected and expected shocks will be more similar. Furthermore, when individuals are risk averse or prudent (e.g. Kimball, 1990; Browning and Lusardi, 1996), individuals may not be willing to reduce working hours and borrow against potential future wealth gains.

6.2.3 Working hours constraints

Most labour supply models, including the model outlined in 6.2.1, assume that (given a wage rate) individuals can freely choose the number of weekly working hours. Under this assumption, actual working hours are equal to optimal (desired) working hours. Theoretical arguments and empirical evidence however suggest that weekly working hours are not exclusively determined by the employee's preferences. Preferences of the employer, production technologies, the economic climate and institutional factors are likely to affect the prevalence of specific working hours options. A large amount of empirical findings from various countries points out that working hours constraints are present and persistent (Van Soest et al., 1990; Stewart and Swaffield, 1997; Altonji and Paxton, 1988; 1992; Euwals, 2001; Böheim and Taylor, 2004; Bryan, 2007). A general finding in this literature is that hours flexibility is higher for those workers who have moved to another job. The presumption is that jobs involve a specific combination of wages and hours and that individuals search for the package that leads to the highest level

of utility (e.g. Bloemen, 2008). An important implication of this research on labour market rigidities is that changes in optimal labour supply do not (immediately) translate into labour supply behaviour. As Kimball and Shapiro (2008: p.39) argue, "[m]any shocks to non-labor income or wealth used to identify wealth effects are simply too small to overcome the frictions that impinge on labor supply decisions". Hence, when working hours are inflexible, the effects of wealth shocks may be limited or take time to materialise.

6.3 Data and methodology

6.3.1 The sample

To estimate the effects of wealth on working hours, this study uses the DNB Household Survey (DHS). This Dutch longitudinal survey of around 2000 households has been collected annually since 1993 (see Section 4.3.1 (p.704) on more general information about the DHS). For the empirical analyses, 18 waves (1993-2010) of the DHS are used. The survey is particularly interesting for this study, as it contains various measures of working hours (Section 6.3.3) and an extensive section on assets and liabilities which can be used to construct measures of aggregate household wealth. Moreover, the DHS includes a number of questions on perceived wealth accumulation and the household financial situation. As we argue below, these variables may proxy wealth changes and are therefore an interesting alternative for the (commonly used) wealth indicators. For the empirical analysis, we select household heads or (cohabiting or married) spouses who are aged between 25 and 65 years and report to be working for at least 4 hours.[6] Because labour market behaviour in general and the effects of wealth (e.g. Joulfaian and Wilhelm, 1994; Henley, 2004) specifically are likely to be different for men and women, the empirical analyses are performed separately for men and women.

6.3.2 Estimation strategy

In order to examine the effects of wealth on working hours, we formulate the following reduced form equation:

$$h_{it} = \beta_0 + \gamma A_{i,t-1} + X_{it}^{'}\beta + \alpha_i + u_{it} \tag{6.10}$$

[6] Jobs below 4 hours can be considered as very small and are rather uncommon. The self-employed are excluded from the sample, as for this group measurement error in both wealth and working hours is likely to be a problem.

where h_{it} represents the (log) number of working hours of individual *i* at time *t*. Hours are modelled as a function of A_{it-1} (wealth holdings at time *t*-1), a set of other explanatory variables, individual-specific fixed effect (α_i) and an idiosyncratic time-varying error term.

It is clear from equation (6.9) that we should control for time-invariant unobserved heterogeneity. For instance, leisure preferences and risk aversion may be correlated with both labour supply and saving behaviour. As Bloemen (2002) for instance argues, wealth may be associated with characteristics of the worker that are also related to layoff rates and labour market attachment. We therefore exploit the panel structure of the data to eliminate time-constant unobserved heterogeneity by taking first differences of (6.10):

$$\Delta h_{it} = \gamma \Delta A_{i,t-1} + \Delta X'_{it}\beta + \Delta u_{it} \tag{6.11}$$

The following controls are included in the estimations: age squared, marital status, dummies indicating the number of children (one, two, three or more), educational level (dummies), unemployment rate (at the province level), the type of employment contract (permanent or temporary), whether the worker is a civil servant, tenure (in years), characteristics of the partner (age squared; educational level; employment status), four region dummies and year dummies (see Appendix 6A for descriptives).[7]

Alternatively, equation (6.10) could be estimated using fixed effects. However, in the first difference estimations we can directly include the indicators for perceived wealth changes, as these (non time-differenced) variables capture changes in wealth over time (see Sections 6.3.5 and 6.3.6). Hence, by estimating the model in first differences rather than fixed effects, we can exploit these indicators. Note that the focus on hours transitions has an important methodological advantage as there is sufficient within-individual variation over time (as we will discuss in the next section). This allows us to estimate the model while controlling for unobserved heterogeneity. In contrast, it is uncommon that within a relatively short time frame individuals make multiple transitions in and out of employment. In fact, as retirement is generally an absorbing state, multiple transitions to this state are virtually nonexistent. This creates several estimation challenges (e.g. Van Ooijen et al., 2010; Bloemen, 2011).

[7] Note that age cannot be included in the first difference estimation as a full set of year dummies is used as controls. Furthermore, we ignore intra-household bargaining issues and assume the employment status of the partner to be exogenous.

Of course, in a stylised life-cycle model (Section 6.2.1, equation (6.9)), labour supply is affected by current wealth rather than lagged wealth. However, there are two important reasons to use A_{it-1} instead of A_{it}. First, as discussed in 6.2.3, working hours constraints may be present and employees may therefore not be able to adjust labour supply immediately. Negotiating with the current employer on a change in weekly working hours or looking for other jobs at other employers takes time, and therefore the effects of A_{it} may be minor.[8] Of course, if workers adjust their working hours instantaneously as assumed in the canonical life-cycle model, the changes in the lag of wealth have no effect on working hours, since working hours would have already been adjusted at time t-1. Hence, the study implicitly tests this assumption of no working hours constraints. Another reason to use lagged wealth in the first difference estimations is that it reduces the following reverse causality problem: when a worker reduces (increases) his working hours between period t-1 and t, he is likely to deplete (accumulate) wealth between period t-1 and t. Consequently, instead of the negative theoretical relation, we would expect a positive relation between A_{it} and working hours. However, even if A_{it-1} is used instead of A_{it}, a number of estimation issues remain: the inclusion of the wage rate (which is endogenous), corner solutions and the endogeneity of wealth. Below we discuss how we deal with these issues.

A potentially relevant estimation problem arises because wages, which we should take into account according to the theoretical model (equation (6.9)), are endogenous. As the DHS income data is retrospective (i.e. income questions refer the previous calendar year), the weekly wage rate in period t can be constructed using total wage income reported in year t+1 and working hours reported in year t. Nevertheless, the inclusion of the wage variable leads to various problems. First, measurement error is likely to be a problem for both the income and hours variables, and therefore particularly for the hourly wage rate. This measurement error problem is further amplified by taking first differences. Moreover, because the data does not contain information about annual work hours, the wage rate is by definition incorrect if the worker has changed working hours during the specific calendar year. Furthermore, division bias and simultaneity bias are likely to cause estimation problems. Hence, the wage rate variable should be instrumented. It is however

[8] Sevak (2002) also argue that lagged wealth shocks may have a larger effect on the timing of retirement than current shocks, as workers have more time to respond to those shocks: the empirical results of the study point out that this is indeed the case.

difficult to find variables that are significantly related to the wage and but do not determine the number of working hours. An additional complication is that income data is frequently missing in the DHS and including the wage rate in the first-difference estimations requires that respondents remain in the sample for at least three successive years. As panel attrition is rather high in the DHS, the latter is particularly a problem. Even without using IV techniques, introducing the wage rate as an additional control leads to a substantial drop in observations and thereby to unreliable results. Because the inclusion of the wage rate involves many estimation problems and leads to a considerable loss of observations, we decided to exclude this variable and estimate the model in reduced form. An important assumption we make is that the right-hand-side variables capture all relevant time-varying effects on working hours, including changes in wages. The study of Joulfaian and Wilhelm (1994) indicates that the reduced forms "do an adequate, but not perfect, job in controlling for the effect of changing wages on the estimate of the inheritance disincentive" (Joulfaian and Wilhelm, 1994: p.1215). Their results point out that the two-stage fixed effects estimates (taking into account the wage rate) of the effects of inheritances are larger and more significant than the reduced form estimates. We therefore argue that we underestimate the effects of wealth shocks and that the estimates represent a lower bound.

Another estimation issue is related to corner solutions. Because the focus of this study is on the intensive margin of labour supply, like Henley (2004) we exclude non-employed individuals and do not model explicitly the participation decision.[9] Ignoring discrete transitions could lead to sample selection bias. However, discrete transitions are rather uncommon: just 3.1 percent of the men and 3.7 percent of the women in the employed sample in period t move to non-employment in period t+1. Because workers do not make discrete transitions regularly, we expect that excluding the non-employed will not cause serious sample selection bias. For simplicity, we therefore assume the Mill's ratio to be time-invariant and subsumed in the individual fixed effects.

A final important estimation problem arises because, in a life cycle framework, wealth and labour supply are jointly determined. Workers accumulate wealth as a buffer against expected and unexpected shocks in labour income. For instance, a full-time worker planning to reduce working hours (temporarily) will save in anticipation of such a transition. A positive relation between wealth and the probability of decreasing working

[9] Although sample selection may indeed be an issue, the approach of excluding non-working individuals and focusing on the intensive margin is not uncommon in the literature (e.g. Henley, 2004; Blundell et al., 2008; Geyer and Myck, 2010).

hours may thus simply be the result of individual planning behaviour instead of a causal effect. Therefore, in addition to the level of wealth (directly measured) (Section 6.3.4) and proxies for wealth changes (Section 6.3.5), unanticipated wealth shocks (Section 6.3.6) are used as right-hand-side variables. Like previous studies on wealth effects, we draw on data on windfalls (inheritances and differences in regional housing price growth). Moreover, we exploit information on expectations to construct a variable indicating whether the worker experienced an unexpected change in the level of wealth.

6.3.3 Working hours

The level of weekly working hours (or changes in working hours) is the central dependent variable in this study. We use three different measures of working hours:

- Actual working hours: the number of hours the employee works on average per week in the main job (plus the number of weekly hours employed in a potential second job);
- Contractual hours: the number of weekly working hours according to the employment contract;
- Desired working hours: the number of hours the employee would like to work.[10]

These alternative measures indicate different aspects of labour supply behaviour. In most empirical studies, actual working hours are used as they measure the total hours of time supplied on the market. However, changes in actual hours may be changed more easily than contractual hours, for instance through a decrease in overtime work. In contrast, alteration of the contractual hours requires a more active process, either by negotiating a new employment contract with the current employer or by moving to another job (employer). Moreover, because contractual hours are one of the crucial formally specified features of most employment contracts, measurement error for this variable is probably a less serious problem than for average actual hours, which have to be estimated by the respondents. Finally, examining effects on desired working hours may be an interesting strategy when working hours restrictions are present. Because very high working hours are rare, actual and desired hours above 60 and contractual hours over 48 are excluded from the analyses.

Table 6-1 presents descriptive statistics and the distribution of weekly working hours (see also Appendix 6B). For both men and women, actual hours are on average

[10] In most surveys questions on desired working hours, the question includes the phrase "taking into account the income change". The DHS question on desired working hours does not include such a phrase.

higher than contractual hours, which are slightly higher than desired hours. Overall, very high working hours (above 50) are rather atypical.[11] It is clear that the distribution of working hours differs substantially between men and women. First of all, labour supply of men is on average considerably higher than the labour supply of women (around 10 hours for each type of working hours). The large majority of men is full-time employed (38 hours and more), whereas most working women are employed in part-time jobs (4-35 hours). Although a significant part of the male workers are part-time employed (according to the contract, around 13 percent), it appears that in general full-time jobs remain the standard labour supply option for male workers. In contrast, the distribution of working hours among employed women is fairly even spread (see Appendix 6B).

Table 6-1 Working hours

	Men			Women		
	Actual	Contr.	Desired	Actual	Contr.	Desired
Mean	41.03	36.97	36.14	29.43	26.97	26.81
St. Dev.	7.29	4.64	7.04	10.93	9.66	8.71
Distribution (%)						
4-19	1.14	1.69	2.11	17.51	22.06	16.32
20_29	2.82	3.43	6.38	29.11	30.99	37.45
30_35	6.96	7.67	24.35	18.51	16.82	25.76
36_37	11.58	26.25	19.34	8.00	12.14	8.35
38_39	11.39	23.69	8.92	4.07	7.13	3.03
40	26.49	36.13	29.86	10.57	10.78	7.97
>40	39.61	1.15	9.05	12.24	0.08	1.13

Because our estimations are based on within-variation of working hours over time, it is essential that workers make a sufficient level of working hours transitions between panel waves. Table 6-2 provides information on changes in working hours between two consecutive years. It seems that workers alter their hours of work rather frequently, suggesting that there is significant scope for adjustment at the intensive margin of labour supply. There seem to be some gender differences: 57 (25) percent of the employed men change the actual (contractual) hours, compared to 60 (33) percent of the working women. Female employees do not only adjust their work hours more often than men, but also adjust their hours to a larger extent. Overall, the labour supply of women seems to be more flexible than the labour supply of men.

[11] Compared to many other OECD countries, working long hours is relatively uncommon in the Netherlands (OECD, 2007).

Table 6-2 Changes in working hours

	Men		Women	
	Percentage	Mean ($\Delta h_{it} \neq 0$)	Percentage	Mean ($\Delta h_{it} \neq 0$)
Actual hours				
Total	57.24	-0.31	60.22	-0.12
Increase	27.09	4.65	30.53	5.00
Decrease	30.15	-4.77	29.69	-5.38
Contractual hours				
Total	25.26	-0.41	32.97	0.17
Increase (>0)	11.30	3.52	16.74	-5.14
Decrease (<0)	13.97	-3.59	16.24	5.31
Desired hours				
Total	53.05	-0.56	52.04	-0.32
Increase (>0)	24.78	6.35	26.77	5.75
Decrease (<0)	28.28	-6.62	25.27	-6.04

6.3.4 Wealth

In a theoretical life-cycle model, wealth is represented by one parameter. However, it is likely that behavioural responses of wealth depend on the type of wealth (see also Section 3.3.1). Here we use four wealth measures: gross liquid wealth consists of the positive balance of the checking account, the balance of saving on deposit accounts, plus the amount of savings certificates. Net liquid wealth is gross liquid wealth minus the (potential) debt on the checking account. Gross total wealth is the sum of financial assets (liquid wealth as defined above plus bonds, stocks, options and the account balances of employer savings schemes and investment accounts), money borrowed to family and friends, the value of the house(s) and the value of other real wealth (cars, other real estate). Net total wealth equals gross total wealth minus financial debt and mortgages.

In the DHS, wealth measured at the individual level is aggregated at the household level. Unfortunately, missing values are common for the wealth variables. The total wealth variable is particularly sensitive to this problem as it is required for the aggregation that all the different asset (and liabilities) components are completed. We therefore use the wealth values that are imputed by CentERdata. Table 6-3 shows the means, standard deviations and distribution of the four wealth variables. It is clear that, for all wealth types, wealth is highly skewed. The majority of the households seems to hold a significant amount of liquid wealth: more than 50 percent of the workers hold over 4300 euros in liquid assets (net). However, the bottom quartile of the households has just little cash-on-hand (gross) and almost zero net liquid wealth. As a large part of the household wealth consists of

housing wealth, the substantial difference between liquid and total assets is not surprising. Average net total wealth is over eight times the average level of net liquid wealth. The differences between men and women in asset holding are minor, which can of course be expected since the data refer to aggregate household wealth.

A common issue with exploiting survey data on wealth is that the variables are generally subject to substantial measurement error (e.g. Juster et al., 1999). This may be particularly a problem in this study as the potential biases due to measurement error are further exacerbated by taking first differences. For that reason, proxies for wealth changes may be an interesting alternative for first differences in reported wealth levels.

Table 6-3 Wealth distribution

	Mean	Std. Dev.	Percentiles				
			10	25	50	75	90
Liquid (gross)							
Men	13251	28134	402	1543	4597	13883	32100
Women	12974	28412	449	1520	4787	14507	32486
Liquid (net)							
Men	12960	41504	-6709	340	4370	16341	39366
Women	12509	41280	-6385	363	4401	16155	37324
Total wealth (gross)							
Men	179638	173924	6671	66650	159804	243944	359637
Women	177088	180159	4838	48501	156751	241429	357508
Total wealth (net)							
Men	113555	156217	1731	18138	75460	159700	272250
Women	107226	156566	641	13085	69666	147329	251683

6.3.5 Proxies for wealth changes

In addition to the first difference in the level of wealth we use several indicators of perceived wealth changes. The DHS contains various questions that measure perceived changes in (household) wealth over time:

- FINSITU: "How is the financial situation of your household at this moment?" Answer categories: 1) making debts 2) need to draw upon savings 3) it is just about manageable, 4) some money is saved, 5) a lot of money can be saved.
- ASIDE: "Have you put money aside in the past twelve months?" (No/Yes)
- ASIDEQ: If the respondent replied that he/she put aside money in the past twelve months, the respondent is asked what amount he/she put aside. In total seven answer categories, varying from 'less than 1500' to 'over 75000'.

- EXPINC: "Considering the past twelve months, where your expenditures 1) smaller than your income 2) about equal to your income 3) larger than your income".

All these variables refer to changes in wealth levels: FINSITU concern the current saving behaviour and ASIDE(Q) and EXPINC deal with changes in (liquid) wealth during the preceding 12 month period. For instance, the answer categories of FINSITU imply that ΔA_{it-1} is a) positive when 'some money is saved' and 'a lot of money is saved; b) around zero when the household financial situation is 'just manageable'; and c) negative if the individual 'draws upon savings' and 'makes debts'. We can therefore utilize the lag of these alternative indicators as proxies for wealth changes (ΔA_{it-1}) instead of the lagged first difference in the level of wealth. Although these questions from the DHS have been used in other studies[12], to our knowledge this study is the first to exploit these items to assess wealth effects on labour supply.

This alternative strategy has several advantages over the more conventional methods. First, perceived changes in wealth may actually be more relevant for behaviour than changes in estimated wealth levels during a calendar year. Second, we maintain a higher number of observations as these variables are less frequently missing (or incomplete) and only one wave is needed to construct the proxy for wealth changes. Third, whereas measurement error plagues self-reported wealth data, this may not be a significant problem for these proxies. This is particularly relevant as measurement error is amplified through the first differencing procedure.

Table 6-4 presents the distribution of workers across the answer categories for the four proxies of wealth changes. Differences between men and women are minor, which can be expected since the questions refer to saving behaviour of the household. Considering the question on the household financial situation (FINSITU), it appears that most workers (around 66 percent) either save a lot or some money. One out of five workers breaks even, while about 10 percent (3-4 percent) draws upon savings (is making debts). The proportion of savers is somewhat lower according to the answers to the EXPINC question (42 percent). The table indicates that over three quarters of the employees have put money aside in the past twelve months, implying that the (liquid) wealth level of this group has increased during that specific period.

[12] For instance, see Alessie and Teppa (2010) and Van Ooijen et al. (2010).

Table 6-4 Perceived changes in wealth

	Men	Women
Financial situation (FINSITU)		
lot of money saved	14.30	15.66
some money is saved	52.91	49.01
just manageable	20.78	20.14
draw upon savings	9.01	11.28
making debts	3.01	3.90
Expenditures and income (EXPINC)		
expend. < income	41.89	41.76
expend. = income	42.69	42.23
expend. > income	15.42	16.01
Put money aside (ASIDE)		
Yes	78.76	82.01
How much? (ASIDEQ)*		
0	22.07	19.07
<1500	15.05	18.92
1.500-5.000	39.11	39.20
5.000-12.500	18.86	17.79
12.500-20.000	3.35	3.34
>20.000	1.55	1.68

*Because very few workers report to have put aside over 20.000 euros, the three highest ASIDEQ categories are pooled ('between 20.000 and 37.500', 'between 37.500 and 75.000' and '75.000 or more').

Table 6-5 shows the correlation coefficients between the three indicators, where higher values of FINSITU, EXPINC, ASIDE and ASIDEQ correspond to a higher savings rate. All coefficients are positive and significant, which suggest that the indicators measure the same underlying variable.

Table 6-5 Correlation between liquidity constraints indicators

	FINSITU	EXPINC	ASIDE	ASIDEQ
FINSITU	1			
EXPINC	0.6001	1		
ASIDE	0.3780	0.3309	1	
ASIDEQ	0.5100	0.4397	0.7506	1

Note: Higher values of FINSITU, EXPINC, ASIDE and ASIDEQ indicate a higher saving rate. All coefficients are significant ($p<0.0001$).

6.3.6 Wealth shocks

To estimate the effects of wealth on labour supply, a number of endogeneity issues should be addressed. On the one hand, workers may accumulate assets with the aim to reduce

labour supply in the future or they may dissave anticipating an increase in weekly working hours. A negative association between wealth and working hours can therefore not be interpreted as a causal effect. On the other hand, expectations could also lead to an attenuation bias: if wealth gains or losses are expected, workers may have already adjusted their level of labour supply. This would imply that future shocks in wealth also affect labour supply.

In order to deal with the endogeneity of wealth, various studies rely on data on inheritances (e.g. Holtz-Eakin et al., 1993; Joulfaian and Wilhelm, 1994; Henley, 2004). As the DNB contains information on inheritances, we also apply this strategy to identify wealth effects. However, in general there may be several limitations to using inheritances as a source of exogenous variation. First of all, inheritances are likely to be correlated with characteristics of the parents, such as the tendency for long working hours, saving behaviour and risk aversion. Individuals that receive more or larger inheritances may – like their parents – also have a strong tendency to save and to work long hours. Second, it could be argued that inheritances are not always fully unanticipated. Brown et al. (2010) for instance find that it is important to empirically differentiate between anticipated and unanticipated inheritances. They demonstrate that the effect of unanticipated inheritances on the timing of retirement is substantially larger than the effect of anticipated inheritances.[13] Hence, if inheritances are indeed expected, labour supply may already be adjusted downwards. This would imply that the estimated relations between wealth and working hours represent a lower bound.

Another reason why using the information on inheritances may be questionable is that receiving a bequest generally follows the death of a parent or other relative. It is possible that the death of a relative leads to "the sudden realization that one should "stop and smell the roses"" (Brown et al., 2010: p.426) and thereby changes the preferences (for leisure) of the inheritance recipient. In addition, as parents may be care receivers (when they are in ill health) or care providers (if they provide informal child care to their grandchildren), the death of a parent may also change restrictions. Unfortunately, we are not able to control for the direct effect of the death of a parent (see also Elinder et al., 2011).

[13] Brown et al. (2010) distinguish between anticipated and unanticipated inheritances received in period t by using questions on inheritance expectations in period t-1.

A final problem is that, in the DHS, respondents are asked whether they "received inheritance or gifts" and the data does not allow us to distinguish between these two.[14] When workers receive gifts from their parents as a response to a drop in their income level due to a working hours reduction, it is questionable whether this variable is exogenous. Because inheritances may not be exogenous, in addition to this windfall we use two alternative sources of wealth shocks: regional house price developments and perceived unexpected shocks. Below we discuss these three types of shocks.

Inheritances

The DHS asks respondents whether they have received any inheritances or gifts in the calendar year prior to the interview and which amount they inherited. In our sample, on average around 5 percent of the workers has received an inheritance or gift. Women are somewhat more likely than men to inherit (5.4 versus 4.9 percent). Nevertheless, on average male heirs receive substantially larger inheritances than their female counterparts (around 24761 versus 11802 euros).[15] So, though not very common, inheritances represent substantial positive wealth shocks in the Netherlands.

As mentioned above, a general critique of using inheritances as a wealth shock is that inheritances are related to unobserved characteristics of the parent, which are likely to be correlated to characteristics of the heir. Because we eliminate unobserved time-constant heterogeneity through first differencing, this is not a problem in this study.

House price developments

Several scholars (e.g. Hurst and Lusardi, 2004; Disney and Gathergood, 2009) have proposed to use house price developments as an alternative for inheritances as an exogenous wealth shock (Henley (2004) also exploit regional house price variation). Following this approach, we make use of the Dutch house price index, which is provided by Kadaster Netherlands. We exploit price variation in three dimensions: year, province (twelve) and types of housing (six: four types of single-family houses, apartments, other).[16] We calculate the percentage change between year t-3 and year t-2 for province X and house type Y and include this variable as the wealth shock. Following Henley (2004), the

[14] This is a problem in some other studies as well (e.g. Henley, 2004).
[15] Like the wealth variables, the level of inheritances have been converted to real terms using the Consumer Price Index and are expressed in year 2000 prices.
[16] In a study on the effects of borrowing constraints on labour market participation, Bottazi (2004) also uses information on different house types.

change the house prices interacts with a dummy indicating homeownership in the empirical analysis.

Housing wealth is typically the most important component of the household's wealth portfolio and for that reason substantial effects may be expected. Using regional housing price developments as a source of exogenous variation may however involve some problems. First of all, like inheritances they may be anticipated and therefore may not be considered as pure windfalls. Second, as argued by Lettau and Ludvigson (2004), housing price increases should be considered as permanent to affect consumption. A similar argument holds for the impact on labour supply. When house prices have increased but are expected to decline again in the (near) future, home owners will not perceive the increase in their housing equity as a permanent wealth increase. Third, one may argue that housing wealth is illiquid and households may experience difficulties liquefying housing price increases. Empirical evidence suggest that house price developments are positively related to consumption (Bostic et al., 2009) but effects on labour market tend to be small or insignificant.[17]

Changes in regional housing prices are of course correlated to changes in regional economic conditions, which also affect working hours. For that reason, it is imperative to take into account the local economic climate: we address issue this by controlling for the province level unemployment and by including region and year dummies.

Perceived wealth shocks

Next to data on inheritances and regional house price developments, we also exploit information on expectations to construct variables that indicate whether the worker experienced an unexpected wealth gain or loss. The DHS contains the following question: "Are you planning to put money aside in the next twelve months".[18] There are five answer possibilities to this question: 1) "Yes, certainly"; 2) "Yes, maybe"; 3) "Probably not"; 4) "Certainly not"; 5) "I don't know". We use this information to create the following dummies:

[17] Previous research found significant effects of house price developments on working hours (Henley, 2004), but no or minor effects on retirement (Disney et al., 2010) and self-employment (Disney and Gathergood, 2009).

[18] Van Ooijen et al. (2010) use this information to select a sample that experienced unexpected wealth changes. In their analysis of wealth effects on labour supply, Benito and Saleheen (2011) also exploit data from the BHPS on expectations about the future household situation to construct dummies indicating whether the individual received an unanticipated financial shock.

- Positive wealth shock: those who are "Certainly not" planning to put money aside but 12 months later reported to have done so;
- Negative wealth shock: those who report "Yes, certainly" but did not put money aside during the next 12 months.

The positive wealth shocks appeared to be extremely rare. Therefore, we also counted as a positive wealth shock those who a) are "certainly not" planning to put money aside but during the next 12 months received an income that was higher than the expenditures (according to the EXPINC variable, see 6.3.5); and b) those "probably not" " planning to put money aside but managed to put aside a substantial amount of money (over 5000 euros) during the following 12 months. Under this definition, 2.2 percent of the workers experienced a positive and 5.7 percent a negative wealth shocks. Men are more likely to be hit by both types of wealth shock than women, though the differences are minor.

As discussed above, changes in wealth due to inheritances and house price developments may be to some extent expected. An important advantage of these perceived wealth shock variables is that they capture (ex post) surprises in financial wealth. This is especially important when wealth affects labour supply only through the forecast error (Section 6.2.1, equation (6.9)). Yet, a potential problem exists when these wealth shocks are related to changes in preferences for work. In the empirical analyses, we test for the possibility of shifts in preferences.

6.4 Results

6.4.1 Wealth and working hours

The first strategy is to estimate the first difference model using reported wealth levels as the central right-hand side variable. Because in DHS wave t (calendar year T) the wealth level is reported for the end of year T-1, we make use the following indicators of A_{it-1}:

- the level of wealth reported in wave t. Because the wealth information is retrospective, the level of wealth reported at time t involves a lag. However, wealth is reported for the end of year T-1 and therefore refers to a point in time between wave t and t-1;
- the level of wealth reported in wave t-1. Since this wealth data refers to the end of year T-2, it provides information on wealth before time t-1.

Four different measures of wealth are used: gross and net liquid wealth and gross and net total wealth. The equations are estimated using the log transformation of gross wealth and the hyperbolic sine transformation of net wealth.[19]

Table 6-6 Wealth and working hours: men

	Actual hours		Contractual hours		Desired hours	
	Level (1)	Log (2)	Level (3)	Log (4)	Level (5)	Log (6)
Wealth						
Liquid wealth (gross)	0.0567	0.00166	-0.0136	-0.000765	0.0149	3.62e-05
	(0.0429)	(0.00140)	(0.0233)	(0.000931)	(0.0456)	(0.00189)
Observations	5548	5548	5686	5686	5176	5176
Liquid wealth (net)	0.0174	0.000672	-0.0104	-0.000388	0.00841	0.000367
	(0.0214)	(0.000726)	(0.00990)	(0.000384)	(0.0230)	(0.000927)
Observations	5366	5366	5686	5686	5007	5007
Total wealth (gross)	0.0171	0.000241	-0.0234	-0.00191	-0.0354	-0.00113
	(0.0842)	(0.00225)	(0.0341)	(0.00150)	(0.0929)	(0.00337)
Observations	5273	5273	5404	5404	4912	4912
Total wealth (net)	-0.00114	0.000457	-0.0112	-0.000488*	0.0251	0.000825
	(0.0209)	(0.000966)	(0.00720)	(0.000255)	(0.0334)	(0.00147)
Observations	5071	5071	5191	5191	4726	4726
Lagged wealth						
Liquid wealth (gross)	0.00116	0.000543	0.0231	0.000888	-0.0961*	-0.00345
	(0.0483)	(0.00156)	(0.0284)	(0.00120)	(0.0530)	(0.00216)
Observations	4853	4853	4989	4989	4537	4537
Liquid wealth (net)	0.00577	6.43e-05	-0.00283	-0.000174	-0.0754***	-0.00337***
	(0.0199)	(0.000634)	(0.0105)	(0.000431)	(0.0277)	(0.00118)
Observations	4736	4736	4867	4867	4427	4427
Total wealth (gross)	-0.0198	-0.00209	-0.0658	-0.00195	0.199*	0.00870*
	(0.107)	(0.00342)	(0.0545)	(0.00185)	(0.115)	(0.00457)
Observations	4084	4084	4182	4182	3785	3785
Total wealth (net)	-0.00544	-0.000523	-0.0184*	-0.000716	-0.0323	-0.000997
	(0.0236)	(0.000822)	(0.0108)	(0.000450)	(0.0328)	(0.00139)
Observations	3960	3960	4053	4053	3673	3673

Note: In all estimations the following controls are used: age squared, marital status, number of children (dummies), educational level, province level of unemployment, contract type (permanent Y/N), civil servant, tenure, characteristics of the partner (age squared; educational level; employment status), region (four regions), year (dummies). Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The effects are estimated separately for men and women. The main findings are presented in Table 6-6 (men) and Table 6-7 (women): in the upper parts of the tables the results for the estimation using the first difference of year T-1 data are shown; the bottom

[19] As gross wealth may be zero and net wealth may be non-positive, instead of log transformations of this variable we use the hyperbolic sine transformation of wealth A: $\sinh^{-1} A = \ln(A + \sqrt{(A^2 + 1)})$

parts present the results using wealth lagged (T-2) instead. The results for men are in general not consistent. In some specifications the sign of the coefficient of wealth is positive, while it is negative in others. Furthermore, most coefficients are insignificant. Exceptions are the relation between net total wealth and log contractual hours and net total wealth (lagged) and the level of contractual hours: in line with the theoretical predictions, total wealth is negatively related to working hours. Furthermore, the findings on the relations between lagged wealth and desired are remarkable. As predicted, liquid wealth is negatively related to desired working hours. However, gross total wealth is negatively associated with the desired weekly hours of work. An explanation for the latter result could be that total wealth may increase substantially when the individual or household purchases

Table 6-7 Wealth and working hours: women

	Actual hours		Contractual hours		Desired hours	
	Level (1)	Log (2)	Level (3)	Log (4)	Level (5)	Log (6)
Wealth						
Liquid wealth (gross)	-0.00171	0.000407	0.0162	0.000894	-0.0625	-0.00323
	(0.0698)	(0.00313)	(0.0402)	(0.00235)	(0.0684)	(0.00294)
Observations	3387	3387	3388	3388	3283	3283
Liquid wealth (net)	0.0209	0.000819	-0.00769	4.37e-05	-0.0347	-0.00177
	(0.0318)	(0.00130)	(0.0266)	(0.00141)	(0.0272)	(0.00132)
Observations	3237	3237	3239	3239	3137	3137
Total wealth (gross)	0.0921	0.00431	0.112	0.00373	-0.0477	-0.00101
	(0.116)	(0.00536)	(0.0952)	(0.00505)	(0.138)	(0.00609)
Observations	3017	3017	3013	3013	2918	2918
Total wealth (net)	0.0488*	0.00223*	0.00572	0.000567	0.0249	0.00168
	(0.0277)	(0.00116)	(0.0147)	(0.000737)	(0.0294)	(0.00119)
Observations	2859	2859	2856	2856	2763	2763
Lagged wealth						
Liquid wealth (gross)	0.0489	0.00144	0.0669	0.00330	0.0748	0.00373
	(0.0686)	(0.00292)	(0.0458)	(0.00252)	(0.0770)	(0.00353)
Observations	2910	2910	2913	2913	2823	2823
Liquid wealth (net)	0.0190	0.00112	-0.000602	-9.97e-05	-0.0187	-0.000508
	(0.0349)	(0.00173)	(0.0323)	(0.00157)	(0.0270)	(0.00133)
Observations	2795	2795	2800	2800	2711	2711
Total wealth (gross)	-0.263*	-0.0111*	-0.159	-0.00630	-0.179	-0.00761
	(0.135)	(0.00631)	(0.121)	(0.00602)	(0.153)	(0.00734)
Observations	2279	2279	2279	2279	2205	2205
Total wealth (net)	-0.0559**	-0.00227**	-0.0168	-0.000873	-0.0765***	-0.00277**
	(0.0230)	(0.000985)	(0.0201)	(0.00101)	(0.0294)	(0.00140)
Observations	2166	2166	2168	2168	2094	2094

Note: For the list of controls, see note Table 6-6. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

a house. The acquisition of a house may also create mortgage commitments and thereby impose liquidity constraints, reducing the scope to reduce hours of work (e.g. Aldershof et al., 1997; Bottazi, 2004; Bottazi et al., 2007).

For women, in various specifications wealth and working hours are significantly related, though the signs of the coefficients are not consistent. As expected, the results point to a negative and in some cases a significant relation between lagged total wealth (gross and net) and the individual's actual and desired working hours. However, the relation between (non-lagged) total net wealth has the opposite sign: an increase in total wealth is associated with increases in actual working hours. It is clear from Table 6-7 that the relations between wealth and working hours are in general insignificant.

These findings should of course be interpreted with caution. As discussed above, the relation between wealth and working hours can be considered endogenous for various reasons. Using information from end of the year T-1 may lead to additional endogeneity problems as wealth and working hours are closely linked through income. When workers increased (decreased) their working hours just after time t-1, they may have accumulated (depleted) wealth. This is a plausible explanation for the positive coefficient estimates of the wealth variables.

6.4.2 Wealth proxies and working hours

Instead of using the first difference in wealth, we also use variables that indicate changes in wealth. These variables refer to the current financial situation of the household (FINSITU), are based on a comparison between the income and expenditures over the past twelve months (EXPINC) or indicate whether and how much money the individual has put aside during the past twelve months (ASIDE/ASIDEQ).

Table 6-8 (men) and Table 6-9 (women) demonstrate the estimation results using these proxies for wealth changes. First consider the results for men. The findings indicate that workers who have saved a little, break even or draw upon their savings increase their actual and contractual working hours more than those who save a lot. Although some of the coefficients are individually significant, the FINSITU dummies are jointly insignificant. A surprising result is that the coefficient of the variable indicating that the household is making debt is insignificant, while it could be expected that especially workers in such a financial state are likely to adjust their hours upward. The results for the dummies indicating whether expenditures where below, about equal or above total income are generally in line with the expectations: when the household has spent about the same or

more than the total household income in the twelve months prior to t-1, the worker is likely to increase actual and contractual working hours. However, whether the worker has overspent does not significantly affect the number of desired working hours. The final type of proxies refer to whether and how much money the worker (household) has put aside in the preceding year (ASIDE(Q)). In general the results for ASIDE(Q)) are weak and insignificant, though in the specification using actual hours the results are to some extent in line with the expectations.

Turning to the results for women, Table 6-9 shows that, as for men, working hours are not consistently affected by the perceived financial situation of the household. An interesting category seems to be 'just manageable': in the estimations where actual and contractual hours are used as the dependent variable, the coefficient of this specific dummy is the largest and highly significant, whereas the coefficients of most other dummies appear to be individually insignificant. If workers are just able to manage their finances, they increase working hours substantially more than when they would save a lot. It could be the case that these workers face binding liquidity constraints. For those workers, it may be neither possible to draw upon savings (as they are depleted) nor to make debts (as the individual does not have access to credit). Moreover, the results for EXPINC point out that particularly when the worker has spend more than her income in the past twelve months, she is more likely to increase the number of working hours. Finally, the strongest evidence for the wealth effects on working hours are obtained when the ASIDE(Q) dummies are used as proxies for wealth changes. Overall, the more money the worker has set aside in the previous period, the lower the actual, contractual and desired working hours in the current period. In contrast to the findings for men, the coefficients are jointly and (in most cases) individually significant. These findings thus support the theoretical prediction that wealth gains depress labour supply.

To conclude, using proxies for wealth changes, the findings indicate that wealth negatively affects working hours. However, the results are not completely consistent across specifications. Overall the evidence on wealth effects is more convincing for women.

Table 6-8 Wealth proxies and working hours: men

	Actual hours		Contractual hours		Desired hours	
	Level	Log	Level	Log	Level	Log
	(1)	(2)	(3)	(4)	(5)	(6)
Financial situation (FINSITU)						
ref.: lot of money saved						
Some money is saved	0.127	0.00559	0.191**	0.00609	0.155	0.00678
	(0.167)	(0.00522)	(0.0965)	(0.00396)	(0.221)	(0.00871)
Just manageable	0.428**	0.0109	0.256**	0.00964**	0.107	0.00581
	(0.199)	(0.00667)	(0.110)	(0.00442)	(0.252)	(0.0102)
Draw upon savings	0.384	0.0155*	0.330**	0.0147**	-0.0422	-0.00404
	(0.272)	(0.00929)	(0.138)	(0.00658)	(0.338)	(0.0137)
Making debts	-0.131	-0.00591	0.0888	0.000251	0.498	0.0207
	(0.469)	(0.0158)	(0.287)	(0.0123)	(0.551)	(0.0181)
F-test statistic	1.719	1.242	1.936	1.841	0.330	0.532
Observations	5951	5951	6101	6101	5550	5550
Expenditures and income (EXPINC)						
ref.: expend. < income						
expend. = income	0.589***	0.0173**	0.249**	0.0118**	0.0415	0.00503
	(0.185)	(0.00679)	(0.110)	(0.00505)	(0.232)	(0.00938)
expend. > income	0.449***	0.0143***	0.167**	0.00753**	0.214	0.00829
	(0.129)	(0.00430)	(0.0726)	(0.00309)	(0.178)	(0.00711)
F-test statistic	8.389***	6.928***	3.891**	4.406**	0.732	0.711
Observations	5926	5926	6074	6074	5526	5526
Money aside (ASIDE)						
Put money aside (0/1)	-0.339**	-0.00777	-0.0815	-0.00221	-0.141	-0.00230
	(0.151)	(0.00542)	(0.0891)	(0.00378)	(0.177)	(0.00705)
Observations	5950	5950	6100	6100	5549	5549
Put money aside (ASIDEQ)						
ref.: put no money aside						
<1500	-0.444*	-0.0131	-0.0793	-0.00260	-0.149	-0.00148
	(0.228)	(0.00809)	(0.140)	(0.00591)	(0.277)	(0.0109)
1.500-5.000	-0.293*	-0.00588	-0.0563	-0.00147	-0.0410	0.000271
	(0.165)	(0.00585)	(0.0947)	(0.00403)	(0.200)	(0.00787)
5.000-12.500	-0.359**	-0.0104*	-0.160	-0.00566	-0.467*	-0.0148
	(0.182)	(0.00603)	(0.107)	(0.00440)	(0.244)	(0.00932)
12.500-20.000	-0.447	-0.00688	-0.130	-0.00366	-0.169	-0.00966
	(0.337)	(0.0111)	(0.143)	(0.00488)	(0.389)	(0.0166)
>20.000	-0.728	-0.0181	0.0349	0.000635	-0.0886	0.00852
	(0.486)	(0.0126)	(0.165)	(0.00523)	(0.776)	(0.0320)
F-test statistic	1.362	0.925	0.642	0.517	0.843	0.734
Observations	5725	5725	5868	5868	5348	5348

Note: For the list of controls, see note Table 6-6. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

Table 6-9 Wealth proxies and working hours: women

	Actual hours		Contractual hours		Desired hours	
	Level (1)	Log (2)	Level (3)	Log (4)	Level (5)	Log (6)
Financial situation (FINSITU)						
ref.: lot of money saved						
Some money is saved	0.0760	0.00101	0.353*	0.0208**	0.0939	0.00288
	(0.259)	(0.0108)	(0.191)	(0.00885)	(0.225)	(0.00943)
Just manageable	0.832***	0.0369***	0.859***	0.0468***	0.560*	0.0252*
	(0.305)	(0.0124)	(0.227)	(0.0113)	(0.292)	(0.0135)
Draw upon savings	0.475	0.0270*	0.385*	0.0205*	0.827**	0.0398**
	(0.349)	(0.0146)	(0.224)	(0.0108)	(0.337)	(0.0159)
Making debts	-0.436	-0.0248	0.289	0.00320	0.462	0.0200
	(0.445)	(0.0181)	(0.396)	(0.0184)	(0.575)	(0.0254)
F-test statistic	3.768***	5.159***	3.691***	4.539***	2.575**	2.566**
Observations	3590	3590	3594	3594	3466	3466
Expenditures and income (EXPINC)						
ref.: expend. < income						
expend. = income	0.169	0.0140	0.113	0.00598	0.686***	0.0395***
	(0.256)	(0.0108)	(0.187)	(0.00944)	(0.264)	(0.0125)
expend. > income	0.407**	0.0193**	0.395***	0.0228***	0.527***	0.0232***
	(0.188)	(0.00824)	(0.143)	(0.00730)	(0.177)	(0.00802)
F-test statistic	2.344*	2.889*	3.869**	4.881***	6.632***	7.937***
Observations	3574	3574	3578	3578	3450	3450
Money aside (ASIDE)						
Put money aside (0/1)	-0.708***	-0.0328***	-0.718***	-0.0326***	-0.575**	-0.0224**
	(0.242)	(0.0100)	(0.175)	(0.00936)	(0.241)	(0.0113)
Observations	3587	3587	3591	3591	3463	3463
Put money aside (ASIDEQ)						
ref.: put no money aside						
<1500	-0.564*	-0.0305**	-0.456**	-0.0181	-0.510*	-0.0242*
	(0.330)	(0.0150)	(0.219)	(0.0122)	(0.283)	(0.0134)
1.500-5.000	-0.646**	-0.0288***	-0.735***	-0.0341***	-0.518*	-0.0192
	(0.261)	(0.0107)	(0.200)	(0.0106)	(0.276)	(0.0131)
5.000-12.500	-0.672**	-0.0290**	-0.867***	-0.0421***	-0.628**	-0.0206
	(0.314)	(0.0126)	(0.236)	(0.0115)	(0.306)	(0.0136)
12.500-20.000	-1.453***	-0.0552**	-1.176***	-0.0468**	-1.580***	-0.0643***
	(0.558)	(0.0220)	(0.443)	(0.0217)	(0.468)	(0.0215)
>20.000	-2.180**	-0.0826***	-1.043**	-0.0503***	-0.805	-0.0295
	(0.867)	(0.0304)	(0.495)	(0.0191)	(0.754)	(0.0280)
F-test statistic	2.994**	3.042***	4.450***	3.997***	2.524**	1.970*
Observations	3385	3385	3388	3388	3280	3280

Note: For the list of controls, see note Table 6-6. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

6.4.3 Wealth shocks and working hours

In order address the endogeneity of wealth, several variables are used that represent wealth shocks: the estimation results for men and women are shown in Table 6-10 and Table 6-11. Inheritances and gifts provide a first source of wealth shocks. Like the wealth data, information on inheritances is retrospective: respondents are asked in wave t whether they have received an inheritance during calendar year T-1. We estimate the model using data on inheritances from wave t [year T-1] and t+1 [year T].[20] In the latter case we assume that respondents either already received at time t the bequest reported for year T or expect to receive it within a couple of months.

For men, receiving an inheritance in year T-1 significantly reduces the number of desired working hours. Furthermore, when the level of inheritances instead of a dummy is used, inheritances appear to decrease not only desired but also contractual hours. The level of inheritances received in year T is also significantly negatively related to actual working hours. The effects of inheritances are different for women: no significant effect is found for inheritance received in year T-1, while inheritances received in year T reduce all types of working hours (in some specifications significantly). Especially the evidence on the effects on desired weekly hours of work is strong. These results seem to indicate that women respond more rapidly to wealth gains than men, suggesting that working hours constraints are more relevant for men. We also found some (weak) evidence that women respond to future inheritances (these findings are not reported), which indicates that the inheritances are to some extent anticipated.

Next, we consider the impact of regional housing price developments. Actual and contractual working hours of men do not seem to respond to shocks in the house price. Surprisingly, desired working hours are positively related to regional housing price changes. A potential explanation for this result is that house price increases create higher (expected) mortgage commitments. For women, the results are consistent with the theoretical predictions. In fact, negative positive relations are found for all three working hour types and the size of the coefficients is rather similar across the specifications. A 10 percent increase in regional house prices is associated with around 2.8 percent decrease in actual working hours. As expected, the effect on actual hours is somewhat larger than the effect on contractual hours, which are more difficult to adjust. The finding that the working hours of women respond negatively to house price increases could also explain the result

[20] We also estimated the model using wave t-1 [year T-2] data on inheritances but did not found any significant relation between lagged inheritances and working hours.

on desired hours for men: when women decrease their working hours, their spouses may prefer to increase hours of work as a response to the resulting drop in household income.

Table 6-10 Wealth shocks and working hours: men

	Actual hours		Contractual hours		Desired hours	
	Level (1)	Log (2)	Level (3)	Log (4)	Level (5)	Log (6)
Received inheritance [T-1]	-0.147	-0.00576	-0.172	-0.00740	-0.694**	-0.0205*
	(0.239)	(0.00738)	(0.135)	(0.00500)	(0.324)	(0.0106)
	6269	6269	6425	6425	5838	5838
Log inheritance [T-1]	0.00625	-0.000235	-0.0361**	-0.00141**	-0.0606*	-0.00168
	(0.0318)	(0.00107)	(0.0162)	(0.000602)	(0.0366)	(0.00118)
	6230	6230	6383	6383	5801	5801
Received inherit [T]	-0.307	-0.00932	0.103	0.00383	0.228	-0.000941
	(0.230)	(0.00635)	(0.164)	(0.00763)	(0.356)	(0.0126)
	4549	4549	4642	4642	4215	4215
Received inheritance [T]	-0.0514*	-0.00133*	0.0242	0.00109	-0.00441	-0.00123
	(0.0298)	(0.000805)	(0.0259)	(0.00129)	(0.0454)	(0.00179)
	4522	4522	4614	4614	4190	4190
House price change (%)	0.00514	-5.18e-06	-0.00229	-0.000111	0.0569***	0.00199**
	(0.0162)	(0.000593)	(0.0101)	(0.000457)	(0.0204)	(0.000849)
	5474	5474	5588	5588	5059	5059
Positive shock	0.208	0.00520	0.0760	0.000554	-0.140	-0.00511
	(0.443)	(0.0133)	(0.222)	(0.00813)	(0.564)	(0.0172)
Negative shock	0.637**	0.0148	-0.131	-0.00428	-0.314	-0.0145
	(0.319)	(0.0102)	(0.173)	(0.00687)	(0.388)	(0.0151)
	4526	4526	4644	4644	4224	4224

Note: For the list of controls, see note Table 6-6. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

The third and final indicator of wealth shocks is constructed using data on expectations about future saving behaviour. Some workers have put some money aside while they did not expect to do so in the previous year (positive shock); others were planning to accumulate savings but did not manage to put money aside (negative shock). These wealth shocks seem to have ambiguous effects on the labour supply of men. In general, the impact of these unanticipated wealth shocks is insignificant. Nevertheless, as predicted, the effect of a negative shock on actual hours is positive and significant (in the level of hours specification). For women, the effects are stronger and more significant. The estimation results are in line with the theoretical predictions: positive wealth shocks decrease working hours, although this effect is in most cases insignificant (except for the specification where the level of contractual hour is used). The results for negative wealth

shocks are more convincing: in almost all specifications, the coefficient of this variable has the expected sign (positive) and is statistically significant. The effects on actual and desired hours are particularly substantial: a negative wealth shock increases actual working hours by 0.7 (3 percent) and desired working hours by 1.8 (10 percent).

Table 6-11 Wealth shocks and working hours: women

	Actual hours		Contractual hours		Desired hours	
	Level (1)	Log (2)	Level (3)	Log (4)	Level (5)	Log (6)
Received inheritance [T-1]	0.0797	0.00331	-0.0351	0.00724	-0.0321	0.00623
	(0.394)	(0.0153)	(0.310)	(0.0151)	(0.390)	(0.0161)
	3819	3819	3823	3823	3684	3684
Log inheritance [T-1]	0.0422	0.00156	0.0107	0.00105	-0.0314	-0.000182
	(0.0528)	(0.00204)	(0.0351)	(0.00163)	(0.0475)	(0.00199)
	3788	3788	3793	3793	3684	3684
Received inherit [T]	-0.587	-0.0286*	-0.371	-0.0615	-0.794**	-0.0355**
	(0.425)	(0.0162)	(0.301)	(0.0443)	(0.349)	(0.0164)
	2650	2650	2650	2650	2559	2559
Received inheritance [T]	-0.0850	-0.00339*	-0.0163	-0.00254	-0.110**	-0.00479**
	(0.0548)	(0.00193)	(0.0120)	(0.00176)	(0.0431)	(0.00207)
	2634	2634	2636	2636	2543	2543
House price change (%)	-0.0520**	-0.00280***	-0.0523***	-0.00255***	-0.0588**	-0.00257**
	(0.0216)	(0.000990)	(0.0176)	(0.000920)	(0.0231)	(0.00106)
	3189	3189	3193	3193	3067	3067
Positive shock	-0.384	-0.0114	-0.936*	-0.0432	-0.399	-0.0122
	(0.944)	(0.0374)	(0.536)	(0.0287)	(0.598)	(0.0305)
Negative shock	0.767*	0.0316**	0.422*	0.0118	1.596**	0.0675**
	(0.421)	(0.0158)	(0.222)	(0.00899)	(0.640)	(0.0324)
	2620	2620	2621	2621	2536	2536

Note: For the list of controls, see note Table 6-6. Clustered standard errors in parentheses.
*** p<0.01, ** p<0.05, * p<0.1

In order to interpret these coefficients as causal effects, a necessary condition is that the wealth shock dummies measure unexpected changes in wealth. Preferences for work (or leisure) are for instance assumed to be stable between time t-2, when the respondent fills in the questions on saving expectations, and time t-1, when the actual savings behaviour is reported. However, when preferences for working hours also change within that specific time frame, it is not clear whether the unexpected wealth shock is the result of a change in preferences or an exogenous event. This explanation seems unlikely as there is no significant correlation between wealth shocks and changes in desired working hours.

Furthermore, we test this alternative explanation by including the lag of the first difference of desired working hours in the specifications with actual and contractual hours. If the main results are driven by changes in preferences, the coefficient of the wealth shock dummies can be expected to become smaller or insignificant, assuming that the change in desired hours of work captures changes in work and leisure preferences. Yet, the coefficients of the negative wealth shock dummy become somewhat larger and more significant after controlling for lagged changes in desired working hours. Changes in preferences for work are thus unlikely to explain the results.

6.5 Conclusion and discussion

This chapter studies the effects of wealth on working hours in the Netherlands. The empirical results do not point out clear and unambiguous relations between wealth levels and working hours when wealth is directly measured. Relying on self-assessed indicators of changes in wealth, we find some evidence of negative wealth effects on labour supply. The effects seem to be more pronounced for women than for men. Furthermore, to take into account the endogeneity of wealth, information on inheritances, developments in the local housing prices and unanticipated wealth gains and losses are used as sources of exogenous variation in wealth. In general the labour supply of women appears to be substantially affected by wealth shocks, while the impact on working hours of men may be limited. This finding is consistent with many previous labour economics research. In his study on wealth effects on labour supply, Henley (2004) also reached this conclusion. Furthermore, the large amount of evidence on labour supply elasticities point out that the wage rate hardly affects the working hours of men, whereas it significantly determines women's labour market behaviour.

The empirical result that women respond stronger to wealth shocks than men could be explained by gender differences in working hours flexibility. Full-time employment remains the standard for men and rigidities in working hours may be persistent for male workers. An alternative explanation is that women have a lower level of labour attachment. In the Netherlands, most women are employed in part-time jobs and are the main (child) care providers of the household. As such, they typically are the secondary wage earners. At the household level, labour supply adjustments may primarily occur through working hours changes of women: when the household faces a negative wealth shock, women may increase their weekly hours of work, whereas windfall gains provide women the

opportunity to decrease working hours. Labour supply of women thus seems to function as a buffer, which allows the household to smooth leisure and consumption over time.

A variety of wealth shocks are used in this study to identify wealth effects. Of course, the use of these wealth shocks may be criticised for various reasons: inheritances may be anticipated, house price developments may be illiquid and therefore such windfalls are not used to finance reductions in labour supply. In addition, the measures of perceived unexpected changes in wealth may capture changes in preferences. In order to test the robustness of the empirical analyses, it is therefore important to include various alternative measures of wealth shocks.

A direction for future research is to assess the validity of windfalls, such as inheritances and house price developments, as exogenous wealth shocks. For instance, it may be interesting to distinguish between outright and mortgage homeowners. This study shows that relying on information on expectations may be an innovative strategy to differentiate between anticipated and unanticipated wealth shocks. Finally, future studies could make an effort to distinguish between wealth effects that operate through the forecast error and wealth effects that are due to liquidity constraints.

Appendix 6A Controls

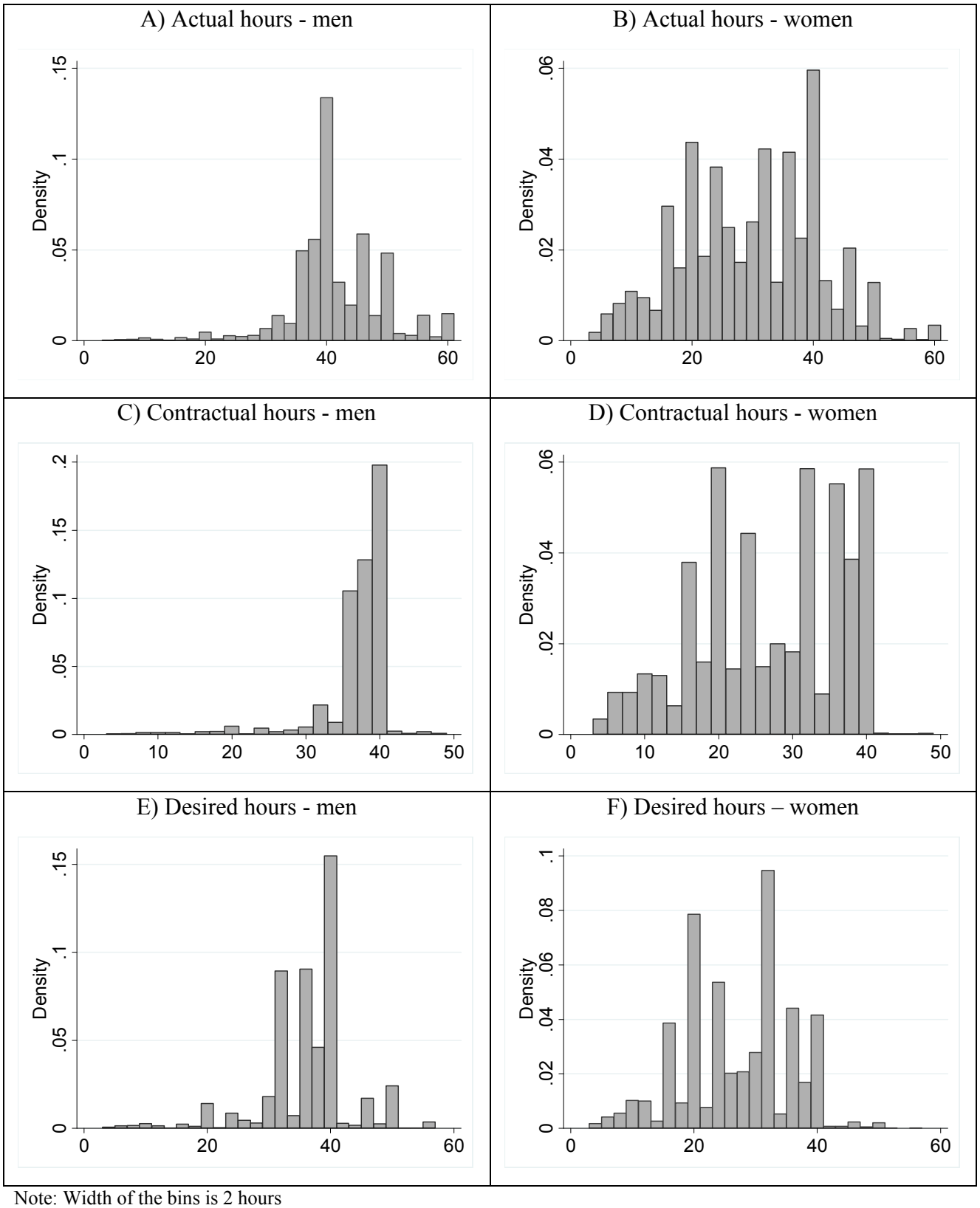
Table 6A-1 Descriptives

Variable	Mean (Std. Dev.) Men	Women
Age	45.47	43.21
	(8.90)	(9.54)
Age partner	43.47	45.56
	(9.22)	(9.98)
Unemployment rate	5.55	5.53
	(1.45)	(1.46)
Tenure	14.54	9.95
	(10.93)	(8.64)
	Fraction	
	Men	Women
Married	71.91	65.46
No children	47.12	52.61
One child	13.23	12.52
Two children	26.24	25.43
Two or more children	13.41	9.44
Education level:		
Pre-vocational (VMBO) or below	25.59	24.42
Pre-university (HAVO/VWO)	9.09	12.69
Senior vocational (MBO)	23.26	21.31
Vocational college (HBO)	27.80	31.68
University	14.30	9.90
Permanent	96.80	93.26
Civil servant	21.73	22.95
Region:		
North	10.21	10.12
East	20.06	20.74
South	27.71	23.17
West	42.02	45.98
Partner present	80.59	76.97
Partner employed	52.52	87.88
Education level of partner:		
Pre-vocational (VMBO) or below	37.78	25.20
Pre-university (HAVO/VWO)	10.91	10.17
Senior vocational (MBO)	23.03	24.57
Vocational college (HBO)	21.50	27.22
University	6.78	12.83

Note: Descriptives for partner variables are shown for individuals who report a partner is present

Appendix 6B Distribution of working hours

Figure 6B-1 Working hours distributions: men and women



Note: Width of the bins is 2 hours

Chapter 7
Conclusion

7.1 Summary of main findings

The aim of this dissertation is to test behavioural assumptions in labour economics models and thereby improve our understanding of labour market behaviour. The assumptions under scrutiny in this study are derived from an analysis of recent influential policy proposals: the introduction of savings schemes in the system of social security. Savings schemes can be used to finance unemployment (unemployment accounts), or alternatively, to facilitate voluntary labour market transitions (life course schemes). A central question in this thesis is how these reforms will affect labour market incentives and behaviour. Part I (Chapter 2 and 3) investigates these proposals and points out which behavioural assumptions are critical for the effectiveness of savings schemes. Part II (Chapters 4-6) tests these critical assumptions empirically. All the empirical analyses presented in the second part of the dissertation are based on the Dutch DNB Household Survey (DHS), a representative longitudinal survey collected annually by CentERdata (since 1993).

Chapter 2 examines the behavioural effects of replacing the existing unemployment insurance system with unemployment accounts (UAs). Under this alternative system, workers are required to save a fraction of their wage in special accounts whereas the unemployed are allowed to withdraw savings from these accounts. Previous studies argued that such a reform will improve employment incentives considerably and thereby lead to a dramatic decrease in unemployment levels and durations. It can be shown that the impact of the reform on employment incentives is twofold. First, the UAs system provides an incentive to avoid unemployment through a 'retirement bonus': this is a distant future incentive. Second, because the mandatory savings rate under the UAs system is higher than the tax rate to finance unemployment under the unemployment insurance system, the reform will decrease current wages (net of taxes and mandatory savings). A move from an unemployment insurance system to an UAs system thus weakens short-term incentives and strengthens long-term incentives. The expected impact of UAs hinges therefore critically on the assumptions on intertemporal choice. Previous studies assume that the population consists entirely of exponential discounters and that the discount rate is equal to the

prevailing interest rate. Under these assumptions, the net change in employment incentives is substantial and positive – at least for those who expect to retire with a positive account balance. However, when a more plausible level of the discount rate is assumed, the impact of the reform is ambiguous and depends to a large extent on the distance to retirement. Furthermore, if we assume hyperbolic instead of standard exponential discounting, the reform is likely to backfire: relying on distant future incentives to reduce unemployment seems to be an ineffective strategy. This leads to the first behavioural assumption to be tested: how do time preferences affect job search behaviour and labour market transitions? Is job search behaviour consistent with an exponential or hyperbolic discounting model? These questions are analysed empirically in Part II (Chapter 4 and 5).

Next, Chapter 3 investigates the labour market effects of life course schemes. In contrast to UAs, life course schemes are savings schemes that can be used as general income-smoothing devices: savings accumulated through these schemes can be withdrawn to finance working hours reductions or transitions from paid employment to non-employment. The general presumption is that these savings schemes facilitate transitions between or combinations of paid employment and other life domains (such as education and care). This premise rests on two assumptions: life course schemes promote the accumulation of savings substantially and wealth (or a lack thereof) has a significant impact on labour supply behaviour. Existing theoretical and empirical studies show that savings schemes may affect the composition as well as the level of individual wealth. First, the schemes result in a reallocation of the wealth portfolio: a shift from 'normal' wealth to 'savings scheme wealth'. Second, savings schemes may also raise the total level of savings. Although the evidence on the effect on total savings is not fully consistent, overall studies indicate that savings schemes increase wealth. This effect seems to be especially strong for lower-income households, who have little opportunities to reshuffle their wealth portfolio. Furthermore, the labour market impact of life course schemes depends on how these changes in saving behaviour affect labour supply behaviour. In general, the empirical evidence reviewed in Chapter 3 points out that wealth has an impact on labour market behaviour, but that the size of the effects may be minor. However, most existing studies on this issue focus on the timing of retirement or transitions between unemployment and employment. Evidence on wealth effects on voluntary reductions in labour supply is scarce. Particularly the impact of wealth on the intensive margin labour supply remains an empirical question: this effect is therefore examined in Part II (Chapter 6).

Chapter 4 theoretically and empirically examines the effects of time preferences (patience) on job search behaviour of the unemployed. The central aim is to test the exponential versus the hyperbolic discounting model within a labour market context. The theoretical relations between patience and various job search outcomes depend on whether exponential or hyperbolic discounting is assumed. First, patience positively affects job search intensity as searching for a job involves immediate costs and future gains. This implies a negative relation between patience and the duration of unemployment. Second, patient workers are more selective in accepting job offers, resulting in a positive impact on the duration of unemployment. Which of these two effects dominates depends on whether exponential or hyperbolic discounting is assumed. Under standard exponential discounting, the second effect dominates and patience has a negative effect on exit rates. However, when hyperbolic discounting is assumed, the first effect dominates and patience is positively related with the probability of leaving unemployment. Examining these relations empirically therefore provides a test of the two alternative models of discounting. The empirical results indicate that job search increases with patience, whereas no significant relation between patience and the reservation wage was found. Furthermore, the probability to leave unemployment increases with patience. The findings on job search behaviour of unemployed individuals are thus in line with the hyperbolic discounting model.

Parallel to Chapter 4, the aim of Chapter 5 is also to test the two alternative models of time discounting within a labour market context. However, the focus of this chapter is not on unemployed but on employed individuals. Two types of career investments are central in the analyses: work effort and on-the-job search activities. Whereas the former increases the probability of getting promoted, the latter affects the chance of receiving an outside job offer. A theoretical model is developed which allows for endogenous work effort and on-the-job search intensity. The central assumption of the model is that the gains of promotion are larger but more delayed than the gains of (external) job mobility. Several theoretical predictions are exploited to test the exponential versus the hyperbolic discounting model. Under exponential discounting, patience is positively related to work effort but has an inverse U-shaped relation with on-the-job search effort. However, assuming workers are hyperbolic discounters, patience has a positive effect on both work and job search effort. Furthermore, a negative or inverse U-shaped relation between (exponential) long-run discount factor and the probability of a job transition can be expected, whereas the theoretical relation between the (hyperbolic) short-run discount

factor and external job mobility is ambiguous. The empirical results show that patience is positively related to both types of career investment. These findings appear to be consistent across different model specifications. Furthermore, the results did not indicate a relation between patience and job mobility as predicted by the exponential discounting model. Hence, these results provide support for the hyperbolic discounting model.

In Chapter 6, the effects of wealth and working hours are examined. Assuming that leisure is a normal good, it can be expected that positive wealth shocks reduce labour supply. While previous studies on the effects of wealth on labour supply decisions focused mainly on the extensive margin, this study estimates the impact of wealth on the intensive margin. The Netherlands is an interesting case in this respect as part-time employment is common and there are relatively low barriers to adjust working hours. Several measures of (changes in) wealth and indicators of liquidity constraints are used. In order to identify a causal effect of wealth, data on inheritances and local house price growth is exploited to capture exogenous shocks in wealth. Furthermore, information on expectations about future saving behaviour is used to construct a variable that indicates unanticipated changes in wealth. The findings indicate that workers reduce working hours when they receive a positive wealth shock, but the effects vary according to the source of exogenous variation. The labour supply of men responds significantly to inheritances, while working hours of women are mainly affected by house price developments and unanticipated savings. In general, the evidence points out that wealth effects on working hours are stronger for women.

7.2 Policy implications

Economics has both positive and normative objectives. The discipline not only provides tools to describe behaviour, but also aims to evaluate policies. The economic models that are used to perform policy evaluations are based on assumptions. Changing these underlying assumptions may have important implications for the outcome of policy evaluations. A number of scholars have stressed that assumptions matter crucially in the analyses of welfare states and social security. For instance, Barr (2001: p.12) formulates the intuitive statement that if we assume that risks are absent, insurance is unnecessary: “In a world of certainty, there is therefore little need for a welfare state”. Similarly, it can be demonstrated that introducing important institutional features (Atkinson, 1999) or allowing for imperfect capital markets (Chetty, 2008) has important implications for the optimal

design of the unemployment insurance system. Furthermore, as standard economic models assume that economies are essentially stable and thereby assume away the possibility of systemic crisis, some even claim that the economic profession is (partly) to blame for the current financial and economic crisis (Colander et al., 2009).

This thesis examines assumptions on time preferences and wealth in labour economics. The empirical results show that time preferences affect job search behaviour of the unemployed and career behaviour of workers. The findings reported here are in line with predictions derived from the hyperbolic discounting model and do not support the standard exponential model. Furthermore, though not fully conclusive, the evidence indicates that wealth affects labour supply behaviour. These findings have important implications for unemployment accounts and life course schemes.

Unemployment accounts provide a distant future incentive through a retirement bonus to avoid unemployment, but also decrease present wages (net of mandatory saving). Under hyperbolic discounting this reform is unlikely to be effective and may in fact backfire, as the UAs system worsens short-term and improves long-term employment incentives. Introducing policies that have the reverse effects on incentives would actually be a more sensible strategy. However, the impact of the reform is not the same for all individuals: UAs create winners and losers. On the one hand, those who both expect to have a positive terminal account balance (i.e. low unemployment risk groups) and care significantly about the retirement bonus (i.e. have a low discount rate, 'patient' individuals) are the winners: they face better incentives to remain employed and will have a higher net life-time wealth. On the other hand, individuals who expect to end their working life with a negative UA balance (for example, the long-term unemployed) or do not care about the distant future bonus ('impatient' individuals) are likely to be the losers: the employment incentives will be weaker for these individuals under the UA system than under the current unemployment insurance system. In more general terms, those who perform well on the labour market are the winners and those who perform poorly (in terms of unemployment spells) are the losers of the reform. Introducing UAs is thus likely to increase inequality considerably. Interestingly, patient individuals not only care more about long-term incentives, but, as the findings in Chapter 4 and 5 show, are also more successful on the labour market. Hence, they are likely to be the winners in the UAs system. Because previous studies assume that the population consists completely of patient individuals, it is not surprising that they predict that UAs reduce unemployment substantially. The thesis demonstrates that the claim of UAs proponents that the reform will improve employment

incentives considerably and will have only a minor effect on inequality is based on unrealistic assumptions.

Unlike UAs, life course schemes aim to facilitate voluntary reductions in labour supply. The assumptions are that life course schemes encourage savings and that the changes in saving behaviour affect labour market behaviour. These assumptions seem rather strong. The effects of savings schemes on saving behaviour remain controversial, though in general evidence points out that savings schemes raise the total level of wealth. However, even if savings schemes affect total wealth holdings, the magnitude of the effect may be rather small. Furthermore, empirical evidence points out that the size of the effects of wealth on labour supply is quantitatively small. Obviously, if both the impact of savings schemes on saving behaviour and the wealth effects on labour supply are small, it is likely that the labour market effects of life course schemes are minor. In general, the potential of life course schemes to cover new risks should therefore not be overestimated. Of course, when participation in the savings schemes is low and contributions to these accounts are rather small (as is the case for the Dutch Life Course Savings Scheme), the impact on both savings and labour market behaviour will be small. The evidence presented here indicates some suggestions for improvements of life course schemes. The results show that unanticipated negative wealth shocks increase labour supply of women significantly, which suggests that the presence of liquidity constraints rather than the level of wealth determine labour supply behaviour. Therefore, instead of completely relying on (voluntary) savings, an interesting option could be to introduce the possibility to finance labour supply reductions using a life course scheme credit. Access to this credit facility could be restricted to those with lower wealth holdings.

Overall, the arguments in favour of introducing savings accounts in the system of social security seem weak. First, the effectiveness of UAs depends crucially on time preferences: the reform will only improve labour market incentives substantially if individuals are patient and discount future payoffs exponentially. The findings presented in this dissertation indicate that these assumptions are simply incorrect. Second, life course schemes aim to facilitate transitions to and combinations between work and other life domains by encouraging saving in special accounts. However, the effects of savings schemes on saving behaviour are controversial and the evidence on wealth effects on labour supply remains inconclusive.

Obviously, as this thesis examines general behavioural assumptions, the implications of the findings are not limited to savings schemes. Standard labour economic

models either implicitly or explicitly assume time-consistent, exponential discounting. For instance, this is one of the standard assumptions in the large literature on optimal unemployment insurance. In their influential paper, Hopenhayn and Nicolini (1997) argue that moral hazard of unemployed job seekers can be reduced considerably by introducing a long-term after reemployment wage tax, which increases with the unemployment duration. This is a long-term incentive that may be effective when job seekers are patient and have time-consistent preferences. However, if hyperbolic discounting models describe human behaviour accurately, the standard (exponential) models overestimate the impact of long-run incentives. In that case, policy strategies should rely mainly on short-run incentives to encourage job search and work effort. As job search is an investment activity and individuals have a tendency to postpone such activities, introducing commitment devices to overcome procrastination may be more effective. A policy that combines monitoring of job search effort with short-term sanctions could function as such a commitment device.

In addition to the shape of the discount function, heterogeneity in time preferences (patience) matters. The finding that time preferences affect job search behaviour of the unemployed and career behaviour of the employed has important policy implications. Many active labour market policies are aimed at encouraging job search of the unemployed, particularly those who search insufficiently. As the results indicate, impatient individuals do not search actively and intensively. This is therefore a typical policy target group. To incentivise this group, policies should rely principally on short-term incentives, for instance by decreasing short-term costs or increasing short-term rewards. The same line of reasoning applies to other areas as well, like the promotion of healthy behaviour or investments in education (decreasing dropout rates). Because impatient individuals heavily discount the future benefits of their actions, they tend to invest less in their health and their human capital. This implies that this group tends to be more at risk: public policy should therefore aim to encourage the investments made by the members of this group. But because they are impatient, they respond to incentives in a different way than the average population. This relates to a general problem in economics, but is especially important for welfare analyses: most economic models assume away differences between agents and focus on the 'representative agent' (e.g. Atkinson, 2011, p158). The representative agent is for instance assumed to have a discount rate that is equal to the prevailing interest rate. It is not only dubious whether such an agent can indeed be considered representative, there is also no reason to assume away variation in preferences. Allowing for heterogeneity in

preferences may lead to completely different results. It is therefore simply bad economics to focus exclusively on the policy effects on a self-constructed representative agent.

Finally, the labour supply effects of social security and labour market policies via savings behaviour should be taken into account. Some policies directly influence wealth accumulation, such as pension schemes, but many other policies have a more indirect effect. For example, weakening employment protection will amplify the unemployment risks of employees. Similarly, a cut in the unemployment benefit level will increase the adverse income shock due to a job loss. Both reforms increase the need to save and thereby have a positive effect on labour supply. On the other hand, this increase in the level of savings may be used to finance labour supply reductions. Basically, precautionary savings for unforeseen income shocks may be used as life-cycle savings for anticipated changes in labour supply.

7.3 Directions for future research

The dissertation points out several suggestions for future research. Although this study increases our insights into the impact of social security savings schemes, some questions on this issue remain unanswered. The chapters of this thesis examine whether life course schemes will facilitate labour supply reductions. However, savings schemes eventually aim to increase life-time labour market participation. This topic deserves further research. Moreover, several unexplored areas in labour economics can be identified. Whereas on-the-job search effort is a critical variable in job search models, the empirical labour economics literature has ignored this variable almost completely and instead concentrates on job duration and mobility data. On-the-job search behaviour is therefore an important area for future empirical studies. In addition, research should re-examine the validity of windfalls, such as inheritances and house price developments, as sources of exogenous variation in wealth. Relying on information on expectations may be an innovative strategy to differentiate between anticipated and unanticipated wealth shocks.

This thesis shows that time preferences affect labour market behaviour. The relation between economic preferences and economic behaviour is an interesting field that, until recently, has been largely ignored. One important question in this respect is how to measure preferences. Many previous studies relied on behavioural proxies (e.g. smoking, having a life insurance) to measure an individual's degree of patience. The results show that using such noisy indicators may lead to misleading outcomes. Instead, future research

could exploit more general self-assessed information such as psychological scales. Other relevant questions in this are whether preferences are stable or change over time. Can they be influenced? The latter question is very relevant for public policy. Training or educational programs that increase the individual's level of patience may be socially productive investments. Since early childhood programs affect non-cognitive skills (Borghans et al., 2008; Cunha and Heckman, 2010), it is likely that patience may be affected by investments at very early stages of the life cycle.

A general message is that introducing more realistic assumptions in economic models may improve our analyses of human behaviour. This seems therefore a fruitful direction for future research in economics. The objective of increasing the empirical realism of theoretical models seems rational to most academics. Yet, replacing some of the standard behavioural assumptions by more realistic ones has evoked resistance from many (mainstream) economists. Economists have claimed that models should not be judged by the realism of the assumptions but their descriptive and predictive power. Some may also argue that departures from the standard framework will make the models more complex and less tractable. However, even if allowing for more realistic assumptions implies a departure from rationality or makes the model more complex (which is not necessarily the case), it seems only rational to incorporate 'irrationalities' in our models if this increases our ability to explain and predict behaviour. Unquestionably, allowing for more realistic assumptions matters for economic analyses.

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Samenvatting

Aannames over menselijk gedrag zijn belangrijke bouwstenen van economische analyses. Om maatschappelijke en economische fenomenen te verklaren en te begrijpen maken economen gebruik van theoretische modellen, die gebaseerd zijn op allerlei aannames die de werkelijkheid versimpelen. Zonder deze aannames is het economisch instrumentarium simpelweg onhanteerbaar. Wetenschappers hebben zich al decennia bezig gehouden met de vraag of bepaalde aannames realistisch zijn en, misschien nog belangrijker, in hoeverre onrealistische aannames de uitkomsten van economische analyses bepalen. Een relatief jonge subdiscipline, de gedragseconomie, richt zich in het bijzonder op deze vraagstukken.

Deze dissertatie laat zien dat het introduceren van meer realistische gedragsaannames in economische modellen van cruciaal belang is voor beleidsanalyses en het verklaren van arbeidsmarktgedrag. Vertrekpunt van de analyses zijn veelbelovende en vaak ook vergaande hervormingsvoorstellen: het introduceren van spaarsystemen in de sociale zekerheid. De effecten van twee voorstellen worden nader onderzocht in dit proefschrift: het vervangen van de bestaande werkloosheidsverzekering door een verplicht spaarsysteem en het introduceren van levensloopregelingen. Beide hervormingen zouden een antwoord kunnen bieden op diverse sociale en economische problemen. Deel I (Hoofdstuk 2 en 3) van deze studie gaat in op de arbeidsmarkteffecten van deze voorstellen: hoe zullen de hervormingen de prikkelstructuur veranderen en hoe zullen de veranderingen in prikkelstructuur het arbeidsmarktgedrag beïnvloeden? De analyses van Deel I wijzen op twee gedragsassumpties die cruciaal zijn voor de effectiviteit van de spaarsystemen: de aannames over tijdspreferenties in zoekmodellen en de invloed van vermogen op het arbeidsaanbod. In Deel II (Hoofdstuk 4, 5 en 6) worden deze aannames empirisch getoetst.

Hoofdstuk 2 gaat in op de arbeidsmarkteffecten van een verplicht spaarsysteem voor werkloosheid. Bestaande verzekeringen voor het werkloosheidsrisico leiden tot moreel gevaar. Werklozen zullen namelijk minder hard zoeken naar een betaalde baan en werknemers zullen zich minder inspannen om hun baan te behouden wanneer zij een werkloosheidsuitkering (kunnen) ontvangen. Als antwoord op dit klassieke probleem hebben verschillende prominente economen in de recente literatuur voorgesteld om de werkloosheidsverzekering te vervangen door een spaarsysteem, waarin werklozen hun eigen werkloosheid financieren met verplicht opgebouwde spaartegoeden. De

veronderstelling is dat in een dergelijk systeem werklozen en werknemers een sterkere prikkel hebben om een baan te zoeken dan wel werkloosheid te vermijden, zodat de werkloosheid zal dalen. Eerdere studies concluderen dat een spaarsysteem deze prikkels inderdaad versterkt en dat deze hervorming tot een substantiële daling van de werkloosheid zal leiden. Dit hoofdstuk laat zien dat het invoeren van een spaarsysteem twee belangrijke effecten op de prikkelstructuur impliceert. In de eerste plaats wordt er een lange-termijn prikkel om werk te zoeken en te behouden geïntroduceerd. De resterende spaartegoeden komen (gedeeltelijk) vrij wanneer de werknemer de pensioengerechtigde leeftijd heeft bereikt. Individuen krijgen in het spaarsysteem dus een pensioenbonus voor het vermijden van werkloosheid. Daar staat tegenover dat de verplichte besparingen hoger zullen zijn dan het niveau van de huidige premies. Dit betekent dat de hervorming leidt tot een daling van het huidige netto loon. De hervorming zal daarom lange-termijn prikkels om een baan te zoeken of te behouden versterken, maar de korte-termijn prikkels verzwakken. Het verwachte effect van een spaarsysteem voor werkloosheid hangt daarom sterk af van de aannames over tijdspreferenties. Omdat in eerdere studies de *discount rate* gelijk werd gesteld aan de rente, domineerde het effect van de lange-termijn prikkel en werd een daling van de werkloosheid voorspeld. Echter, onder meer plausibele aannames over tijdspreferenties (een hogere *discount rate*) zal dit effect slinken. Wanneer vervolgens *hyperbolic* in plaats van *exponential discounting* wordt verondersteld, is het waarschijnlijk dat de hervorming de prikkels om een baan te houden of te zoeken zal verminderen en is zelfs een stijging van de werkloosheid te verwachten. Cruciale vragen zijn daarom: hoe beïnvloeden tijdspreferenties arbeidsmarktgedrag? Is zoekgedrag in lijn met het *exponential* of met het *hyperbolic discounting model*? Deze vragen worden onderzocht in Deel II (Hoofdstuk 4 en 5).

In Hoofdstuk 3 worden de levensloopregelingen bestudeerd, waarbij de nadruk ligt op de arbeidsmarkteffecten. Levensloopregelingen zijn spaarregelingen die gebruikt kunnen worden om (tijdelijke) verminderingen in arbeidsuren of transities van betaald werk naar andere levensdomeinen te financieren en beogen daarmee een antwoord te bieden op verschillende maatschappelijke ontwikkelingen. Op deze manier zouden de regelingen individuen kunnen beschermen tegen de gevolgen van nieuwe risico's, door bijvoorbeeld de combinatie van arbeid en zorg te vergemakkelijken of door investeringen in menselijk kapitaal te ondersteunen. In hoeverre levensloopregelingen dergelijke arbeidsmarkttransities ook daadwerkelijk faciliteren hangt af van twee assumpties: de regelingen stimuleren het opbouwen van spaartegoeden en spaartegoeden (of een gebrek

daaraan) zijn bepalend voor arbeidsaanbod. Het hoofdstuk behandelt de theoretische mechanismen en geeft een overzicht van de empirische studies die relevant zijn voor deze relaties tussen spaarregelingen, spaargedrag en arbeidsaanbod. De bestaande literatuur wijst op twee effecten van spaarregelingen op spaargedrag: een verschuiving van de middelen binnen het individueel vermogensportfolio en een verhoging van het totale vermogensniveau. De bevindingen over het laatste effect zijn niet volledig consistent, maar waarschijnlijk is dit effect klein en verschilt dit tussen inkomensgroepen. Bovendien laten een aantal studies zien dat de effecten van vermogen op arbeidsmarktgedrag relatief beperkt zijn. Echter, empirisch bewijs omtrent dit vraagstuk is schaars, vooral wanneer het gaat om het effect van sparen op arbeidsuren. Daarom wordt dit effect in Deel II (Hoofdstuk 6) van het proefschrift nader onderzocht.

Deel II van de dissertatie bevat drie empirische studies. Voor alle analyses is gebruik gemaakt van de Nederlandse DNB Household Survey (DHS), die vanaf 1993 jaarlijks wordt verzameld door CentERdata. Dit longitudinale databestand bevat zowel uitgebreide informatie over vermogen en schulden als over arbeidsmarktgedrag. Bovendien bevat de DHS een uitgebreide psychologische sectie, die in de drie hoofdstukken van Deel II op verschillende manieren wordt benut.

De eerste empirische studie wordt behandeld in Hoofdstuk 4. Het hoofdstuk onderzoekt de effecten van tijdspreferenties op zoekgedrag van werklozen. Omdat het zoeken naar een baan een investeringsactiviteit is, kan verwacht worden dat tijdspreferenties een belangrijke rol spelen voor het zoekgedrag. Standaard zoekmodellen veronderstellen dat mensen toekomstige uitkomsten exponentieel verdisconteren; een aanname die tijdsconsistente preferenties impliceert. Echter, gedragseconomische studies laten zien dat mensen tijdsinconsistente preferenties hebben. Modellen in de gedragseconomie veronderstellen daarom *hyperbolic discounting* in plaats van standaard *exponential discounting*. Deze studie presenteert een empirische toets van deze alternatieve modellen van intertemporeel keuzegedrag in de context van zoekgedrag. De twee modellen voorspellen verschillende theoretische relaties tussen tijdspreferenties en zoekgedrag. Geduld (‘*patience’*) heeft een positief effect op zoekintensiteit en verhoogt daarmee de kans op het vinden van een baan. Tegelijkertijd betekent een hogere mate van geduld dat de werkloze selectiever is en dat de kans dat een baanaanbod wordt geaccepteerd afneemt. Onder *exponential discounting* zal het tweede effect domineren en zal geduld de werkloosheidsduur verhogen, terwijl onder *hyperbolic discounting* het eerste effect sterker is en geduld een negatief effect heeft op de duur van werkloosheid. In tegenstelling tot veel

andere (gedrags)economische studies die gedragsvariabelen gebruiken om tijdspreferenties te meten, wordt hier voor de empirische toetsing gebruik gemaakt van een psychologische schaal: de Consideration of Future Consequences (CFC) Scale. De bevindingen laten zien dat geduld positief gerelateerd is aan zoekgedrag, maar geen invloed heeft op het reserveringsloon. Bovendien stijgt de kans dat de werkloze een baan vindt met het niveau van geduld. Deze resultaten zijn dus consistent met het *hyperbolic discounting model*.

Waar Hoofdstuk 4 zich richt op het zoekgedrag van werklozen, concentreert Hoofdstuk 5 zich op het carrièregedrag van werknemers. Ook in dit hoofdstuk wordt getoetst of arbeidsmarktgedrag in lijn is met het (standard) *exponential discounting* of met het (gedragseconomische) *hyperbolic discounting model*. Twee soorten carrière-investeringen staan centraal: werkinzet en ('on-the-job') baanzoekgedrag. Een theoretisch model is ontwikkeld waarin deze carrière-investeringen endogeen zijn. Dit model leidt tot verschillende voorspellingen die benut worden om een empirisch onderscheid te maken tussen de twee alternatieve modellen. Onder *exponential discounting* is (lange-termijn) geduld positief gerelateerd aan werkinzet, maar omgekeerd U-vormig gerelateerd aan zoekintensiteit en mobiliteit. Echter, wanneer *hyperbolic discounting* wordt verondersteld kan een positieve relatie tussen (korte-termijn) geduld en beide typen carrière-investeringen verwacht worden. Het theoretische verband tussen (korte-termijn) geduld en mobiliteit is niet eenduidig. Voor de empirische analyses wordt opnieuw gebruik gemaakt van de CFC Scale. De resultaten zijn consistent met het gedragseconomische model: de relaties tussen geduld aan de ene kant en werkinzet en zoekintensiteit aan de andere kant zijn positief. Bovendien laten de schattingen geen verband zien tussen geduld en mobiliteit zoals voorspeld onder *exponential discounting*.

Hoofdstuk 6 bevat de derde en laatste empirische studie, die de effecten van vermogen op arbeidsuren worden geanalyseerd. Theoretisch kan verwacht worden dat positieve vermogensschokken arbeidsaanbod verminderen. Eerdere studies richten zich met name op de effecten op de extensieve marge; de invloed op de intensieve marge zijn grotendeels onderbelicht gebleven. De Nederlandse casus is in dit opzicht interessant, omdat parttime banen veelvoorkomend zijn en het aantal arbeidsuren zonder al te veel barrières kan worden aangepast. Verschillende indicatoren van (veranderingen in) vermogen worden in de analyses gebruikt. Een uniek aspect van de studie is dat de effecten geschat worden met zowel objectieve als subjectieve variabelen voor vermogen. Om een causaal effect te identificeren worden gegevens over erfenissen en de ontwikkeling van de regionale huizenprijzen benut. Bovendien worden data over verwacht spaargedrag gebruikt

om een variabele te creëren die aangeeft of de respondent een onverwachte vermogensschok heeft ervaren. In het algemeen tonen de resultaten aan dat vermogen een negatief effect heeft op het aantal arbeidsuren, hoewel de effecten relatief klein zijn. De effecten blijken sterker te zijn voor vrouwen dan voor mannen.

De bevindingen hebben een aantal belangrijke beleidsimplicaties. De empirische resultaten uit Hoofdstuk 4 en 5 geven aan dat tijdspreferenties een significante invloed hebben op het zoekgedrag van werklozen en de carrière-investeringen van werknemers. Dit betekent dat deze vormen van arbeidsmarktgedrag met name worden beïnvloed door korte-termijn prikkels. In dat geval kan verwacht worden dat het vervangen van de werkloosheidsverzekering door een spaarsysteem slechts beperkte positieve of zelfs negatieve effecten zal hebben op arbeidsmarktgedrag. Het is daarom onwaarschijnlijk dat de voorgestelde hervorming zal leiden tot een substantiële daling van de werkloosheid. De bevindingen laten ook zien dat het belangrijk is om rekening te houden met de rol van tijdspreferenties: het gelijkstellen van de *discount rate* aan de rente kan leiden tot onjuiste voorspellingen. Verder suggereren eerdere studies en de empirische schattingen uit Hoofdstuk 6 dat vermogen een significant, maar relatief beperk effect heeft op het arbeidsaanbod. Levensloopregelingen zullen daarom arbeidsmarkttransities slechts beperkt ondersteunen. De argumenten om spaarregelingen in het systeem van de sociale zekerheid in te voeren worden dus niet empirisch ondersteund. Een algemene conclusie van de dissertatie is dat gedragsaannames cruciaal zijn voor economische analyses. Het introduceren van meer realistische aannames vergroot ons inzicht in arbeidsmarktgedrag en leidt tot betere voorspellingen van economische modellen.

Curriculum Vitae

Thomas van Huizen (1984) was born in Amersfoort, the Netherlands, where he graduated from secondary education (VWO) at the Stedelijk Gymnasium Johan van Oldenbarnevelt in 2003. From 2003 to 2006, he studied Economics at Utrecht University School of Economics (USE). After the completion of this Bachelor programme, Thomas continued his studies at USE and received his Master's degree in Economics and Social Sciences with honours in 2007. His Master thesis provided an extensive analysis of the Dutch Life Course Scheme. Subsequently, he started a PhD programme at this institute within the multidisciplinary research project 'Life course, social security and the labour market' ('*Levensloop, sociale zekerheid en arbeidsmarkt*'), financed by Stichting Instituut Gak. Between 2007 and 2011 he attended PhD courses, participated in the IZA Summer School in Labour Economics and presented his research at various conferences, such as the EALE/SOLE, SABE/IAREP and ESPE annual conferences. During these years, his research was published in international journals and resulted in this dissertation. As of January 2012, Thomas holds a position as Assistant Professor at USE. His current teaching and research agenda focuses on labour economics and behaviour economics.

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