

Temporary contracts: effect on job satisfaction and personal lives of recent PhD graduates

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Abstract In this study, we assess the effects of temporary employment on job satisfaction and the personal lives of recent PhD graduates. Temporary employment is becoming increasingly prevalent in many sectors, but has been relatively common in academia, especially for early career scientists. Labor market theory shows temporary employment to have a conspicuous negative influence on the job satisfaction and well-being of employees, but also identifies groups that may be exempt from these negative influences, such as the highly educated. Here, we study the effect of temporary employment on the highest educated group in the labor force, PhD graduates. We present findings of a survey of 1133 respondents who obtained their PhD from one of five Dutch universities between 2008 and 2012. Compared to PhDs employed on a permanent contract, PhDs on a temporary contract are less satisfied with their terms of employment, especially if they have no prospect of permanence. Temporary contracts with no prospect of permanence also decrease satisfaction with job content. Conversely, self-employment increases satisfaction with job content. Educational level required for the job also influences job satisfaction to a large degree: working below PhD level negatively affects job satisfaction. Finally, the type of contract affects different aspects of the personal lives of PhDs, such as the ability to obtain a mortgage, the stability of family life, and the possibility to start a family. In conclusion, we show that the highest educated, i.e., PhD graduates are not exempt from the negative influences of temporary employment.

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Introduction

Temporary (or fixed-term) employment is becoming a reality for an increasing share of academic researchers. The increase in temporary contracts for academics is especially pronounced for early career researchers and can be observed in many countries, such as the United States (Schuster and Finkelstein 2006: 194), Germany (Waaiker 2015) and the Netherlands (Association of Dutch Universities 2016). However, this shift from permanent to temporary employment is not confined to academia, but applies to all employment sectors. For example, in the Netherlands about half of all recent university graduates are employed on a temporary contract (Bertrand-Cloodt et al. 2012; Statistics Netherlands 2014). Still, in academia temporary employment is even more prevalent than in other sectors, which is easily exemplified by looking at the employment of PhD graduates who have just received their PhD: two-thirds of PhD graduates working outside academia have a permanent job, compared to only one-third for those working in academia (Sonneveld et al. 2010).

The prevalence of temporary employment in academia compared to other sectors raises the question what its effects are on early career researchers. In this study, we study:

1. What is the effect of temporary employment on the job satisfaction of recent PhD graduates?
2. What is the effect of type of employment on the personal life of recent PhDs?

Recent PhDs make for an interesting group to study this effect as we expect a relatively large dichotomization in type of employment by sector. In addition, the fact that the group consists of both permanently and temporarily employed persons makes it possible to estimate the effect of temporary employment using a “control” group of permanently employed persons. This is not possible using a group of postdoctoral researchers, for example, as most of these will be employed on a temporary contract. Furthermore, PhDs are an interesting group because they are the highest educated persons in the labor force. Whereas the effects of temporary employment on the labor force as a whole have been relatively well-studied, this is less the case for the highly educated, and not at all for PhDs.

The remainder of the paper is structured as follows. In a review of the literature, we will first provide several theories on the effects of temporary employment, coming from labor market, organization and career literature. Special attention will be given to the national context of the study. Furthermore, we will discuss literature on job satisfaction, focusing on previous studies on job satisfaction among PhDs and factors that influence their job satisfaction. In the methodology section we will describe how the survey has been conducted and which variables were measured. The results and discussion section starts by providing data on the prevalence of different types of temporary employment among the respondents. Then, we will show a comparison of several aspects of job satisfaction by type of employment. As a next step, we determine the effect of temporary employment on job satisfaction while controlling for other factors that may influence it. Finally, we show how type of employment affects the personal lives of recent PhD graduates. In our conclusions

section we put our results into the context of the labor market and career literature, and describe the policy implications of our study.

Literature review

Temporary employment

In their human resource management, organizations must decide on a strategy regarding the contractual arrangements and thereby the employment relationships with their employees. Most organizations have a core workforce of employees on permanent contracts, supplemented by a flexible supply of temporary workers (Aldrich and Ruef 2006: 97). Having a small core workforce offers the flexibility to adapt to changes in the economic environment, e.g., by reducing the workforce when demand decreases or by adapting the workforce to meet changed skill requirements, without the costs of redundancy pay (Bertrand-Cloodt et al. 2012; Cörvers et al. 2012). At the same time, temporary employees are less likely to be committed to the organization and the knowledge temporary employees obtained is lost when they find employment elsewhere (Aldrich and Ruef 2006: 97). Having a larger core workforce counteracts these issues. In conclusion, there is a tradeoff between the long term (commitment and obtained knowledge) and the short term (flexibility) in contractual arrangement strategies.

In case of universities and public research organizations, these considerations do not apply at the institutional level: their budgets are not heavily determined by market forces and are fairly stable. This is true even in cases where a considerable share of funding is obtained from competitive funding: the sources of competitive funding are themselves fairly stable, and the shares of individual research organizations competing for competitive funding sources are also relatively stable. However, at the level of departments and institutes within the organization, funding levels are more unstable and there the organizational and economic arguments mentioned above might apply. In addition, the acting management of the organizations may apply these considerations to their employees, in order to avoid risks of conflicts within the organization. This could be a reason for the large share of temporary employees modern research organizations, but this mechanism has not been studied in great detail. From work by one of us it appears that this large share has developed mainly as a consequence of the end of the large (budgetary) expansion of the higher education system as a whole (Waijjer 2015).

For workers, too, temporary employment may have two faces. On the one hand, according to dual labor market theory temporary jobs may be considered as low quality or even “bad” jobs with low pay and no access to benefits (Kalleberg et al. 2000), from which it is difficult to find a high quality job due to labor market segmentation (e.g., Reich et al. 1973). These bad jobs do not only have poorer terms of employment than permanent jobs, but also have poorer job content, e.g., featuring more monotonous tasks, less opportunity to learn new things and less often being sufficiently demanding (Letourneux 1998). Still, temporary jobs may be preferable to unemployment and can provide a “stepping stone” to a permanent job, especially for university graduates (Bertrand-Cloodt et al. 2012).

On the other hand, another body of literature on careers postulates temporary employment to enable “boundaryless careers”, in which workers do not work in one organization throughout their working life, but rather change employers more often and develop themselves as they wish (Arthur and Rousseau 1996). Following this theory,

Marler et al. (2002) distinguish “boundaryless” and “traditional” temporary employees and find that the boundaryless employees, who prefer temporary jobs, have a higher skill level and experience. Combining both the “stepping stone” and “boundaryless” theories of temporary employment, temporary jobs may not be “bad” jobs for PhD graduates, who are the highest educated group on the labor market.

A reason for this may lie in the psychological contracts formed between employers and employees. A psychological contract is defined as “individual beliefs, shaped by the organization, regarding terms of an exchange between individuals and their organization” (Rousseau 1995: 9). If the individual believes the terms of exchange have been breached, the psychological contract is violated. This leads to increased turnover and a decrease in trust and satisfaction in an employment context (Robinson and Rousseau 1994). Using the stepping stone analogy, young, highly educated employees on a temporary contract could experience a balanced exchange between themselves and the employer: employees offer (temporary) labor to the employer, and in turn gain job experience, which they can use in another job. In this case, temporary employment does not necessarily lead to decreased job satisfaction. Indeed, a recent study by Lam and de Campos (2015) found that young scientists involved in so-called collaborative research experienced a balanced psychological contract with their professor or employer and remained invested in their current job, despite the fact that some of them seemed trapped in perennial temporary employment. On the other hand, Thunnissen (2015) described the human resources policy at Dutch universities as an unbalanced situation, in which the long spells of temporary employment for scientists led to dissatisfaction. In this study, we can test whether temporary employment affects recent PhDs.

The national context: temporary employment in the Netherlands

As already indicated in our introduction, the past years have seen a large increase in temporary employment in the Netherlands (Bierings et al. 2015). There have been increases in the share of employees with a temporary contract, in the share of self-employed persons without employees (*zelfstandige zonder personeel* or *zzp'er*) and in the share of self-employed persons with employees. By 2013, the Netherlands ranked third among the EU-15 countries regarding the share of employees with a temporary contract, after Spain and Portugal (Kösters and Smits 2015). An explanation for a large share of temporary employees is high levels of legal protection against dismissal—in countries where the legal protection against individual dismissal is high, organizations achieve labor flexibility by hiring employees on a temporary contract (Kösters and Smits 2015). When the difference in legal protection of permanent and temporary employees is smaller, the share of temporary employees is often smaller.

In response to the increasing shares of temporary employees, the Netherlands adopted a new law regarding temporary employment, which became effective on 1 July 2015 (Wet werk en zekerheid 2015). In this law, dismissals were simplified by reducing the number of possible legal procedures. At the same time, employees gained the right to compensation if the employer fired them or if they had been employed for over 2 years. In addition, the maximum number of years on a temporary contract was reduced from three to two (with an exception for universities, for whom this period is 4 years). After this period, employees should be employed on a permanent contract. In addition, employees can only be employed on three temporary contracts (both before and after the change in the law). Before the changes in the law, multiple 3-year periods of employment could follow each other if there was a three-month break in-between the periods. This break has now been extended to

6 months. Together, these measures were supposed to make the difference between permanent and temporary contracts smaller and incentivize employers to hire more employees on a permanent contract.

However, at the time of writing, it is unclear whether the law has actually been effective. The number of permanent contracts in the third and fourth quarter of 2015 actually decreased compared to the number in the respective quarters in 2014 (Statistics Netherlands 2016a). In addition, there are signals that employers (especially small organizations) have become more hesitant to employ workers on a permanent contract due to the compensation at dismissal (De Koning 2016). This is mainly due to legal regulations concerning long-term illness—if employees get a long-term illness, they cannot be fired for 2 years and employers have to pay for their sick leave during this period. After these 2 years, employers can file for dismissal, but now also have to pay compensation.

Similarly, the increase in the number of self-employed persons has led to discussion and changes of laws. By some, this increase is being hailed as a sign of entrepreneurship, by others as hidden form of unemployment for those who cannot find a job (Hofs 2016; Witteman and De Haan 2016). In their newspaper article, Witteman and De Haan conclude that both are true: disproportionately many self-employed persons are either at the top or at the bottom of the income distribution. In financial and commercial services and in health care, income is the highest. In the food service industry and in the culture, sport and recreation sector income is lowest. On average, the income of self-employed persons is lower than that of salaried workers (Statistics Netherlands 2016b). There is one exception: physicians are the only group for whom the income is significantly higher as a self-employed person than as a salaried worker.

As a large share of PhD graduates works in academia shortly after their PhD, temporary employment in academia merits special attention. As already stated in the introduction, the share of temporary employees at Dutch universities has increased over the past 15 years, the share of temporary academic employees having increased from 43 % in 1999 to 62 % in 2014 (Association of Dutch Universities 2016). Particularly within the categories of other scientific staff (a category mainly made up of postdoctoral researchers) and assistant professors (Dutch: *universitair docenten*), positions have increasingly become temporary. With these trends, obtaining a permanent position at a Dutch university has become more difficult over the years. Still, opportunities for a permanent position are still larger than in, for example, Germany, where researchers are appointed as research affiliates on a temporary contract for long periods of time (Kreckel et al. 2008: 352).

A large majority of recent PhDs from Dutch universities work in the Netherlands. As such, the job market that they operate in, is one of increasing flexibility. An earlier study by one of us among postdoctoral researchers in the Netherlands has shown that the temporary nature of these positions affects job satisfaction (Van der Weijden et al. 2016), and so has a study among postdocs in Germany, Austria and Great Britain (Höge et al. 2012). Still, no studies have determined the effect of temporary employment on the job satisfaction of PhDs by using a control group: PhDs with a permanent position—which is what this study sets out to do.

Job satisfaction

Job satisfaction has been defined by Locke (1969) as “the pleasurable emotional state resulting from the appraisal of one’s job as achieving or facilitating the achievement of one’s job values”. Thus, job satisfaction is the result of the relation between a person’s values and the extent to which the job’s attributes can facilitate the achievement of these

values. Many different factors can affect job satisfaction. An important one is the level of the job: a skill mismatch negatively influences job satisfaction (Allen and van der Velden 2001; Mavromaras et al. 2010). The type of employment also plays a role: in a meta-analysis Wilkin (2013) showed that non-permanent employment decreases job satisfaction. The type of non-permanent employment matters: self-employed persons are as satisfied as permanent employees, whereas agency workers and direct-hires (i.e., persons hired on a temporary contract directly by the company) are less satisfied.

Job satisfaction among (recent) PhD graduates has been assessed for several countries and regions and is generally quite high (e.g., Bender and Heywood (2006), and Moguérou (2002) for the U.S., Di Paolo (2012) for Catalonia; Kifle and Desta (2012) for Australia). Many of these studies (e.g., Bender and Heywood 2006; Di Paolo 2012; Moguérou 2002) found that PhDs working outside of academia are overall less satisfied with their job than those working in academia, although Di Paolo (2012) found that PhDs in non-academic jobs are more satisfied with pecuniary rewards. Skill matches play a large role among PhDs: a skill mismatch is associated with lower job satisfaction (Bender and Heywood 2009).

In the general labor force, multiple other factors have been shown to affect job satisfaction, and were therefore also measured in our survey (for a complete list of variables, see the methodology section). Part-time employment may have an effect, but this effect is ambiguous, with some studies finding a positive effect, some a negative one, and some none (Conway and Briner 2002). Time in job also affects job satisfaction: directly after finding a new job people are more satisfied with their job (the “honeymoon effect”), but later they are less satisfied (the “hangover effect”, e.g., Vroom and Deci 1971; Lawler et al. 1975; Boswell et al. 2009). Furthermore, having a mentor has been shown to contribute to job satisfaction, through an increase in self-confidence (e.g., Nick et al. 2012).

In addition, a number of personal characteristics have been found to influence job satisfaction, both in the general labor force and more specifically among academics or PhD graduates. For example, satisfaction varies by field of PhD (e.g., Moguérou 2002; Sabharwal and Corley 2009). Females tend to be more satisfied with their job than males, not because their jobs are better, but because the expectations they have of their jobs are lower (Clark 1997). However, the same paper finds that this gender difference, with women being more satisfied, disappears for the highly educated, and for persons in professional and managerial positions. Indeed, studies on the job satisfaction of PhD graduates have found female PhDs to actually be *less* satisfied (Bender and Heywood 2006; Moguérou 2002). Nationality also matters: US-born science and engineering faculty were found to be more satisfied with their job than foreign-born faculty (Sabharwal 2011).

Methodology

Sample and survey methodology

Our survey was developed to gain more knowledge on the labor market position of recent PhD graduates from Dutch universities. Topics included job choice, perception of career prospects, use of skills developed during PhD, mentoring experiences, and the value of the PhD degree. A detailed description of the sample and survey methodology can be found in our working paper on the development of the survey questionnaire (Waijjer et al. 2015). The survey sample consisted of 2193 PhD graduates. Of these, 1023 persons obtained a

PhD between April 2008 and March 2009 from Utrecht University (a large, broad research university), Delft University of Technology (engineering and technology), Wageningen University (historically focused on agriculture but now broadening its scope to life sciences and environmental research), and Erasmus University Rotterdam (focused on medicine and social sciences, especially economics, law and management). This group has been approached before in a previous survey (Sonneveld et al. 2010). Another 1170 PhDs in the sample obtained a PhD between January 2008 and May 2012 from Leiden University, which performs research in all major areas except engineering and economics. Universities in the Netherlands differ in terms of scope, but are (almost) all deemed to be of good quality and reputation, without very high or low outliers (Government of the Netherlands 2014). The universities that the respondents obtained their PhDs from are no exception.

A survey invitation was sent to the 2193 PhDs in the survey sample, as well as up to three reminders if they had yet to fill in the survey. The survey was open for 91 days. A total of 1133 respondents started the survey, a 51.7 % (partial) response rate. Of the complete sample, 43.8 % progressed to the final question (960 respondents).

Variables

The variables measured were type of employment contract, several aspects of job satisfaction, other employment characteristics (sector of employment, level of the job, part-time employment, time in job, and presence of a mentor), PhD characteristics (field of PhD, time since PhD), and personal characteristics.

Employment status

One of our main variables was employment status by type of employment contract. Workers may have a permanent job contract, a temporary contract, or be self-employed. However, temporary contracts may vary in their flexibility: workers might have the prospect of obtaining a permanent position when performing their job well, or they might not. Therefore, we made a distinction between three types of temporary contracts: permanent but in a probation period, temporary with tenure track, and temporary without the prospect of a permanence. This resulted in five employment types: permanent contract, probation period of a permanent contract, tenure track contract, temporary contract without prospect of permanence, and self-employment. Self-employed persons are those doing paid work, but who are not employed by an employer.

Job satisfaction

A total of eighteen aspects of job satisfaction were measured, regarding job content, terms of employment, and work-life balance. The questions for several variables were drawn from the Careers of Doctorate Holders Survey model questionnaire (Auriol et al. 2010). Respondents were asked to rate the variables on a five-point Likert scale ranging from “very satisfied” to “very dissatisfied”.

Other employment characteristics

In our study we distinguished three sectors of employment: academic R&D, non-academic R&D, and non-R&D. The grouping of the respondents into these categories was based on two variables: involvement in R&D and type of employer. The Organisation for Economic Co-operation and Development (OECD) distinguishes three types of R&D: basic research, applied research, and experimental development (OECD 2002). PhDs not involved in any of the three types of R&D in their main job were classified as working in non-R&D (further dubbed outside research). PhDs in academic R&D (further dubbed academia) are PhDs involved in R&D and employed at a university, university of applied sciences or college, academic hospital, or research institute. Non-academic R&D jobs (further dubbed non-academic research) are held by PhDs involved in any type of R&D and working at another type of institution (e.g., at a private business, government institution, non-academic hospital).

Other measured job characteristics were the level of the job, full-time or part-time employment, and the time in job. We measured two aspects of job level: whether respondents had a supervisory role, and the education level normally required for their job. The four education levels were bachelor or lower, master, PhD, and professional degree (e.g., medical degree). Although some studies do not find a negative effect of overeducation on job satisfaction (e.g., García-Espejo and Ibáñez 2006), other studies do (Hersch 1991). This effect has been found to be mediated by a skill mismatch rather than an educational mismatch (Allen and van der Velden 2001; Mavromaras et al. 2010). However, as educational level is a more straightforward measure we chose this variable.

In addition, to measure experienced support in their current job, we asked the respondents whether they have a mentor. A mentor is “a more skilled or more experienced person who serves as a role model, teaches, sponsors, encourages for the purpose of promoting the latter’s professional and/or personal development” (Anderson and Shannon 1988). As the definition of a mentor may not be self-explanatory, this definition was given to the respondents in the questionnaire.

PhD characteristics

Respondents were asked to indicate in which field they did their PhD. The fields were medical and health sciences, natural sciences (including agricultural sciences), social sciences, humanities, and engineering and technology. Fields were chosen in such a way that different disciplinary contexts could be taken into account while still allowing for sufficient power in our statistical analyses. Furthermore, we measured the number of years since PhD.

Personal characteristics

Measured personal characteristics were gender, nationality, relationship status, and having young children. All variables were measured as dummy variables: gender as male or female, nationality as having the Dutch nationality or not, relationship status as living with a partner or not, and having young children as having children below the age of six or not.

Results and discussion

Employment status

To provide background information to the extent of temporary employment among recent PhDs, we assessed the respondents' employment status. Half of the respondents (with a job at the time of the survey) have a permanent contract (Electronic Supplementary Material Table S-1). Just over a third have a temporary contract without the prospect of obtaining permanence, seven per cent are self-employed, six per cent have a tenure track contract, and three per cent are in the probation period of a permanent contract. Types of employment contract differ by sector of work: the share of permanent contracts is highest in non-academic research, lowest in academia, and intermediate outside research. The share of PhDs on a tenure track contract is highest for academic PhDs. Finally, nineteen per cent of PhDs in non-academic research and thirteen outside research are self-employed. The share of PhDs on permanent contracts is higher for those when PhD was obtained longer ago: 40 % after 1 to 3 years and 55 % after 4 to 5 years. The difference is particularly pronounced for those in academia.¹

Job satisfaction: simple comparison of job satisfaction aspects between employment types

Now, we turn to the actual impact of temporary employment on job satisfaction. PhDs were asked to rate a total of eighteen aspects of job content, terms of employment, and work-life balance. In general, they are very satisfied with many aspects. PhDs are generally (very) satisfied with the content of their job, but less satisfied with the terms of employment and some aspects of work-life balance.

We compared different aspects of job satisfaction between the different employment statuses. The answers to the job satisfaction questions were not normally distributed over the answer categories, so we used the Mann–Whitney *U* test to determine whether there were statistically significant differences between the groups. We compared the satisfaction of PhDs on a permanent contract to that of PhDs with other employment statuses. This revealed that PhDs on temporary contracts are, unsurprisingly, less satisfied with job security than those on a permanent contracts, especially if they have no prospect of permanence (Fig. 1). The PhDs on a temporary contract without the prospect of permanence are also less satisfied with several other aspects, i.e., their contribution to society, salary, personal and family-related circumstances, social status, benefits, infringement of job on personal life, availability of permanent jobs within the organization, the organization's career policy and HRM, and job opportunities within the organization. The one aspect they are more satisfied with than those on a permanent contract, is the intellectual challenge of their job. PhDs on a tenure track contract and self-employed PhDs are more satisfied with this aspect as well. Furthermore, self-employed PhDs are more satisfied with their degree of independence, creativeness, level of responsibility, and social status.

¹ Only for PhDs outside research the share of PhDs on temporary contracts without prospect of permanence does not go down; this is likely to be caused by the fact that many of them are residents (medical specialists in training, e.g., to train as a neurologist), which are temporary positions that can last up to 6 years for some medical specialisms.

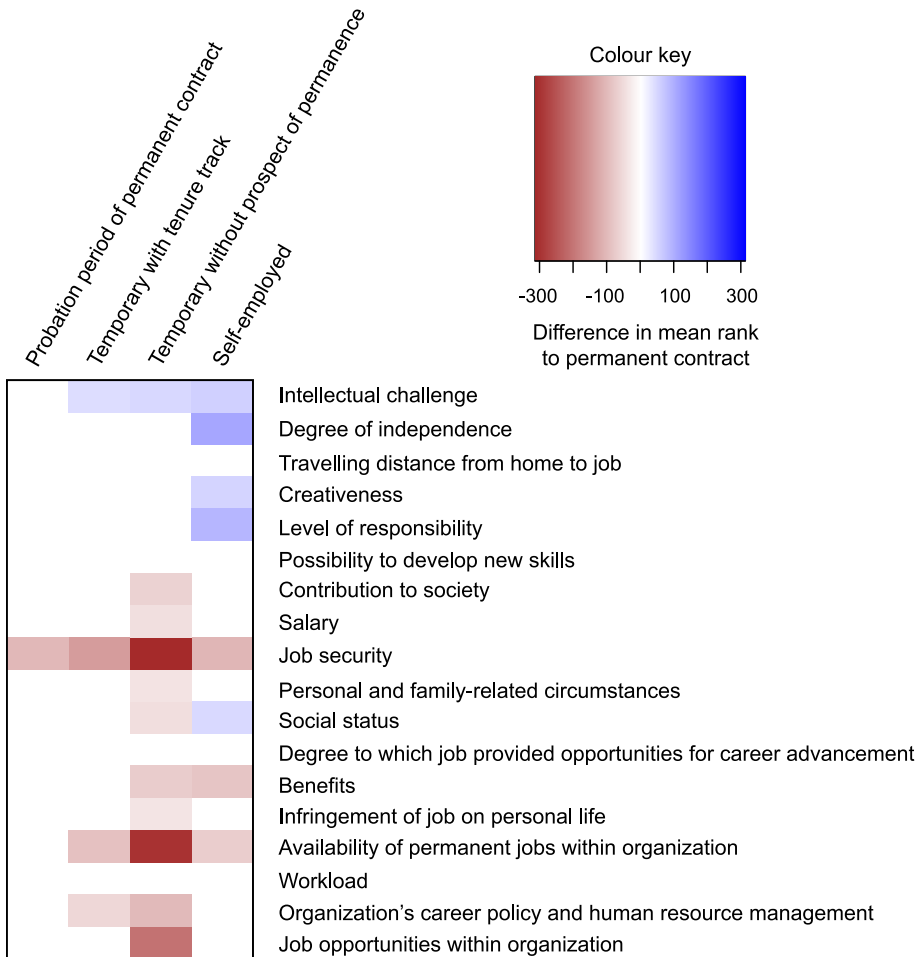


Fig. 1 Job satisfaction by employment status. Depicted in the heatmap are the statistically significant differences in mean rank between different types of non-permanent employment and a permanent contract in matrix format (Mann–Whitney U test, $p < 0.05$). In *brown* are the aspects that PhDs on a temporary contract (or being self-employed) are less satisfied with than those on a permanent contract; in *blue* the ones that they are more satisfied with. The brighter the color, the larger the difference. Heatmap generated using the R package gplots. (Color figure online)

Job satisfaction: effect of employment status controlling for other variables

Thus it appears that temporary contracts have a considerable (adverse) effect on job satisfaction, especially when it comes to terms of employment. However, it remains to be seen if this effect also exists if other factors affecting job satisfaction are taken into account.

Combination of job satisfaction variables into three scales

In the questionnaire, job satisfaction as such is not a variable: what is measured is the satisfaction with many separate aspects of the job. These have to be combined in order to

obtain a job satisfaction variable. We did not combine all aspects into a single variable, but instead defined three job satisfaction scales: job content, terms of employment, and work-life balance based on exploratory factor analysis using principal component extraction and promax rotation (Table S-2). After factor analysis, the reliability of the three scales was determined. For the scale of satisfaction with work-life balance, the Cronbach's α score was lower than 0.7. Therefore, two variables, satisfaction with travelling distance and with personal circumstances, were excluded. After removal of these items the Cronbach's α scores were at least 0.77 for all three scales. For the satisfaction with work-life balance scale the average score on the two items was computed. For the scales on satisfaction with job content and with terms of employment, the average score was computed if four or more items out of the seven scale items were answered.

Satisfaction with job content

We ran a linear regression of job satisfaction on both employment status and other characteristics. These characteristics were other employment, PhD and personal characteristics. Table 1 shows the results of the regression of the three job satisfaction scales on employment status and the other characteristics. In our analyses, we tested for interaction between gender and having children, but no interaction was found and thus not included in the model.

Self-employment increases the satisfaction with job content, whereas temporary contracts without prospect of permanence decrease it. Thus, employment status influences satisfaction with job content. Like Wilkin (2013), we show that the type of "non-permanence" matters, with self-employment not decreasing satisfaction with job content (rather *increasing* it), whereas temporary contracts without prospect of permanence do decrease it (albeit to a small extent). Thus, our results indicate that for PhDs, self-employment is an attractive option, as it gives them more satisfaction with degree of independence, level of responsibility, intellectual challenge, creativeness and social status (see Fig. 1). Self-employed PhDs appear to be part of the group of self-employed persons in the Netherlands who mainly reap the benefits of self-employment, instead of the group who is self-employed because they cannot find employment at an employer (Witteveen and De Haan 2016). From these results, a policy implication could be that PhDs should be encouraged to set up their own businesses. Self-employed PhDs do, however, differ from other PhDs in one aspect: age. At the year of PhD, they were on average 41 years old, whereas those now employed on a permanent contract were on average 35 years, and those on temporary contracts between 31 and 32. Therefore, it may be their work experience that makes self-employed successful and thereby satisfied with their jobs, rather than (just) the fact they are self-employed.

The level of the job matters, too: having a supervisory role has a positive effect on job satisfaction, whereas having a job below PhD level has a negative influence. This negative effect of working below PhD level on the satisfaction with job content is in accordance with Bender and Heywood's study (2009), which found that skill mismatches are associated with lower job satisfaction among U. S. PhD graduates. The mismatch between educational attainment of PhDs and job level is not a marginal phenomenon, as more than twenty per cent of PhDs indicate they have a job at master's level, and another two per cent a job at bachelor level or lower. These shares are higher for PhDs outside academia than in academia (Table 2).

The finding that skill mismatches are a strong negative influencer of satisfaction and that they are more prevalent outside academia has an important implication. Previous

Table 1 Effects of employment, PhD and personal characteristics on three scales of job satisfaction (linear regression)

	Job content		Terms of employment		Work-life balance	
	B (S. E.)	p value	B (S. E.)	p value	B (S. E.)	p value
Intercept	3.76 (0.11)	<0.001***	3.43 (0.12)	<0.001***	3.33 (0.17)	<0.001***
Employment status (ref. is permanent contract)						
Probation period of permanent contract	-0.18 (0.13)	0.181	-0.13 (0.14)	0.347	-0.05 (0.20)	0.807
Temporary contract with tenure track	-0.04 (0.10)	0.689	-0.33 (0.10)	0.001**	-0.33 (0.15)	0.025*
Temporary contract without prospect of permanence	-0.12 (0.06)	0.031*	-0.71 (0.06)	<0.001***	0.04 (0.09)	0.637
Self-employed	0.48 (0.10)	<0.001***	-0.11 (0.11)	0.310	0.03 (0.15)	0.825
Other employment characteristics						
Supervisory role in job	0.14 (0.05)	0.003**	0.16 (0.05)	0.001**	-0.03 (0.07)	0.676
Educational level required for job (ref. is PhD)						
Bachelor or lower	-0.38 (0.15)	0.014*	-0.64 (0.16)	<0.001***	-0.13 (0.23)	0.565
Master	-0.20 (0.06)	0.002**	0.06 (0.07)	0.376	0.07 (0.10)	0.446
Professional degree (e.g., M. D.)	-0.03 (0.08)	0.711	0.10 (0.08)	0.218	-0.45 (0.12)	<0.001***
Sector of work (ref. is academia)						
Non-academic research	-0.08 (0.06)	0.176	0.21 (0.06)	0.001**	0.09 (0.09)	0.295
Outside research	-0.11 (0.08)	0.180	0.19 (0.08)	0.025*	0.09 (0.12)	0.441
Having mentor in current job	0.19 (0.05)	<0.001***	0.11 (0.05)	0.028*	0.08 (0.07)	0.264
Years in job	0.00 (0.01)	0.636	-0.02 (0.01)	0.002**	-0.02 (0.01)	0.003**
PhD characteristics						
Field of PhD (ref. is engineering and technology)						
Medical and health sciences	-0.08 (0.09)	0.369	-0.08 (0.09)	0.349	-0.05 (0.13)	0.696
Natural sciences	0.06 (0.08)	0.476	0.14 (0.09)	0.111	-0.06 (0.12)	0.620
Social sciences	-0.10 (0.09)	0.285	-0.02 (0.10)	0.872	-0.08 (0.14)	0.580
Humanities	0.02 (0.09)	0.818	-0.16 (0.10)	0.104	-0.30 (0.14)	0.033*

Table 1 continued

	Job content		Terms of employment		Work-life balance	
	B (S. E.)	p value	B (S. E.)	p value	B (S. E.)	p value
Personal characteristics						
Dutch	0.07 (0.06)	0.212	-0.09 (0.06)	0.152	-0.06 (0.09)	0.508
Female	-0.01 (0.05)	0.821	-0.01 (0.05)	0.766	-0.15 (0.07)	0.027*
Living with partner	-0.02 (0.06)	0.738	-0.05 (0.06)	0.459	0.08 (0.09)	0.373
Children below 6	0.11 (0.05)	0.021*	0.00 (0.05)	0.992	0.08 (0.07)	0.295

*, **, and *** Statistically significant difference of the independent variable at the 5, 1, and 0.1 % levels, respectively

Table 2 Educational level required for job by sector of employment (%)

Educational level	Ac. R&D	Non-ac. R&D	Non-R&D	Total
Bachelor or lower	0	4	7	2
Master	7	35	53	21
PhD	82	48	24	65
Professional degree (e.g., M. D.)	11	13	17	12

studies have found that PhDs working outside academia are less satisfied with their job than those working in academia (e.g., Bender and Heywood 2006; Mogue rou 2002). However, we do not find such an effect of employment sector when type of employment and required educational level are controlled for. This is a consequence of the relation between sector of employment and required educational level. As such, it is the job's required educational level that affects satisfaction with job content, rather than sector of employment itself.

Our results indicate that outside academia, PhDs have more trouble finding jobs that are intellectually challenging and that offer autonomy, values they find very important in their job choice (e.g., Roach and Sauermann 2010; Bloch et al. 2015; Waaijer 2016). The current study shows that not only are jobs outside academia less attractive to PhDs due to the relative lack of these job qualities, they also decrease job satisfaction.

Satisfaction with terms of employment

A temporary contract (both tenure track and without the prospect of permanence) negatively influences satisfaction with terms of employment. A supervisory role increases satisfaction, as does having a mentor in the current job, and working outside academia. The latter mirrors Di Paolo's finding (2012) that PhDs outside academia are more satisfied with their pecuniary rewards. A job at bachelor level or lower in turn negatively influences satisfaction. Also for terms of employment a longer time in job decreases satisfaction: the hangover effect (Vroom and Deci 1971; Lawler et al. 1975; Boswell et al. 2009).

Satisfaction with work-life balance

Having a tenure track contract negatively influences job satisfaction with work-life balance, as does having a humanities PhD, and having a job at professional degree level. The negative effect of having a tenure track contract is likely to be a result of the pressure to succeed when having such a contract. A likely explanation for those with a job at professional degree level having lower job satisfaction is that many of these PhDs are medical doctors, whose jobs are highly demanding and among whom stress and burn-out are relatively prevalent (Prins et al. 2010; Visser et al. 2003). In addition, female PhDs are less satisfied. This is a common finding in other studies on female and male academics (e.g., de Lourdes Machado-Taylor et al. 2014). Finally, the longer a PhD has had a job, the less satisfied they are.

An extra variable: part-time employment

An important employment characteristic that could have influenced job satisfaction was whether a respondent had a full-time or part-time job contract (Conway and Briner 2002).

This question was only put to employees and not to self-employed respondents, for whom the distinction between part-time and full-time is problematic. Thus, we performed this linear regression without self-employed PhDs (Table S-3). The results show that most effects remain statistically significant. Most importantly, the negative effects of the different types of temporary contracts on job satisfaction, particularly with terms of employment, but also with job content and work-life balance are also apparent in the second model. Part-time employment itself negatively influences satisfaction with terms of employment.

Overall effect of temporary employment on job satisfaction

We now make a complete assessment of the effect of temporary employment on job satisfaction. The largest effect is on satisfaction with terms of employment: in a simple comparison, the job satisfaction of PhDs on temporary contracts is lower than that of their peers on permanent contracts, unsurprisingly especially regarding job security. In this simple comparison, PhDs on temporary contracts are actually *more* satisfied with one of the aspects of job content, namely the intellectual challenge in the job. The lower satisfaction of PhDs with terms of employment in the simple analysis when employed on a temporary contract, is counteracted by a slightly higher satisfaction with the intellectual challenge in the job. However, we also found that when other factors, such as the sector of employment and level of the job are controlled for, there is no positive effect of temporary contracts on satisfaction with job content. Instead, temporary contracts (without prospect of permanence) turn out to be a slight *negative* influencer of satisfaction with job content. This is due to the role that sector of employment and required education level of the job play. Many recent PhDs on a temporary contract work in academia, where they have a higher chance to work on their level of educational attainment than their peers outside academia. When the level of the job is controlled for, the “positive” influence of temporary employment found in a simple comparison disappears.

Effect of employment status on personal life

The respondents were also asked what effects their type of employment contract had on their personal lives. Items were the ability to obtain a mortgage, the stability of their family lives, and the possibility to start a family. PhDs on a permanent contract were asked to which extent their contract had positively influenced these items and PhDs on a temporary contract to which extent it had negatively influenced them. The type of contract has the largest effect on the ability to obtain a mortgage. Four in ten PhDs on a temporary contract say their contract type has “much” or “very much” negatively influenced this ability. For the ones on a permanent contract this share is even higher: seven in ten say their permanent contract has positively influenced the ability “much” or “very much”. With respect to the stability of family life and the possibility to start a family the effects are smaller, but still considerable: roughly a third of PhDs on a temporary contract say this contract “much” or “very much” negatively influenced their families. Men and women do not differ in a statistically significant way. As PhDs in academia are more prone to have a temporary contract, the effects of temporary contracts on personal lives are particularly pronounced in academia.

Conclusions and policy implications

According to dual labor market theory, temporary employment negatively affects the job satisfaction and well-being of workers, and disparities between workers on temporary contracts and those on permanent contracts tend to persist. However, it is also hypothesized that the highly educated may be exempt from this negative effect, and may use temporary jobs as a stepping stone to permanent employment.

Our analysis shows that for PhD graduates, temporary jobs are not “bad” jobs in the true sense of the word: if anything, PhDs on a temporary contract are *more* satisfied with job content. But, when we control for sector and job level, we find a negative influence of temporary employment on satisfaction with both job content (small effect) and terms of employment (larger effect). This shows that a negative effect of temporary employment also exists for (recent) PhD graduates, the highest educated persons in the labor force. Our findings are in line with Bertrand-Cloudt et al. (2012) and Van der Meer and Wielers (2014), who found that the highly educated (those with a university degree) are not exempt from the negative effects of temporary employment. We expect this is because temporary employment can lead to insecurity about career prospects, which in turn affects job satisfaction, as also found by Van der Weijden et al. (2016) among postdoctoral researchers (by definition employed on a temporary contract). As such, on the whole the PhDs studied here do not appear to experience a balanced psychological contract as found by Lam and de Campos (2015). However, further qualitative research would be needed to study which psychological contract PhDs experience with their employers, whether subgroups can be discerned, and whether the effects of temporary employment differ by psychological contract. Finally, we find a negative effect of temporary employment on the personal lives’ of recent PhD graduates.

In conclusion, temporary employment negatively influences the job satisfaction of recent PhD graduates. Temporary contracts are much more prevalent in academia than outside it, making this effect especially important for the human resource management at universities and other academic institutions. Our results strongly suggest that whereas universities offer jobs that satisfy PhDs intellectually, they could much improve their relative attractiveness on the labor market by increasing the share of permanent contracts and contracts with the prospect of permanence to levels comparable to those in other sectors. Furthermore, since we found that almost a quarter of PhDs indicate they work below PhD level, we may conclude that there is a mismatch between the number of PhD conferrals and the demand for PhD graduates outside academia, where PhDs are overqualified for the labor market. This mismatch may well be exacerbated by the current growth of the number of PhDs (Association of Dutch Universities 2016).

However, the mismatch may also lie in the types of skills obtained during a PhD trajectory in the Netherlands, and actually concern an *underqualification*. To check this, the match between acquired and required skills for various job types has to be studied. Actually, in our survey, we also collected information on the extent to which PhDs developed certain skills during their PhD and to which extent they need them in their current job. Preliminary data (to be reported elsewhere) show that research skills are overdeveloped by PhDs outside academia, but personal effectiveness, management and communication skills severely underdeveloped. This means that not only are PhDs working at bachelor or master level overqualified (looking purely at their degree), they are also underqualified, as they did not develop the skills needed for their current job in their doctoral training. This, too, could have a negative effect on job satisfaction. Thus a major

policy implication is that Dutch universities should broaden their doctoral training to not only include the development of research skills, but also skills in other areas.

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Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

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