Learning on the job, the composition of tasks and the earnings of older workers

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Abstract

In this paper, we investigate whether patterns of formal and informal learning and changes in the task composition of workers can account for the observed wage and job mobility profiles and to what extend deviations can be explained by market imperfections. Using the Dutch Life Long Learning Survey we introduce measures for formal and informal learning, the importance of tasks in the current and alternative jobs, performance in the job and mobility. Based on these self-assessed measures we document differences between age groups in the nature of the job, the performance of the workers, and the potential for changing occupation.

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1 Introduction

Wages tend to increase substantially with age, while older workers are much less mobile in the labor market than young workers. There is a concern that wages of older workers exceed their productivity and therefore limit their employment opportunities. In this view either increasing productivity by providing training or lowering wages could reduce the productivity wage gap. This could increase participation of older workers before the regular age of retirement and enable a shift in this regular retirement age.

The labor market position of older workers can not be isolated though from the development of their human capital and wages at younger ages. Ben Porath (1967) has shown that the age pattern of investments in education and training can be viewed upon as a strategy to optimize life time income. Learning by doing will be an important element in the training of workers. Lazear (1979) argued that the wage profile provided by a firm could be chosen in a way that optimizes the incentives for workers. In both cases the resulting optimal wage profile deviates from the productivity curve of workers. Policies that disturb these optimal patterns, might appear successful in the short run, but will be costly in the long run. Income taxes, institutional characteristics and the social norm of retiring at age 65, however, potentially disturb the labor market of older workers, and therefore require policy intervention.

To understand the labor market position of older workers it is therefore useful to take a life-cycle perspective. The aim of this paper is to investigate whether patterns of formal and informal learning and changes in the task composition of workers can account for the observed wage and job mobility profiles and to what extend deviations can be explained by market imperfections. Using the Dutch Life Long Learning Survey we introduce measures for formal and informal learning, the importance of tasks in the current and alternative jobs, performance in the job and mobility. Based on these self-assessed measures we document differences between age groups in the nature of the job, the performance of the workers, and the potential for changing occupation.

Although both formal and informal learning decrease with age, we find that many older workers still spend quit some time on learning. For all age groups - measured in hours learning - formal learning is only a small propor-

tion of informal learning. Younger workers spend up to 40 percent of their working time on tasks they can learn from. For older workers this percentage equals 20 percent. The assessment of the overall job performance and the growth of this performance are well in line with these investments in informal learning and the wage-age-profiles observed in the data. Also considering that young workers might pay a premium for learning on the job, wage patterns are consistent with productivity patterns. This is confirmed by self-assessed question about the wage-productivity gap. Most workers indicate that their wage is consistent with their productivity. Young workers indicate slightly more often that they are underpaid compared to productivity.

These findings are, though, not supported by either measures of performance in specific tasks, or changes in the nature of the tasks performed by older workers. With only a few exception there are no large differences in the tasks performed by different age groups, while the performance in most tasks seems to decline when people get older. There is a clear trend however in the composition of tasks. Older people tend to have more tasks that are important for their job. These additional tasks also become more important for wage formation. Based on these findings we argue that experience not just implies a better performance on the same tasks, but mainly implies that workers increasingly posses a mix of skills that is best suited for their company or occupation. This might also explain lower potential for job mobility. Our data suggest that especially for older workers alternative jobs require a different mixes of tasks, making job mobility less attractive.

2 Literature

Human capital theory (Becker 1964) regards education and training as investments. Participating in education and training is costly, especially due to foregone earnings, but will increase future wages. Becker distinguishes between general and specific human capital. Specific human capital can be used only in one firm. Workers can therefore not force employers to pay the marginal value of their specific human capital and are therefore not willing to invest in this form of capital. As a consequence employer pay for the investments, or (Hashimoto 1981) employers and employees share the investment and the returns to reduce mobility of workers. A scheme to share returns requires that employees trust the firm. It is hard to think of any skill that

is purely firm specific. Stevens (1994) therefore extends this theory by introducing frictions in the labor market. Lazear (2003) argues that not the skills themselves, but the combination of skills required for a specific job, is unique therefore less values by others firms.

Ben Porath (1967) introduced a model to analyze how people will spread investments in human capital over the life cycle. In his approach he assumes that time is either used to learn or to work. In the context of this paper it important to also include leisure in this approach. Following Borghans and Golsteyn (2009) Figure 1 depicts the optimal division of time to learning, working and leisure in the Ben Porath framework: People maximize life-time utility in a setting where learning increases human capital; Wages depend on human capital; Life-time income and life-time leisure are complements; People have a preference for spreading leisure over the life-cycle; People discount income but do not discount leisure. When people have entered the labor market wages grow faster than knowledge. The reason for this is that initially people spend a substantial share of their time on learning. The time that people learn is not paid by the employer. Later in their career, before retirement, in this simulation people gradually increase leisure time. For that reason wages drop faster than knowledge. In practice, an upward sloping wage profile is typically observed in the data, but only very limited reductions in wages and working time are observed. In general working hours are not reduced gradually before retirement and also the reduction of per hour wages before retirement is limited.

In the past 50 years life expectancy has increased. Figure 2 shows what happens to the simulated optimal division of time in the hypothetical case when life expectancy goes up from 70 to 80 years. People will increase the years at work with about 3 years. They will also spend more time on education and training. The resulting increase in life-time income due to extra learning and more working years increase the value of the complementary leisure. People therefore also want to increase leisure and use a substantial share of their increase life expectancy for leisure purposes. Statistics Netherland reports that for men life expectancy at the age of 60 increased from 78 in 1950 to 81 in 2006. For women at 60 life expectancy increased from 79 to 84. At the parameters used for the simulations in Figure 2, this would *ceteris paribus* lead to approximately one year increase in retirement age.

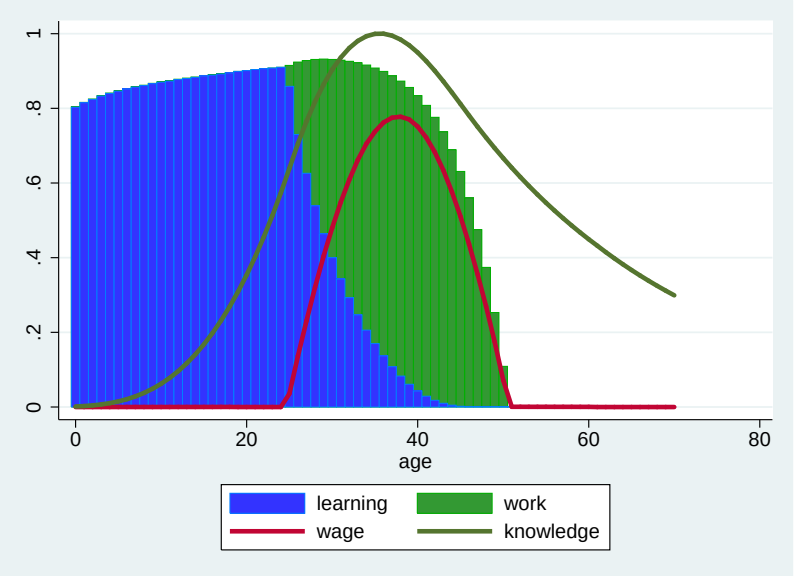

Figure 1: Simulated optimal allocation of work, learning and leisure over the lifecycle

An increase in labor productivity (hourly income controlled for education) per se will also affect the optimal division of time. This is shown in Figure 3. Here more income means an increase in the value of leisure and consequently a reduction in time spend on work. Taken together the trends of increased labor productivity and increased life expectancy lead to an ambiguous prediction concerning the development in the retirement age. In practice retirement age has remained fairly constant over the past 50 years. The public pension system (AOW) and most industry pension schemes have used 65 as the age of retirement. Recently the government announced an increased of the age at which people are eligible for AOW to 67. In the 80s and 90s many firms and industries introduced pre retirement schemes to allow older workers to retire earlier.

The optimal pattern to allocate learning, working and leisure consists of a phase in which people combine working and learning. After a period of full time education, people starting working while they remain to spend some time on learning. The amount of time spend on learning gradually declines with age. Borghans and Golsteyn (2008) have shown that this gradual decline in learning results from the model assumption that combining learning and working is per hour more efficient than learning alone. In general,

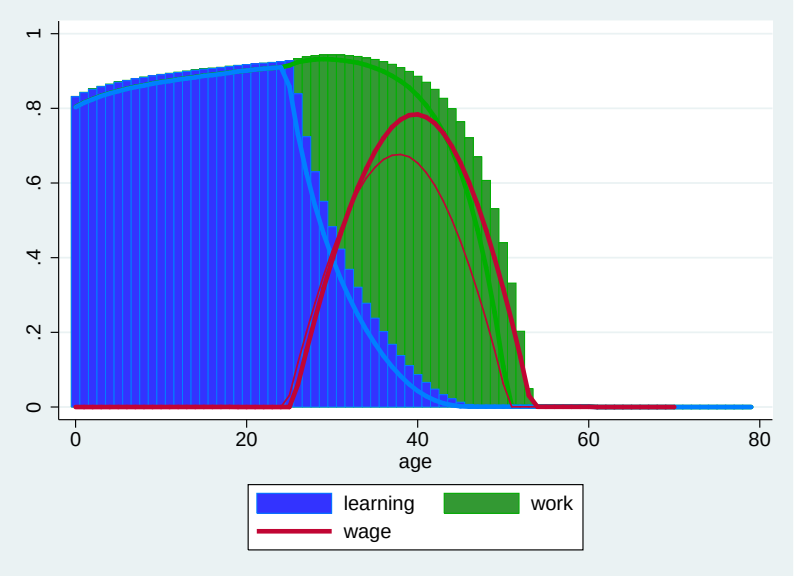

Figure 2: Simulated effect of increased longevity (from 70 to 80) on the optimal allocation of work, learning and leisure over the lifecycle

while working, people do not spend a substantial fraction of their time on courses. In our view, the learning activities therefore have to be interpreted as work based learning, varying from learning by doing to learning on the job (Killingsworth 1982). This implies that people learn things that are typically learned at work. The growth in wages that results from this learning is therefore probably related to very different kinds of skills than what people bring to the labor market when they just graduated.

If this is indeed the case then, using a more fluid distinction between firm-specific and general human capital, the human capital of people might gradually grow more firm specific when they get older. Lazear (2003) offers such a gradual interpretation of firm specificity. He argues that jobs can be described by a set of tasks. Not the tasks themselves but the combination of tasks makes the job unique. That implies that when people have exactly the right set of skills for their current job, any job change would imply that specific skills become redundant. Appropriate alternatives when a job change has to be made are jobs that share at least a substantial fraction of the skills with the current job. So, within that interpretation, one might expect that the skills of workers become more and more suited for the job they actually have and therefore less suited for potential alternatives. Employment pro-

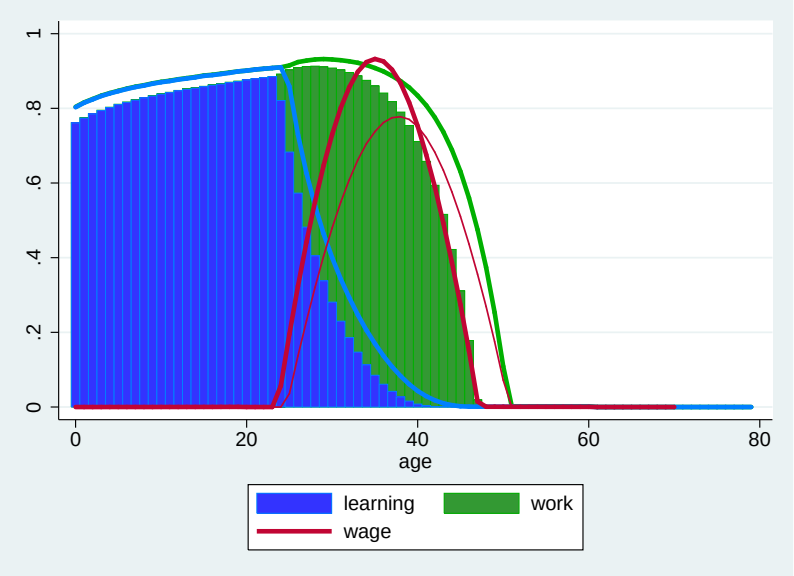

Figure 3: Simulated effect of increased income on the optimal allocation of work, learning and leisure over the lifecycle

tection rules, could influence this process, as people might want to avoid the acquisition of firm specific human capital when there is large uncertainty that they loose their job. If there is indeed a growing tendency of specialization for a specific job, that might explain lower voluntary mobility among older workers, and more difficulties to find new work once unemployed.

So from the perspective of the human capital theory, when people optimally allocate their time between working, learning and leisure, the income of workers will increase quite substantially early on in their career, both because of the acquisition of skills at work and because the (on the job) training required for this will reduce wages. Later on in their career people will reduce learning activities because the pay back period gets shorter. Income increases will reduce and eventually hourly income might fall due to knowledge depreciation. If also – as this model predicts – people increase leisure when they get older, annual income will decline even faster. Finally, as their skills become more firm specific over time and because the benefits of additional training decrease over time, changing occupation will become less attractive and therefore less likely when people get older. If people loose their job also the step to a new job will be harder to make.

Although roughly speaking the simulated patterns resemble the patterns observed in the data, especially in the policy debate, there are serious concerns that the Dutch labor market for older workers in not working optimally. Wages are thought to exceed productivity, older workers invest insufficiently in human capital and retire too early.

Comparing the simulated optimal pattern to the general patterns observed in the data, the most striking difference is that people tend to switch from work to retirement without the gradual decline in hours. Blau and Shvydko (2007) argue that team production and the fixed costs of labor can explain the tendency not to reduce hours. If older workers could choose they would prefer to work fewer hours.

The tax system and rules with respect to social security can provide unintended incentives to workers in their participation decision. Tax as such will of course lower the marginal benefits of working. If only the day of retirement would be a choice variable, the government could create incentives for older workers that make them to postpone their retirement decision. Essentially that would mean lower tax rates for workers in the years close to retirement. Since leisure during the working career and leisure after retirement will be substitutes the question is how effective such a policy will be. Also the value of benefits that can be obtained for unemployment and disability decline in the years before the official retirement, while the premium that has to be paid remains unchanged until 65. These benefit systems only pay until the age of 65, so when the age of 65 comes nearer the net present value will go to zero. Furthermore, in the Netherlands the state pension benefits (the AOW) – which are a part of the total pension rights most workers have – is a lump sum (conditional on life expectancy), while the implicit premium – also in the years before retirement – depends on income.

A fundamental assumption in the human capital framework sketched above is that wages reflect productivity, taking into account the value of what can be learned in a job. Several authors have argued that in practice wages for older workers exceed their productivity. This productivity-wage gap could explain the difficulties for workers to acquire a new job. It is very complicated to measure empirically this productivity-wage gap. For many jobs no adequate measure of productivity is available. There are a few interesting studies though that do attempt to determine this gap. Medoff and Abraham (1981) link wage information to assessments of managers about the productivity

of workers and find that productivity has only a limited role in explaining wages. Kotlikoff and Gokhale (1992), De Grip and Sieben (2005) and Dostie (2006) also find that older workers earn more than would be justified by their productivity. Hellerstein and Neumark (1995) and Hellerstein and Troske (1999) find a positive correlation between wages and productivity. A major problem in this work is the measurement of productivity. To compare productivity between younger and older workers it is needed that they perform similar tasks in a firm. In practice older workers will have different role in a firm than younger workers, while the productivity of the firm will depend on the composition of workers. The marginal contribution of a single workers is therefore hard to identify. Ederveen; and Henkens (2008) emphasize the role of employers' perspectives on productivity of older workers in explaining the employability and mobility of older workers (for the Netherlands). The expected productivity of workers is important for employers' hiring policies. They show that employers put relatively much weight on *hard tasks*[1] in their assessment of productivity. It is exactly these aspects of work in which older workers perform less than young workers. Older workers on the other hand are better in *soft tasks* such as reliability, commitment, social skills and being customer-oriented.

Related to this discussion about the productivity-wage gap it has also been argued that older workers invest insufficiently in training. Several studies report that training participation decline with age (see e.g. Arulampalam and Booth 2004). Since human capital theory predict that people will reduce participation, this does however not answer the question, whether there is an over- or under-investment in training. An interesting question is what happens to workers when a new technology is introduced. The introduction of ICT in the 80s and 90s provide an interesting case for this. There was a fear that older worker would lack the skills to work with computers. Young workers would have a large advantage compared to older workers in using this new technology and older workers either had to be trained or would run the risk of loosing their job. Several authors reported however that computer use among older worker was surprisingly large. Weinberg (2001) provided evidence that experience in the traditional industries acted as a complement to computer use, actually providing an advantage to older workers. Borghans and Ter Weel (2004) provide evidence that the skills needed to op-

[1]Physical and mentally bearing aspects of work such as creativity, flexibility and physical strength.

erate a computer are obtained through informal learning, by both young and older workers. Friedberg (2003) found evidence that people who are close to retirement decided not to participate in training for computer use and as a consequence retired earlier. This affected only the workers who were very close to retirement, though. Theory would predict this effect to start much earlier so the question is whether indeed human capital considerations explain this training effect. Bartel and Sicherman (1993) provided evidence that the effect of a new technology can have two different effects for older workers. The introduction of a new technology stimulates some older workers to invest in the skills needed for this technology. To make this investment worthwhile they postpone retirement. Other decide not to invest and retire earlier. The net effect is ambiguous therefore, while furthermore both choices are based on optimizing behavior and the question is therefore whether intervention is needed.

Others have argued that institutional factors explain why wages for older workers exceed their productivity (Nickell and Ochel 2005 and Nunziata 2005). Booth and Frank (1996) and Frank and Malcomson (1994) explain seniority wage profiles as a effect of the unions. Brown and Nolan (1988) have argued that wage determination is fundamentally different form the pricing of commodities. In a volume edited by Lazear and Shaw (2008) for a wide range of countries it is investigated to what extend wage formation seems to be the result of agreements at the sector level. Borghans and Kriechel (2008) document that on average 87 of the variation of wages is at the individual level. 12 is firm specific and only 1 is industry specific. Borghans et al. (2007) find that a substantial share of the employees experiences a reduction in income, suggesting that institution in the Netherlands do not take away all labor market flexibility.

Lazear (1979) offers a rationale for employers to pay relatively low wages to young workers and to pay wages that exceed the productivity of older workers. An important element of this idea is that for workers who stay with the same employer not the annual wage but the discounted wage profile as a whole is the relevant variable. Lazear argues that upward sloping wage profiles could be a useful instrument to reduce the agency problem and thus to increase productivity by increasing worker effort and reducing shirking. The basic idea of the model is that firms will fire workers who shirk. These workers will loose the relatively beneficial part of the wage profile and thus such a profile functions as a penalty for shirking. The prediction of the

theory that wage profiles will be steeper in industries where monitoring is more important is supported by several papers such as Lazear and Moore (1984), Hutchens (1987) and Bayo-Moriones and Gell (2006). The theory also predicts the existence of mandatory retirement. Lazear concludes that payment schemes that violate the direct link between productivity and pay could be optimal from a firm perspective. Policies that aim to change these payment schemes could therefore – especially in the long run – do more harm than good. The same holds for mandatory retirement. It can be questioned whether in the Netherlands employers have indeed the possibility to fire workers as soon as shirking is detected, especially when this can not be confirmed by an objective outsider. Also an employee will not loose his right for a large share of the postponed payments – the pension – when he is fired a few years before retirement. The question can be asked therefore whether the model by Lazear is applicable to the Dutch situation. More in general, though, it seems to be very important to consider that payment schemes that are introduced in an employer-employee relationship could be beneficial also when there is no direct link between productivity and wages. Furthermore, when employees care about the long-run relationship in their firm – either because of intrinsic motivation or because of incentive schemes – moral hazard can be expected to be an issue when people are close to retirement. To our knowledge there have been no empirical studies about moral hazard in the years close to retirement, but the evidence about training provided by Friedberg (2003) would well fit in such an interpretation. This is an issue that could be of practical relevance, also in explaining difficulties of workers close to retirement to find new work, that might be difficult to solve. A shift in the retirement age will not change the nature of this problem.

3 Data

To measure knowledge development and training behavior during the life-cycle, the Dutch Life-Long-Learning Survey was developed in 2004. This survey is a supplement to the basic questionnaires of the *DNB Household Panel*. In 2007, a second wave of the Dutch Life-Long-Learning Survey was sent out. For our main analyses, we use the Dutch Life-Long-Learning Survey 2007. At that time the panel consisted of 2,361 individuals who form a representative sample of the Dutch population of 16 years and older. The

response of this survey is equal to 1,775 respondents (which is approximately 75 percent). For most analyses we restrict the sample to workers only. This leaves us with a data set of 931 respondents. For the data description, we use both waves of the Dutch Life-Long-Learning Survey. When reporting on workers' wages, we use merged information of the Dutch Life-Long-Learning Surveys and the DNB Household Panel (waves 2003, 2005 and 2007).

The survey contains two set of questions to measure the composition of tasks.

Workers' time use. The way workers spent their working time gives us a first impression on the tasks they perform. We asked workers to provide information about the time they spent on specific tasks at work during the week before the survey. It concerns the following five clusters of work: routine tasks, challenging tasks, new tasks, meetings, cooperation with people from whom they could learn. For each of the tasks, they had to mention the number of hours they spent on tasks within each cluster. The total number of hours, had to equal the number of working hours they work per week. From this, we calculated the percentage of working time workers spent on the specific tasks.

Workers' most important tasks. Furthermore, the survey provides us with four important aspects for workers' current and possible alternative jobs. First of all, we asked respondents to inform us about their current job by means of the following question: *What is your current job?*. We continued by asking them: *Could you mention two aspects which you consider to be most important to fulfill your job successfully?* Respondents could choose two aspects from a list with 26 aspects, including for example analytical thinking, coaching, creativity, presenting and foreign languages. The list is based on the most frequent answers on a similar open question in the 2004 survey.[2]

After this, we asked respondents to mention two jobs which could be suitable and feasible alternatives for their current job. From now on, these will be referred to as alternative job 1 and 2. For these jobs, we asked related aspects as well. *Could you mention one aspect which you did not mention in the earlier question, which you consider to be most important to successfully fulfill a job as <alternative job 1>? Could you mention one aspect which*

[2]For a full list of aspects, see appendix A.

you did not mention in the earlier questions, which you consider to be most important to successfully fulfill a job as <alternative job 2>?

Skills and Interests of workers' tasks. After the respondents mentioned the 4 aspects, several related questions were asked:

- *Could you indicate how interesting you think these aspects are?*
- *Could you indicate how good you are in these aspects?*
- *Could you indicate how much you think you can still learn about these aspects?*
- *Could you indicate where you learned most about these aspects?*

The first three questions are asked on a 5 point Likert scale. For the last question, respondents could answer between *school*, *last job*, *current job*, *training course*, *I've always been good at this.*

Importance of workers' tasks. After this set of questions, we randomized the four mentioned aspects and asked three more questions to measure the importance of the mentioned tasks for workers' current and alternative jobs:

- *To what extent you think the knowledge and skills concerning the following aspects are important to function well in your current job?*
- *To what extent you think the knowledge and skills concerning the following aspects are important to function well in the job <alternative job 1>, which you mentioned as a suitable and feasible alternative for your current job?*
- *To what extent you think the knowledge and skills concerning the following aspects are important to function well in the job <alternative job 2>, which you mentioned as a suitable and feasible alternative for your current job?*

Respondents could answer on a scale from 1 *not at all useful* to 5 *very useful.*

Probability to loose work and to obtain jobs. Later in the survey, respondents were asked to comment on the probability of a job loss and their possibilities to obtain new work. More precisely, we asked them the following three questions:

- *How large do you think it the probability that you will loose your job within five years?*
- *Would you like to work at another firm within five years?*
- *Do you expect to work at another firm within five years?*
- *How big do you think your chances are to find a job comparable to your current job when you would have to look for another job?*
- *In case you would look for a job such as < alternative job 1>, how big do you think your chances for getting such as job are?*
- *In case you would look for a job such as < alternative job 2>, how big do you think your chances for getting such as job are?*

Workers' skill development. Next to the questions related to the four aspects, we asked questions more specific to workers' current job. To comment on their formal training behavior, we asked the following question: *How many courses and/or trainings did you follow during the last two years? Leave aside pure hobby courses/trainings, except when they are relevant for your work as well.* Information on informal learning behavior is acquired via the question *What percentage of your working time do you spend on tasks from which you can learn?* To get an idea about their general skill increase over the last two years we formulated the following question: *Imagine which knowledge and skills are needed to optimally function in your job. If this ideal would be equal to 100, how would you value your skills:*

- *two years ago?*
- *at this moment?*

We construct the general skills increase over the last two years by subtracting workers' current skill level by their skill level two years ago.

Workers' payment. To comment on a potential wage-productivity gap, we use two measures of workers' payment. First, we asked workers to comment on the relation between their skills and wage. They could choose between the following answers:

1. *My wage is much lower than my contributions at work*
2. *My wage is slightly lower than my contributions at work*
3. *My wage is in line with my contributions at work*
4. *My wage is slightly higher than my contributions at work*
5. *My wage is much higher than my contributions at work*

Second, we use information on workers' gross wage of the DNB Household Survey to construct hourly wage increases over two years.

4 Wages and mobility

Figure 4 shows age pattern of wages in our data. Consistent with what is observed in other studies wages increase over the lifecycle, but with a diminishing rate.

The accumulation of skills and wages is contrasted by the potential job mobility of older workers. While income increases with age, mobility and the possibilities to find another job decline when people get older. Figure 5 shows the willingness to change jobs steeply declines. Especially from the age of 40 onwards employees are increasingly less willing to change employer. Figure 6 provides a similar picture concerning the probability that workers will be employed in another firm. Older workers are also more pessimistic about their chances of finding a new job. Here also this decline starts at the age of 40. Figure 7 shows the probability to find work in the two indicated alternative jobs. The patterns in this figure are similar to the earlier findings.

5 Skill Development

Figure 8 shows workers' training participation over the lifecycle. The pattern is consistent with predictions from human capital theory. Whereas around

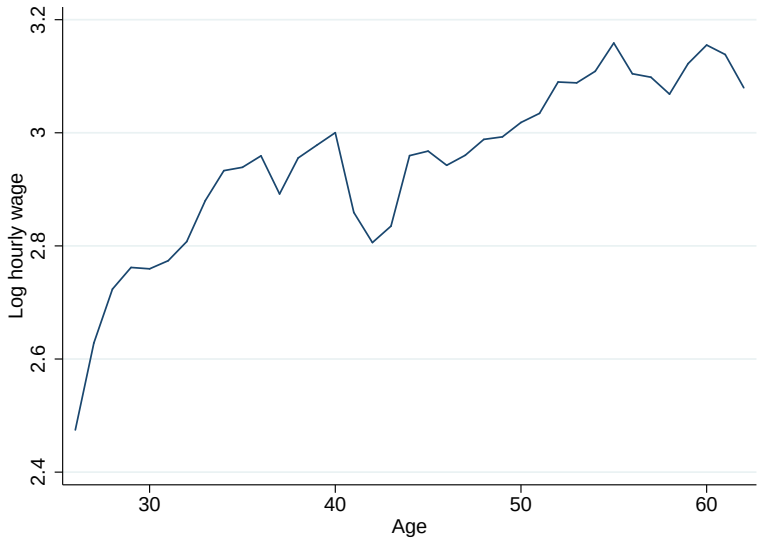

Figure 4: Hourly wages over the lifecycle

Source: Dutch Life-Long-Learning Survey 2004, 2007
Notes: Hourly wages are constructed by gross monthly wages divided by the number of working hours per month. Figure is based on 3-year moving averages.

age 30, 60% of the workers attended at least one training during the last two years, at age 60 this percentage decreases to 30%. As a fraction of the time spend on learning training participation is not substantial though. The time people at work spend on formal training is only 2-3 of their total working time. In a recent meta-analyses Borghans and Haelermans (2009) find that the wage effects of on the job training per hour of study are roughly equal to the wage effects of every hour of education. Participation in training is therefore too small to explain a large increase in wages over the life-cycle.

To understand the increase in skills of people over the life-cycle informal learning therefore has to be important. Figure 9 shows informal learning over the lifecycle. As human capital theory expects, informal learning decreases over the lifecycle. Borghans and De Grip (2006) and Borghans, Golsteyn, and De Grip (2007) showed that for all ages, the time workers spent on informal learning is much larger than the time spent on formal training. On average, workers spent 94% of the time they learn on informal learning. Only 6% is spent on formal training. These large time-investments in informal learning help to explain the life-cycle wage patterns in two ways. First, if time spend on

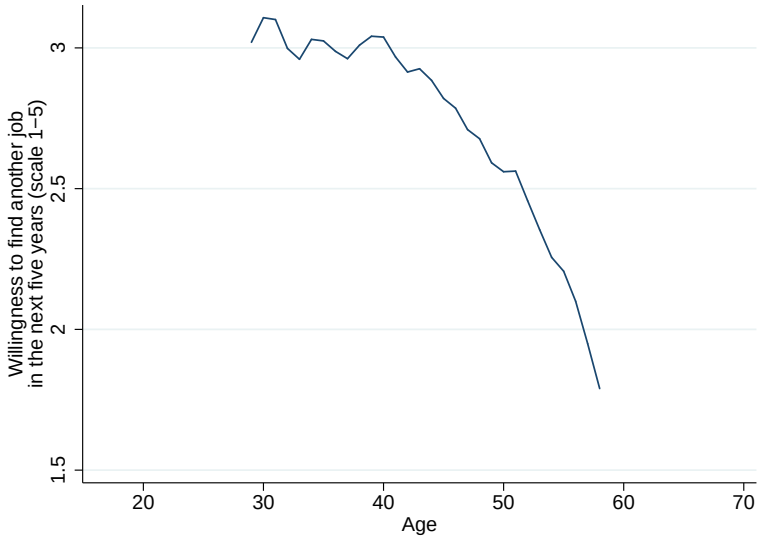

Figure 5: The willingness to change job

informal learning accumulates in increased skills and therefore productivity, this will generate an increase in wages per hour over the life-cycle. Secondly, if the costs of informal learning have to be paid by the worker, in addition to this, the hourly wages of young workers will lower since for a substantial fraction of hours, they will – perhaps implicitly – receive a lower wage as a way to pay for the training value of the work. Since learning and working are not mutually exclusive in case of informal learning the actual wage paid for activities from which a workers can learn will depend on supply and demand factors. Suppose there is a tasks from which unexperienced workers can learn quit a lot, but in which the productivity of these workers in not much lower than in other tasks these workers could perform. If there are only few of these tasks to be performed young workers will compete for these jobs and the high training value will reduce the wages. If there are many of these tasks to be fulfilled, employers might compete for workers who are willing to do this work and the wage will be determined by the productivity. In the Figure it is interesting to see that workers aged 60 still spend around 20% of their working time on tasks from which they can learn. This indicates that tasks from which workers can learn are not purely assigned to younger workers. One might infer therefore that 20 of activities from which a worker

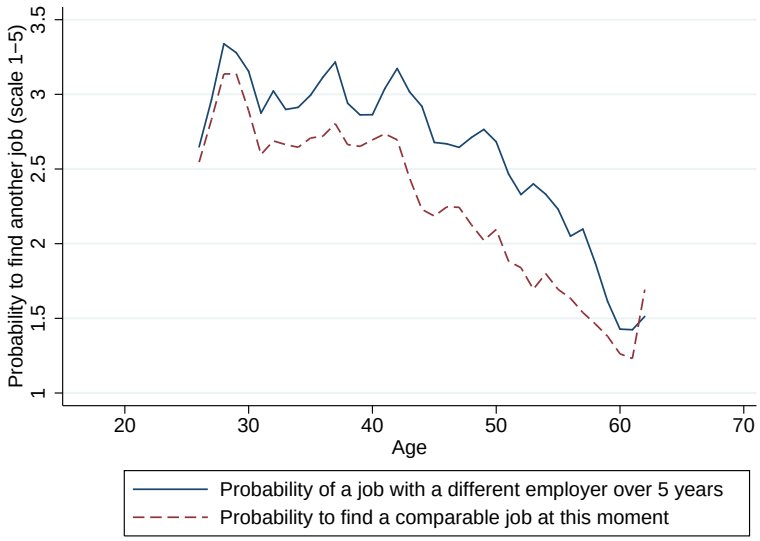

Figure 6: The expected probability of a job changes and the changes of being able to find a new appropriate job

can learn is a lower bound on jobs that can not be avoided by the assignment of tasks.

If time spend on formal and informal learning explains the age-wage profile skills have to increase with age. Figure 10 shows the self-assesed relative development of skills by age. For almost all age groups we find that skills increase. The negative relationship between skill increase and age is in line with the decreased time spend on formal and informal learning 8 and 9.

Whereas young workers of around 30 years report to have a two year skill increase of almost 10 percentage, this percentage decreases over the lifecycle and even becomes negative for workers just before turning 60.

So the subjective assessment of how much people learn and how much skills they accumulate appear to be in line with wages increases over the life cycle. To obtain additional information about the relationship between wages and productivity we also asked respondents directly to indicate whether in their view their wage corresponds to their productivity. Figure 11 shows workers' opinion on the relationship between their skills and their wage. Most workers indicate that their wage is consistent with productivity. Young workers indicate to a small extent more often that they are paid less than their skills. The graph peaks at 40 and 60, but difference are very small.

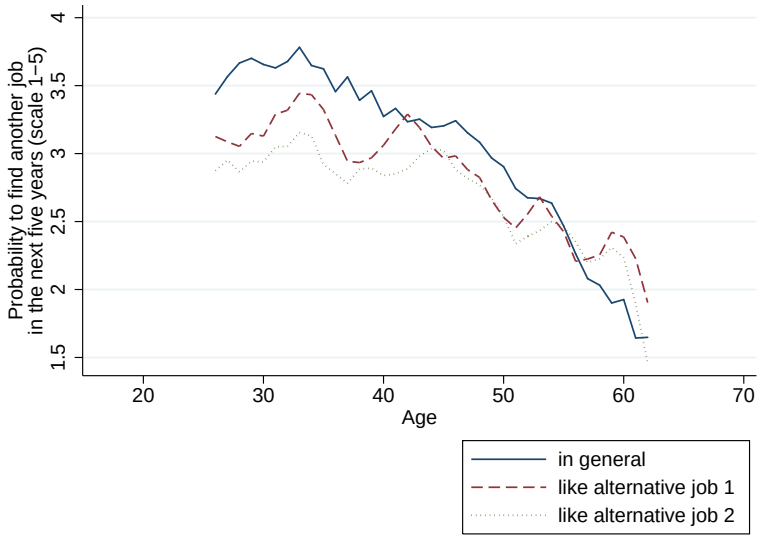

Figure 7: Employability over the lifecycle

Source: Dutch Life-Long-Learning Survey 2007
Notes: Probability to find another job is defined on a 5 points Likert scale. Figure is based on 3-year moving averages.

Therefore, while indicators about learning on the job are consistent with wage growth, this subjective assessment of a wage-productivity gap does not indicate a large imbalance between the two.

6 Composition of tasks

Figure 12 gives a first impression on possible differences in task composition between young and older workers. The Figure is based on the percentage of working time workers spent on different tasks.

When people are older, a larger fraction of their time is spend on routine tasks. The top is reached at about the age of 48. Older workers spend less time on routine tasks. Also the percentage of working time spend on meetings appears to be significantly related to age. The older workers get, the more time they spent relatively on meetings. The time that workers cooperate with others decreases with age. Time spend on meetings turns appears to be related to the variety of tasks people have to perform. This is shown in Table 1. In this Table the time spend on meetings is related to age and to

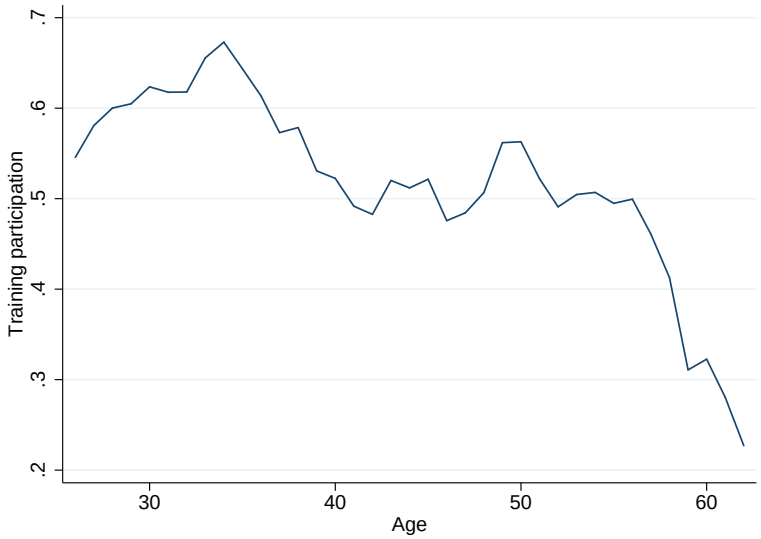

Figure 8: Training participation over the lifecycle

Source: Dutch Life-Long-Learning Survey 2004, 2007
Notes: Training participation is defined as attending at least one training during the last two years. Figure is based on 3-year moving averages.

indicators about the importance of the four tasks that have been mentioned by the respondent as relevant for their current or potential alternative jobs. In the first column the importance of the least important aspect is used as indicator for the variety of tasks. In column 2 the difference between the most and the least important aspect is used. Both regression show that more variety in tasks is indeed related to the time spend on meetings. Furthermore, the table shows that – independent from the variety in tasks – older workers spent more percentage of working time on meetings than younger workers (aged 35 or less).

Figure 13 shows the age pattern of the self-assessed ability of workers to perform the four most relevant aspects of their job. In contrast to the result about skill development in the previous section there is no strong growth in the ability to perform each of these tasks.[3] The figure shows two periods of growth and two periods of decline in the ability to perform there tasks. Apparently young workers get better in their tasks through experience.

[3]The specific tasks can change over the life cycle. The patterns in the graph can not be explained by composition effects.

Table 1: Percentages of working time spend on meetings for young and older workers

Dep. Variable: % of working time spend on meetings	(1)	(2)
Least important aspect of current job	1.009***	
	(0.338)	
Difference between least and most important aspect of current job		-0.735**
		(0.349)
Agegroup 35-50	1.283	1.250
	(0.848)	(0.850)
Agegroup 50 and older	1.940**	1.958**
	(0.887)	(0.889)
Constant	4.107***	8.638***
	(1.489)	(0.730)
Adjusted-R-squared	0.011	0.006
N	931	931

Standard errors in parentheses
* p<0.1; ** p<0.05; *** p<0.01

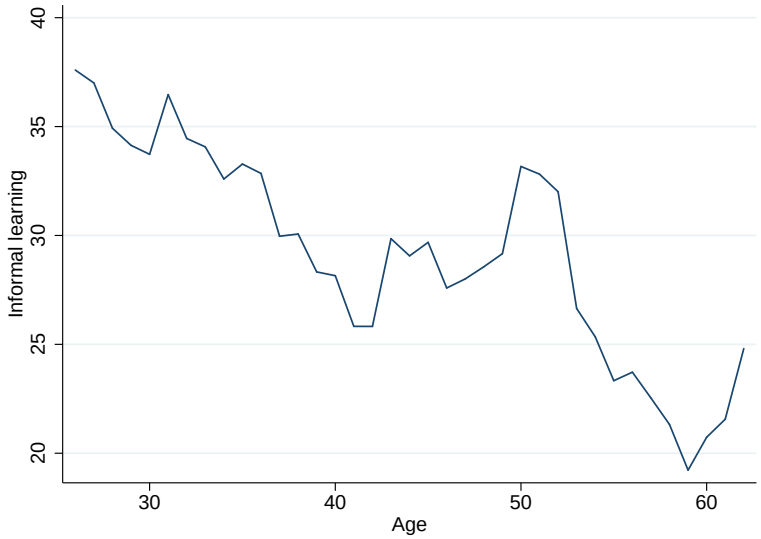

Figure 9: Informal learning over the lifecycle

Source: Dutch Life-Long-Learning Survey 2004, 2007
Notes: Informal learning is defined as the % of working time spend on tasks from which workers can learn. Figure is based on 3-year moving averages.

Between 35 and 45 they get new tasks in which they lack this experience. From about 45 till 52 people gain experience with these skills again, while these skills depreciate in the last ten years at work. These results suggest that indeed tasks of workers change over the life-cycle. A comparison in performance between young and older workers is therefore hard to make. Furthermore, the results confirm that the development of the performance in specific tasks differ substantially from the overall performance, as indicated by the worker.

Figure 14 shows how interested workers are in the four aspects of their current job and potential alternatives. Apart from an initial phase in which workers seem to loose interest in the main aspect of their work, in general interest for all aspects increases with age. Only during the last five year in the labor market the interest in all four aspects declines. This could be evidence that motivation for work decreased once retirement comes near.

In the following three figures, we will look at the importance of the 4 mentioned aspects for workers' current job and the two alternative jobs they mentioned. Figure 15 plots the importance of the four aspects for the current

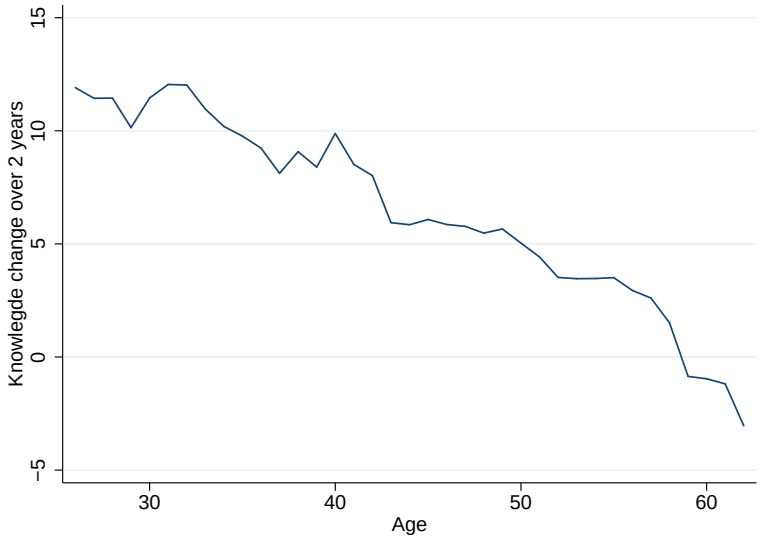

Figure 10: General skills increase over the lifecycle

Source: Dutch Life-Long-Learning Survey 2004, 2007
Notes: General skills increase is defined as increase in general skills over last two years. Figure is based on 3-year moving averages.

job. Again two phases in the career can be distinguished. Initially the first two aspect are much more important than the relevant aspect of potential other jobs. At about 35 all aspect get less important, most likely because the set of tasks to be performed becomes larger. Gradually the importance of all these tasks increases until about 52. Comparing the relevance of the first two aspects with the two aspects that are indicated to be relevant for alternative jobs, there is some convergence: The difference gets smaller when people get older.

Figure 16 and Figure 17 provides similar information for the two alternative jobs. Due to the construction of the question used, Figure 16 shows that aspect 3 is the most important aspect for the first mentioned alternative job. Compared to Figure 15 there is much more of a decline in the importance of especially the first aspect. Also there is no convergence in the importance of the four tasks distinguished. This implies that the distance to the alternative jobs gradually increases when people get older.

So the evidence provided in this section suggest that when workers get older the performance in specific tasks does not increase, but their work

Figure 11: Relationship between workers' skills and their wage
Source: Dutch Life Long Learning Survey 2007
Note: Figure based on 7-year moving averages.

changes and most aspects become important simultaneously. Figure 18 provides further evidence on this. We ran regressions of overall job performance on the workers' performance in the four tasks. By moving the age window for which this regression is carried out, it can be investigated how the link between the performance in individual tasks and overall performance changes over the lifecycle. The figure shows that the job performance of young workers is mainly determined by their performance in the most important task in their job. The older workers get, the more their overall job performance is related to more than one task. This implies again that jobs of elderly are different in the sense not the performance on one specific task but the performance on a set of tasks become more relevant.

A remaining question is whether the change in the task composition of jobs when people get older can explain the reduction in mobility. Table 2 and 3 show that there is indeed such a relationship. In both tables the probability of get work in the first or second alternative is related to the talent for that job (i.e. a weighted score of the ability of the workers, weighting the four aspects with their relevance for that job) and to an index indicating the difference between the current job and the alternatives. These variables turn out to be significant. So when the distance between the current job and

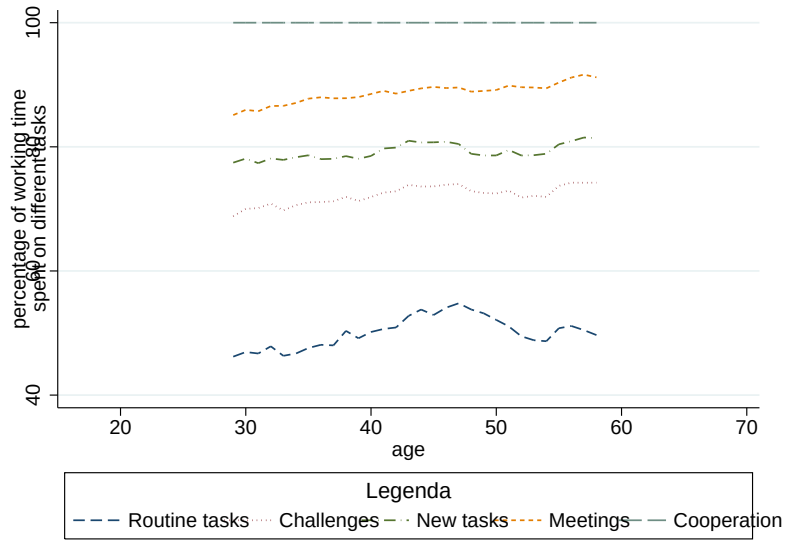

Figure 12: Composition of tasks over the lifecycle

Sources: Dutch Life-Long-Learning Survey 2007

alternatives increases, workers expect it to be less likely to find work in that alternative occupation.

Table 2: Effect of Age and Task Composition on Employability Alternative Job 1

Dep Var. Employability Alternative Job 1 (1-5 scale)	(1)	(2)
Age	-0.031***	-0.032***
	(0.004)	(0.004)
Talent for alternative job 1	0.016***	
	(0.002)	
Difference between current job and alternative job 1		-0.074***
		(0.013)
Constant	3.131***	4.453***
	(0.225)	(0.165)
Adjusted-R-squared	0.130	0.107
N	941	941

Standard errors in parentheses
* p<0.1; ** p<0.05; *** p<0.01

Table 3: Effect of Age and Task Composition on Employability Alternative Job 2

Dep Var. Employability Alternative Job 2 (1-5 scale)	(1)	(2)
Age	-0.024***	-0.024***
	(0.003)	(0.004)
Talent for alternative job 2	0.017***	
	(0.002)	
Difference between current job and alternative job 2		-0.090***
		(0.011)
Constant	2.633***	4.018***
	(0.209)	(0.159)
Adjusted-R-squared	0.125	0.111
N	941	941

Standard errors in parentheses
* p<0.1; ** p<0.05; *** p<0.01

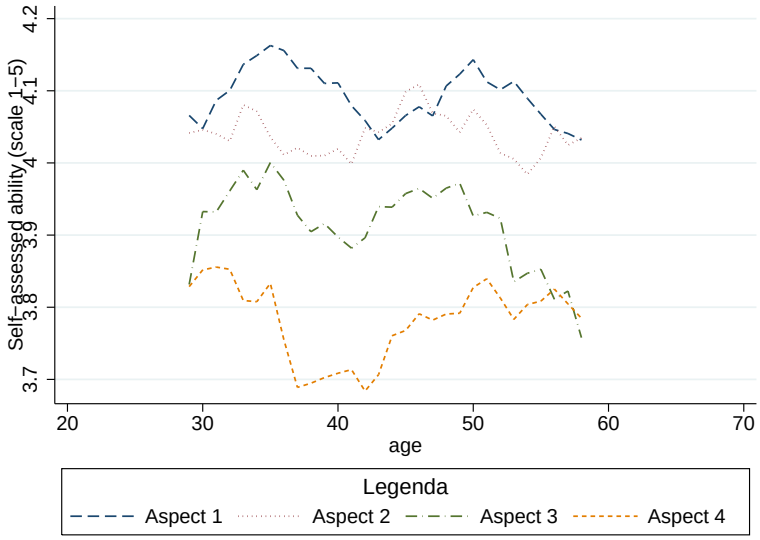

Figure 13: Ability to perform Aspects over the lifecycle

Source: Dutch Life Long Learning Survey 2007
Note: Figure based on 7-year moving averages.

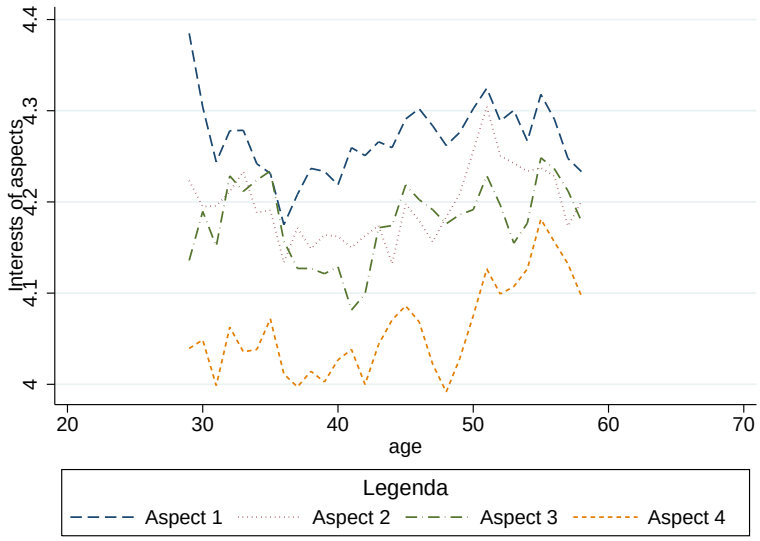

Figure 14: Interests of Aspects over the lifecycle

Source: Dutch Life Long Learning Survey 2007
Note: Figure based on 7-year moving averages.

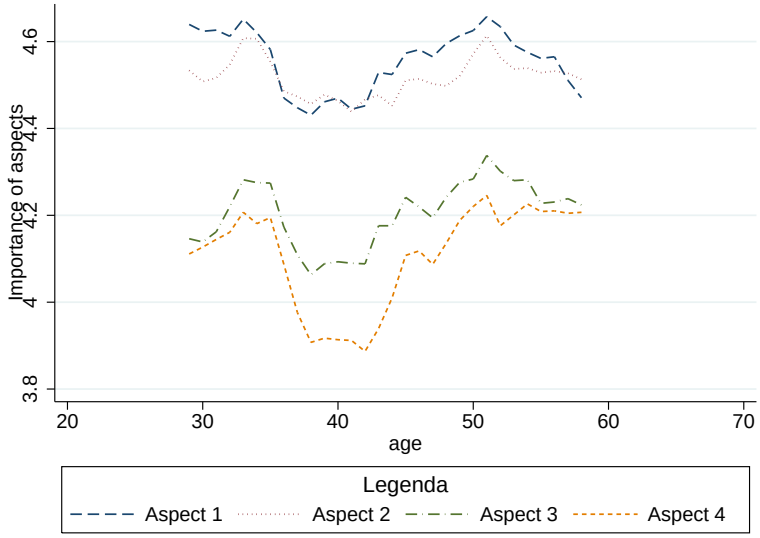

Figure 15: Importance of Aspects for *Current Job* over the lifecycle

Source: Dutch Life Long Learning Survey 2007
Note: Figure is based on 7-year moving averages.

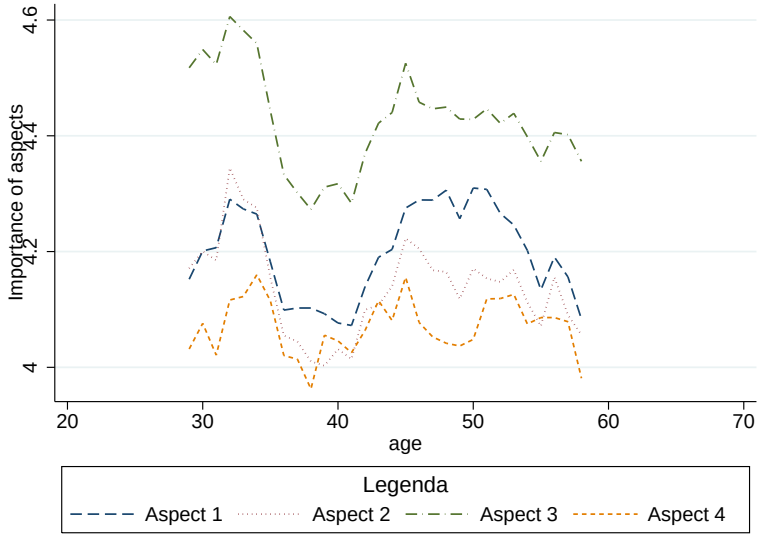

Figure 16: Importance of Aspects for *Alternative Job 1* over the lifecycle

Source: Dutch Life Long Learning Survey 2007
Note: Figure is based on 7-year moving averages.

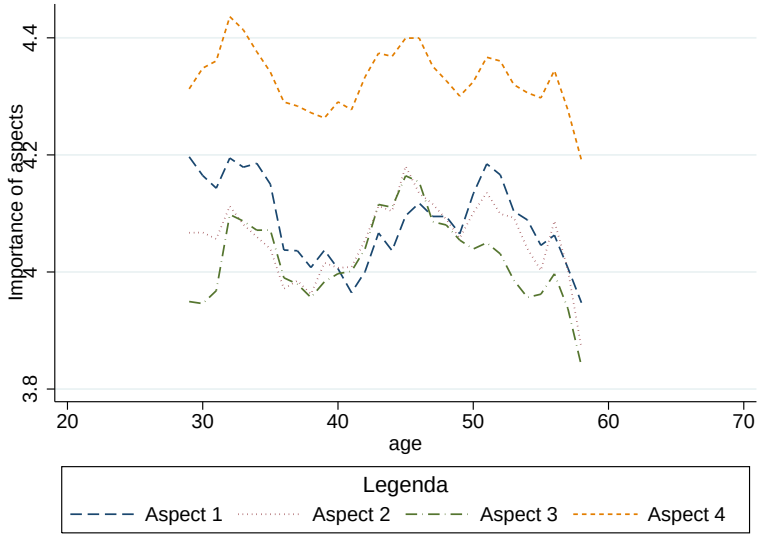

Figure 17: Importance of Aspects for *Alternative Job 2* over the lifecycle

Source: Dutch Life Long Learning Survey 2007
Note: Figure is based on 7-year moving averages.

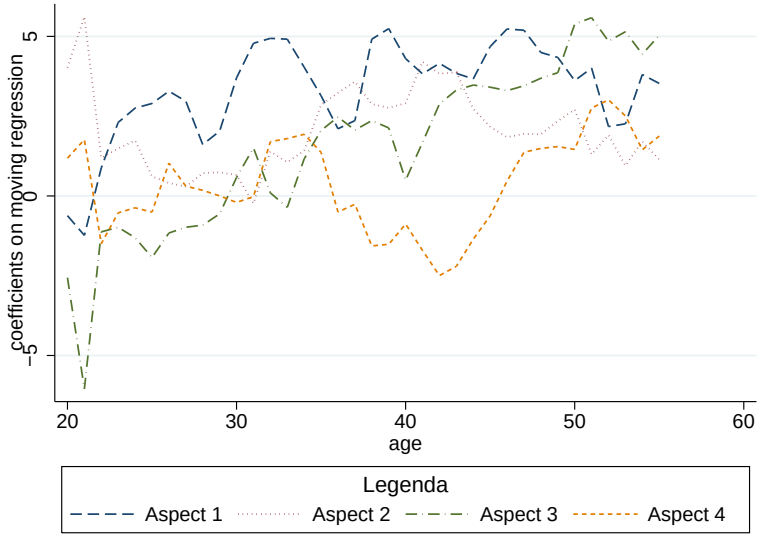

Figure 18: Importance of performance in several tasks for overall performance

Source: Dutch Life Long Learning Survey 2007
Note: Figure plots coefficients of moving regression

7 Conclusion and Implications

Older workers tend to have high wages while job mobility and labor market participation is low. It has been argued therefore that wages of older workers are too high, and that they should participate more in training to remain competitive in the labor market. In this paper we took a life-cycle perspective to understand the labor market position of older workers. Human capital theory predicts that younger workers invest more in human capital than older workers. Training participation will reduce wages while the skills acquired will increases wages, explaining the wage increased associated with age. Additionally, employers could postpone payments to workers to provide additional incentive to avoid shirking and moral hazard. It can be expected that the skills of older workers are much less general in nature than the skills of young workers. When people get older it can be expected that they increasingly prefer leisure above work.

In this paper we reviewed the literature and documented empirical evidence about the Netherlands to investigate whether the actual wage, learning and mobility profiles can be consistent with these theories that assume optimal behavior. Our main conclusion is that there are no observable major misalignments in the way people learn and their earnings. The strong wage growth observed in the data can however only be explained when assuming a major role for informal learning. Participation in formal training on its own is too small to explain substantial wages increases. The data support an important role for informal learning. A logical consequence seems to be that the nature of work changes when people get older. This is also supported by the data and can explain the low job mobility of older workers. A consequence of the specialisation that takes place during the working career is that older workers are vulnerable to large industry shifts and technological change, although there is evidence that older workers cope much better with technological change than often expected.

An important question is whether the government should intervene by introducing policy measures that stimulate workers to retire later and to help workers that are hit by industry shifts or technological change to find new work. In our view the optimal retirement age depends on individual preferences for work and leisure and will be influences by the value of human capital, life expectancy and income. Institutions and tax regulations will affect this choice. Ideally circumstances should be created in which the indi-

vidual decision to retire, equals the social optimum. In the current situation it is very likely that institutional incentives promote people to retire earlier than socially optimal.

Our conclusion however is that it is not very likely that wage formation and skill development are disturbing the market in this sense. Intervention in training provision to older workers, or changes in employment protection might therefore be beneficial in the short run, but could be disadvantageous in the long run. Even when the human capital of older workers looses value due to unexpected changes in the demand for work, it might be optimal to let these people retire earlier. This decision depends on a trade-off between training and adjustment costs (given the short pay-back period) and the value of leisure for these workers. Inefficient incentives for retirement mentioned above, might easily disturb this decision.

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A List of aspects

1. Dealing with people
2. Influencing or convincing people
3. Communication
4. Executing
5. Coaching
6. Accuracy
7. Immunity to stress
8. Perseverance
9. Decisiveness
10. Flexibility
11. Specific knowledge
12. Administrative skills
13. Working with computers
14. Analytical thinking
15. Insight in figures
16. Technical knowledge
17. Commercial insight
18. Collecting and processing information
19. General knowledge
20. Physical shape and strength
21. Creativity
22. Organizing
23. Time management

24. Writing
25. Presenting
26. Foreign languages

This list has been constructed on the basis of the Dutch Life Long Learning Survey 2005 in which a comparable, but *open* question was asked. Based on the reported aspects from this survey, we constructed a list with aspects.