

# Temporary employment and wage inequality over the life course

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Wage inequality between workers with different levels of educational attainment has been shown to increase over the life course. In this study, we investigate to what extent this growth is explained by temporary employment. Using linked employer-employee register data from the Netherlands, we follow the labour market careers of workers born in 1979. We decompose the impact of temporary employment on the change in the wage gap over the life course into two distinct components: (i) changes in group-specific temporary employment rates (risk) and (ii) changes in group-specific effects of temporary employment on wages (vulnerability). In line with previous research, we find a marked growth of the educational wage gap over the life course in the Netherlands. While group differences in temporary employment risk changed throughout the observation period to the detriment of less-educated workers, group differences in vulnerability to temporary employment diverged specifically during the early life course. Overall, temporary employment explains around 9 per cent of the change in the wage gap between workers with different levels of educational attainment by the age of 38 relative to age 28.

## Introduction

The rise of flexible forms of employment has been a major labour market transformation in the past few decades. In several European countries, changes in employment protection legislation have stimulated the growing prevalence of temporary work contracts (DiPrete *et al.*, 2006; Barbieri, 2009). Temporary contracts give organizations more leeway to adjust their staff size at the expense of higher job insecurity among workers. A substantial body of literature suggests that the flexibilization of employment relationships has spurred rising inequality in the labour market (Kalleberg, 2009; Bidwell *et al.*, 2013). Workers with lower levels of educational attainment bear the most negative consequences, as the substitution of temporary jobs for permanent jobs mainly affects routine work (DiPrete, Goux and Maurin, 2002; Gebel and Giesecke, 2011).

From a life course perspective, the growing use of temporary contracts by organizations signifies a revocation of long-term employment guarantees with potential repercussions for inequality over the working career. Indeed, recent research stresses the need to examine labour market outcomes from a life course

perspective (Cheng, 2014; Kalleberg and Mouw, 2018). Wage inequality grows over time among workers of similar age, and the level of intra-generational wage inequality has increased among younger cohorts (Bernhardt *et al.*, 1999; Cheng, 2021). This career process of wage differentiation is linked to educational attainment, as higher initial wages of higher-educated workers are associated with steeper wage growth over the life course (Cheng, 2014, 2021; Bhuller, Mogstad and Salvanes, 2017).

In this study, we examine temporary employment as a potential determinant of growing wage inequality over the life course. We investigate whether temporary employment explains wage differentiation between workers who are part of the same birth cohort but have different levels of educational attainment. Temporary employment can affect wage inequality as a life course process resulting in wage growth for some workers and wage stagnation for others (Bernhardt *et al.*, 1999; Mouw and Kalleberg, 2010). The present country case, the Netherlands, combines strong dualization of employment protection legislation with a highly stratified education system. Dualization at the institutional level leads to greater labour market hazards at the

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micro level, as indicated by higher aggregate temporary employment rates (Hipp, Bernhardt and Allmendinger, 2015) and larger negative effects of temporary employment on wages (Fauser and Gebel, 2023).

We extend previous research by estimating the contribution of temporary employment to the growth in wage inequality between lower- and higher-educated workers using Dutch-linked employer-employee register data. Previous research demonstrates that the hazards of temporary employment are unevenly distributed across education groups<sup>1</sup>, as higher-educated workers exhibit career patterns that entail more probable transitions into permanent employment and more favourable wage outcomes during temporary employment (Fuller and Stecy-Hildebrandt, 2015; Mattijssen and Pavlopoulos, 2019; Reichenberg and Berglund, 2019). Yet, as of now, we do not know to what extent these descriptive patterns of unequal career consequences translate into a continued differentiation of aggregate group-level wages over the life course.

Another contribution is that we study changes in temporary employment risk and vulnerability in a unified framework of analysis (Brüderl, Kratz and Bauer, 2019; Hogendoorn, Leopold and Bol, 2020). Previous research on the link between temporary employment and labour market inequality has considered either unequal temporary employment rates or wage outcomes. In contrast, we examine both pathways simultaneously. First, less-educated workers may be at a higher risk of temporary employment throughout their careers. This can lead to growing wage inequality when differences in temporary employment rates between groups increase over the life course, and the wage outcomes of temporary employment are, on average, negative. Second, less-educated workers might accrue larger wage penalties during temporary employment relative to permanent employment and thus are more vulnerable to the consequences of temporary employment. If group-specific effects of temporary employment on wages diverge over the life course, wage inequality increases, even if temporary employment rates remain similar.

Following this approach, we employ fixed-effects individual slopes (FEIS) regression models (Rüttenauer and Ludwig, 2023) together with a Kitagawa–Oaxaca–Blinder (KOB) decomposition for longitudinal data (Kröger and Hartmann, 2021). We decompose the observable change in wage differences between education groups over the life course into distinct components that are due to a changing composition in temporary employment rates (group-specific risk or endowment component) and the changing effects of temporary employment on wages (group-specific vulnerability or coefficients component). The advantage of this approach is that it allows us to judge the relative importance of each pathway for the growth of wage inequality over the life course.

## Theory

### Temporary employment and wage inequality over the life course

Sociological theories that aim to explain wage inequality over the life course focus mostly on how employment careers are affected by the broader institutional context in which they are embedded (Rosenfeld, 1992; Fuller, 2008; Kalleberg and Mouw, 2018). Against this background, individual employment careers at the micro-level can be understood as sequences of jobs that unfold under specific labour market regulations at the macro-level (Sørensen, 2001; Kalleberg, 2011). Once workers of the same cohort enter the labour market, their wage trajectories will evolve differently, as labour market institutions structure the career opportunities and constraints attached to different types of employment relationships.

One form of employment relationship that potentially reinforces wage inequality over the life course is temporary employment. The regulatory context of the Netherlands can be described as ‘partially deregulated’ and is characterized by low barriers to the use of temporary contracts combined with high protection of workers who hold permanent contracts (OECD, 2013). This policy constellation, commonly referred to as institutional labour market dualization (Busemeyer and Kemmerling, 2020), stimulates a higher aggregate temporary employment rate, specifically among less-educated workers (Hipp, Bernhardt and Allmendinger, 2015), and results in larger negative effects of temporary employment on wages from a cross-national perspective (Fauser and Gebel, 2023).

Given institutional labour market dualization, we expect temporary employment to be an important determinant of growing wage inequality over the life course in the Netherlands. We conceptualize temporary employment as an employment practice implemented by organizations (i.e., employers) at the meso-level. We argue that organizations link regulatory context to individual-level career trajectories. As organizations make use of temporary work contracts under national employment protection legislation, they shape the wage trajectories of workers (and ultimately aggregate inequality) by affecting the individual-level career sequences of jobs (Cobb, 2016).

In the Netherlands, this stratifying effect of temporary employment may be particularly strong among workers with different levels of educational attainment (Commissie Regulering van Werk, 2020). The Dutch education system is well-known for its early tracking and tight linkages between school and work (Bol and van de Werfhorst, 2013). Students are selected into different educational tracks at the age of 12 years. After the completion of lower secondary education, there are three further tracks: upper secondary vocational

education, tertiary vocational education, and university. The upper secondary option offers students the most occupation-specific skills, often organized in a dual system that combines school with apprenticeships, where students learn on the job. Tertiary vocational education is less specific, as education mostly takes place in schools, and students can move to a wider variety of occupations. Finally, university education is the most general, with some notable exceptions (e.g., medicine and law) (Forster and Bol, 2018). These differences in the specificity of educational programs also imply a differential labour market mobility of workers. Higher-educated workers, on average, will be more able to move to different job positions, given their broader training.

We employ a risk and vulnerability framework (see Table 1) to understand how temporary employment may affect wage inequality over the life course between workers with different levels of educational attainment (Brüderl, Kratz and Bauer, 2019; Hogendoorn, Leopold and Bol, 2020). We argue that the logic and motives with which organizations implement temporary employment lead to differing temporary employment risks and vulnerability between education groups. Under risk, we understand the group-specific likelihood of working in temporary employment at a given moment during the life course (i.e., group differences in temporary employment rates). With vulnerability, we refer to the group-specific wage effect of temporary employment relative to permanent employment at a given time point in the career (i.e., group differences in the effect of temporary employment on wages). When group differences in risk and vulnerability change over the life course, they contribute to growing inequality.

**Education and risk of temporary employment**

A first pathway through which temporary employment may contribute to wage inequality over the life

course is an unequal incidence. During hiring and contract renegotiation, organizations decide whether to commit to an open-ended employment relationship. Given the dualization of employment protection in the Netherlands, organizations may opt to retain operational flexibility by using easy-to-terminate temporary contracts instead of institutionally better-protected permanent contracts (Barbieri and Scherer, 2009; Gebel and Giesecke, 2011; Hipp, Bernhardt and Allmendinger, 2015). Indeed, the use of temporary contracts is a common employment strategy among organizations in the Netherlands, as the country exhibits one of the highest aggregate rates of temporary employment from a European perspective and is one of the few countries in which the temporary employment rate has continued to rise without major disruption since the early 2000s (Eichhorst, Marx and Wehner, 2017; Latner, 2022).

Prior research reports a higher risk of temporary employment for less-educated workers and explains this educational gradient in risk with the different types of work that are performed on the job (de Vries and Wolbers, 2005; DiPrete et al., 2006; Gebel and Giesecke, 2011; Reichelt, 2015; Olsthoorn, 2016). Workers with lower educational attainment can negotiate less favourable employment contracts, as their jobs are more often characterized by lower task specificity and monitoring costs. These job attributes do not require organizations to engage in long-term employment relationships to prevent losses of shared investments in firm-specific skills (Sørensen, 2001). Given the combination of high firing costs associated with permanent contracts and low restrictions on flexible employment in the Netherlands, organizations can reduce their labour costs and shift the risks related to market volatility to employees by using temporary contracts with no intent of later conversion, particularly among less-educated workers who predominantly hold these jobs in question (Polavieja, 2003).

By contrast, organizations tend to use temporary employment differently for higher-educated workers. Here, temporary contracts are most often intended as initial screening devices for permanent positions within the same workplace (Gebel and Giesecke, 2011; Kiersztyn, 2016). In the strongly stratified Dutch education system, tertiary degrees represent valuable yet mostly general credentials, thereby increasing employers' incentives to opt for a preliminary screening period to minimize risk while hiring under uncertainty. In other words, temporary jobs for higher-educated workers often function as entry hubs in a firm's internal labour market, which eventually provide access to permanent employment. Empirical research presents evidence for this argument by showing, on average, earlier and more durable transitions out of temporary

**Table 1** Summary of concepts and hypotheses

Concept	Interpretation	Expression	Expected contribution to $\Delta Y$ over the life course
Risk of temporary employment	Differing temporary employment rates by education	$\bar{X}_t^H \neq \bar{X}_t^L$	Continued contribution of $\Delta R$ over the life course
Vulnerability to temporary employment	Heterogenous effects of temporary employment on wages by education	$\hat{\beta}_t^H \neq \hat{\beta}_t^L$	Continued or decreasing contribution of $\Delta V$ over the life course

employment for higher-educated workers (Fuller and Stecy-Hildebrandt, 2015; Mattijssen and Pavlopoulos, 2019).

*Static risk hypothesis: Temporary employment risk is higher among lesser-educated workers than among higher-educated workers.*

From a dynamic perspective, temporary employment constitutes a crucial branching point for access to tenure and seniority within organizations (Lindbeck and Snower, 1988; Sørensen, 2001; Garcia-Louzao, Hospido and Ruggieri, 2023). The varying intentions behind the use of temporary employment may result in diverging group-level temporary employment risk over the life course. While most higher-educated workers may transition into permanent employment over time, less-educated workers may face larger long-term barriers to transition into permanent employment. In other words, reductions in temporary employment risk should be unequal and persistently smaller among less-educated workers.

*Dynamic risk hypothesis: Temporary employment risk contributes to changes in wage inequality between education groups throughout the life course.*

### Education and vulnerability to temporary employment

A second pathway through which temporary employment may contribute to growing wage inequality over the life course is an unequal effect on wages. In general, the institutional dualization of employment protection strengthens the wage bargaining position of permanent workers relative to temporary workers because of higher labour turnover costs for organizations (Lindbeck and Snower, 1988; Sørensen, 2001; Bellani and Bosio, 2021). This greater institutional protection of permanent contracts encourages organizations to focus their investments on firm-specific skills and the payment of efficiency wages to their permanent workforce. This results in temporary employment having an overall negative effect on wages in countries with strong institutional labour market dualization (Fauser and Gebel, 2023).

Yet, earlier research shows that the negative wage effect of temporary employment is not uniform across different labour market groups (Kiersztyn, 2016; Fauser and Gebel, 2023). Moreover, decreasing wage penalties towards the upper end of the wage distribution indicate the existence of relatively better compensated temporary employment positions in the labour market (Arranz, Fernández-Macías and García-Serrano, 2021; Westhoff, 2022). Importantly, the negative effect of temporary employment on wages may be

larger among less-educated workers. Given the often intended use of temporary employment as a labour cost-cutting strategy in the case of less-educated workers' jobs, they are more likely to be situated in insecure low-status positions that are disconnected from promotion and training opportunities, as well as reward structures that other workers in the same organization receive (Booth, Francesconi and Frank, 2002; Barbieri et al., 2019; Garcia-Louzao, Hospido and Ruggieri, 2023).

*Static vulnerability hypothesis: Temporary employment vulnerability is, on average, larger among lesser-educated workers than among higher-educated workers.*

From a dynamic perspective, changes in wage effects over the life course can contribute to growing inequality when putting less-educated workers at a further disadvantage. The negative wage effect of temporary employment increases with age in the Netherlands (Fauser and Gebel, 2023), but this general trend of a growing negative effect may mask group-specific patterns of change. Previous research suggests two potential patterns for changing vulnerability over the life course. First, differences in vulnerability between education groups may remain large or even increase throughout the life course. According to the literature on job mobility, workers possess differing levels of market power based on their previously acquired skills, which results in unequal wage outcomes despite similar job insecurity (DiPrete, Goux and Maurin, 2002; Mouw and Kalleberg, 2010; Frederiksen, Halliday and Koch, 2016; Kalleberg and Mouw, 2018). It is argued that higher-educated workers are better able to realize wage gains while chaining temporary contracts between organizations over their entire careers. Economic job matching theories and the theory of boundaryless careers provide complementary arguments. According to these theories, workers can build successful careers by linking jobs in different organizations that match their evolving work experience and training needs (Arthur, 1994; Bidwell and Briscoe, 2010; Kalleberg and Mouw, 2018). In other words, higher-educated workers may fare better in utilizing the potential 'bridge function' of temporary employment, which can offer work experience and valuable social capital for subsequent job search (Barbieri and Scherer, 2009; Fuller and Stecy-Hildebrandt, 2015; Reichenberg and Berglund, 2019; Fauser, 2020). In contrast, less-educated workers are argued to be more dependent on the acquisition of firm-specific skills within firm internal labour markets that insulate them from external market forces (i.e., permanent employment) to realize wage gains (Kalleberg, 2011).

*Dynamic vulnerability hypothesis (I): Temporary employment vulnerability contributes to changes in wage inequality between education groups throughout the life course.*

Second, group differences in vulnerability by educational attainment may initially be large, but may also converge over the life course. A smaller wage penalty among higher-educated workers could be limited to an initial job-matching period during the early career, and afterwards dissipate over the life course. During early job matching, educational attainment may operate as a signal and mitigate vulnerability by increasing the chance for higher-educated workers to receive a favourable starting salary at a new organization despite entering the firm on a temporary contract (Spence, 1973; Bidwell, 2011). However, in the later stages of the life course, temporary employment may increasingly indicate adverse career trajectories among higher-educated workers given a growing number of temporary workers who did not pass an earlier probation period. In other words, negative wage effects between education groups may become more similar, thereby resulting in a smaller contribution of vulnerability to changes in wage inequality.

*Dynamic vulnerability hypothesis (II): Temporary employment vulnerability contributes to changes in wage inequality between education groups particularly in the earlier stages of the life course.*

## Data and Methodology

### Sample

We analyzed Dutch wage register data from 2006 to 2019 (Centraal Bureau voor Statistiek, 2022). The data contain job-level information on wages and hours worked, which employers report monthly for taxation purposes. In the data, uniquely identified workers are linked to their employing organizations. Workers may hold multiple jobs simultaneously, sometimes even within the same organization.

The population for the analysis consisted of all employed workers (full- and part-time) born in 1979. These workers turned 27 years old in the first year of observation (2006) and were 40 years old at the end of the observation period (2019). To analyze changes in wage inequality among a stable group of workers, we focused on workers who were continuously observed between 2007 and 2019 ( $N = 85,786$ ).<sup>2</sup> Throughout the analysis, we benchmark the point estimates based on this sample against equivalent estimates that included all workers born in 1979 with available education codes.<sup>3</sup> Importantly, codes for the highest attained education were only available for approximately 75 per cent of the population. We applied weights provided

by Statistic Netherlands (CBS) to correct for misrepresentation due to the non-random availability of educational codes.

This cohort design has the distinct advantage of conceptualizing wage inequality as a distribution that unfolds over the life course of workers (i.e., between ages 27 and 40), rather than looking at population-wide inequality in specific calendar years. Taking this perspective was more appropriate for this study because we argue that temporary employment affects wage inequality as a career process (Gottschalk and Moffitt, 2009).

We focused on the main job of a worker. The main job was defined as the organizational affiliation of a person with the most absolute hours worked in a given calendar year. This definition affected data processing in several ways. First, we treated multiple job identifiers of the same worker in the same organization as one job and summed all hours and earnings. Second, if a person worked for more than one organization in the calendar year, we designated the person-organization pair with the highest absolute number of hours as the main job. All other jobs were excluded from the analysis. Third, we differentiated all wages and hours within each main job by contract status (permanent or temporary) before aggregating them over the calendar year. Overall, we derived a yearly panel of main jobs nested in unique workers.

### Variables

Table 2 provides an overview of the variables used in the analysis. The dependent variable was the real hourly wage. The wage measure excluded additional benefits such as holiday allowances and overwork compensation. 1 €/h Hourly wages were adjusted for inflation by using the yearly consumer price index with 2015 as the reference point. We set hourly wages below 1 €/h as missing and applied a log transformation. We top-coded a few cases (0.04 per cent) with an hourly wage above 100 €/h.

Education was defined as the highest attained level. The variable comprised three levels of education: lower secondary education or less (ISCED [International Standard Classification of Education] 1–2; basisonderwijs, vmbo, havo-, vwo-onderbouw, mbo1), upper or post-secondary education (ISCED 3–4; havo, vwo, mbo2–4), and tertiary education (ISCED 5–8, hbo-, wo-bachelor/master, doctor). We treated education as time-invariant by assigning the highest observed level to all person-years of a worker. A total of 13.22 per cent of all workers with available education codes upgraded their educational attainment during the observation period.<sup>4</sup> We accounted for these changes by constructing an additional control variable that flagged year-specific deviations from the assigned time-constant highest level of education.

**Table 2** Descriptive statistics at the beginning (2007) and the end (2019) of the observation period among continuously observed workers born in 1979

	All	All	ISCED 1–2		ISCED 3–4		ISCED 5–8	
	2007	2019	2007	2019	2007	2019	2007	2019
Real hourly wage	15.41 (4.35)	21.14 (8.97)	13.29 (3.62)	15.79 (5.27)	14.49 (3.94)	17.94 (5.82)	17.18 (4.40)	26.71 (10.07)
<i>Permanent contract</i>	15.74 (4.34)	21.78 (9.13)	13.68 (3.77)	16.20 (5.33)	14.82 (3.92)	18.47 (5.92)	17.72 (4.31)	27.32 (10.17)
<i>Temporary contract</i>	14.59 (4.28)	18.24 (7.59)	12.31 (2.99)	14.22 (4.71)	13.53 (3.83)	15.71 (4.79)	16.14 (4.37)	23.57 (8.85)
Education								
ISCED 1–2		12.20%						
ISCED 3–4		48.33%						
ISCED 5–8		39.47%						
Man		51.70%		63.45%		54.03%		45.21%
Immigrants and their (direct) descendants								
With own migration experience		9.14%		16.53%		8.09%		8.13%
Without own migration experience		9.25%		9.66%		9.21%		9.18%
Temporary employment ( <i>t</i> )	29.36%	18.22%	27.99%	20.64%	25.66%	19.37%	34.31%	16.07%
Cumulative years of temporary employment (since 2006)	0.57	3.12	0.53	3.16	0.49	3.08	0.68	3.15
Workers with 0 years of temporary employment ('never treated')		36.16%		38.64%		38.63%		32.37%
Workers with 13 years of temporary employment ('always treated')		1.48%		2.13%		1.43%		1.34%
Job mobility events ( <i>t</i> )								
Temporary ( <i>t</i> – 1) & Stay ( <i>t</i> ) & Permanent ( <i>t</i> ) &	4.63%	4.56%	3.72%	4.30%	3.20%	4.35%	6.69%	4.89%
Temporary ( <i>t</i> – 1) & Stay ( <i>t</i> ) & Temporary ( <i>t</i> ) &	12.38%	8.74%	12.10%	11.09%	10.46%	9.49%	14.84%	7.10%
Temporary ( <i>t</i> – 1) & Job mobility ( <i>t</i> ) &	3.62%	1.31%	2.98%	1.57%	3.21%	1.42%	4.32%	1.09%
Permanent ( <i>t</i> ) &								
Temporary ( <i>t</i> – 1) & Job mobility ( <i>t</i> ) &	7.98%	3.92%	7.35%	4.35%	6.85%	4.36%	9.57%	3.24%
Temporary ( <i>t</i> ) &								
N		85,786		7,895		32,370		45,521

Note: Industry and sector shares not displayed.

The main explanatory variable was the employment contract that indicated a permanent or temporary employment relationship. Because the contract status of a main job can change within a calendar year, we applied an 'hours worked' criterion while constructing this variable. If more working hours were accumulated on a temporary contract during the calendar year, we assigned temporary employment as the overall contract status. The wage measure was adjusted accordingly using only wages and hours accrued while observing the assigned contract status. In addition, we

constructed a variable that counted the cumulative number of years of temporary employment since 2006 to capture cumulative effects.

We constructed a second explanatory variable that combined information on contract status with an indicator of job mobility (staying versus switching between organizations). Workers employed in the same organization in both the preceding and current calendar years were designated as stayers. By contrast, when a worker changed organizations between two adjacent calendar years, we defined this as job mobility. This variable

allowed us to contrast the wage effects of either staying within or moving between organizations combined with either staying temporarily employed or moving into permanent employment after holding a temporary contract in the preceding year.

We defined the time dimension of the data along the axis of respondents' age. Alternatively, we could have conceptualized time as work experience because the level of education affects the timing of labour market entry. For example, while higher-educated school graduates usually enter the labour market in their mid-twenties, this happens at a younger age for most workers with lower levels of educational attainment. We focused on actual age for two reasons. First, starting the observation window at age 27 ensured the same regulatory wage floor among all workers, since the full statutory minimum wage applies only to those aged 21 years and older in the Netherlands. Second, the vast majority of individuals had completed their educational trajectory at this point in their lives, thereby minimizing the number of workers who still participated in education parallel to observed employment.

We included several control variables in the adjustment sets. During the risk analysis, we controlled for gender and immigration fully interact as ancestors of the exposure variable (education) and the outcome variable (temporary employment), while other potential confounders such as class background were unobserved. During the vulnerability analysis, we controlled for industry (first level of the Dutch SBI 2008) and sector (public, private, subsidized) as ancestors of the treatment (temporary employment) and the outcome variable (wages). We did not control for industry and sector in the risk analysis, as we considered these variables to be descendants of education, thus inducing overcontrol bias when being included as a control.

### Methodology

We performed the analysis in three steps. In step one, we assessed the empirically observed wage levels of workers by education and traced how these group-level wages developed over the life course.

In step two, we investigated temporary employment risk and vulnerability using two separate approaches. First, we performed a state-probability analysis to describe how the risk of temporary employment differs by level of education and how this developed over the life course. For this purpose, we estimated a pooled logistic regression model

$$\begin{aligned} \text{logit}(Temp_{it}) = & \alpha + \beta Edu_i + \gamma Age_{it} \\ & + \delta Edu_i * Age_{it} \\ & + \mu' X_i + \varepsilon_{it} \end{aligned} \quad (1)$$

where we interacted with the set of education indicators  $Edu_i$  (with ISCED 1–2 as the reference category)

with a set of age dummies  $Age_{it}$ . We used this model to derive predicted probabilities of temporary employment by education and age. The purpose of this model was to provide a description of educational differences in temporary employment risk over the life course rather than an analysis of transition rates.

Second, we estimated FEIS panel regression models to analyze vulnerability to temporary employment. We implemented the following models separately for each education group:

$$\begin{aligned} \ln wage_{it} = & \beta Temp_{it} + a_{1i} + a_{2i} t \\ & + a_{3i} t^2 + \gamma Year_{it} \\ & + \delta' X_{it} + \varepsilon_{it} \end{aligned} \quad (2)$$

$$\begin{aligned} \ln wage_{it} = & \sum_{n=1}^7 \beta_n Event_{n,it} + a_{1i} + a_{2i} t + a_{3i} t^2 \\ & + \gamma Year_{it} + \delta' X_{it} + \varepsilon_{it} \end{aligned} \quad (3)$$

With the first set of models (Equation 2), we estimated the average effect of temporary employment on wages. We relied purely on within-person variation to identify the effect of interest. In addition to worker- and year-fixed effects, we controlled for heterogeneous slopes, as workers with flatter wage trajectories are likely to select temporary employment, thereby resulting in an overestimation of the negative effect of temporary employment on wages (Rüttenauer and Ludwig, 2023). We controlled for this source of bias by including interactions between person-specific IDs and a continuous time measure ( $t$  and  $t^2$ ).

Due to this within-design, we can't identify effects for workers who were either continuously permanently employed ('never treated', 36.16 per cent) or continuously temporarily employed ('always treated', 1.48 per cent) throughout the observation period. Omitting the group of 'never treated' during the estimation was arguably inconsequential for the analysis, as temporary employment did not affect their wages.<sup>5</sup> The unidentified effects of the 'always treated' represented a greater challenge in the design, as they constituted part of the true average treatment effect on the treated. It is plausible that these workers would gain the most from entering permanent employment, and if this is the case, our estimates would be downward biased. This problem was amplified by the fact that the 'always treated' were overrepresented among the less-educated workers (Table 2). However, the small overall share of continuously temporarily employed workers in the sample mitigated this problem. In either case, it is important to consider the estimates of these models as lower-bound estimates.

With the second set of models (Equation 3), we estimated the effect of job mobility events after

holding a temporary contract in the previous year. These effects were identified as contrasts to a worker staying in the same organization while being permanently employed throughout. In other words, while the first set of models (Equation 2) defines the counterfactual as the wage trajectory of the temporary employed had they been permanently employed, the second set of models (Equation 3) applies a narrower counterfactual defined as the wage trajectory of the previously temporarily employed had they been embedded in a firm-internal labour market.

As a third step, we decomposed the contribution of temporary employment to the growing wage gap between education groups over the life course. We relied again on FEIS panel regression by building on Equation 2.<sup>6</sup> We used  $Temp_{it}$  to capture immediate effects of temporary employment. In addition, we fully interacted with the temporary employment indicator with age to allow for time-varying effects over the life course. We also included the cumulative number of years of temporary employment since 2006 as a continuous variable (linear and quadratic) in the decomposition to capture effects that accumulate over time. Other than the immediate effect, the cumulative effect of each additional year in temporary employment since 2006 was constrained to be time-constant.<sup>7,8</sup>

We used an extension of the KOB decomposition for longitudinal data (Wellington, 1993; Kröger and Hartmann, 2021). Conceptually, we decomposed the change in the mean group differences over time ( $\Delta Y$ ) in other words, we asked how much of the change in wage difference between education groups from age 28 ( $s$ ) to time point  $t$  was due to a change in the group-specific temporary employment rates ( $\bar{X}$ ) or a change in group-specific wage effects of temporary employment ( $\hat{\beta}$ ).

$$\Delta Y = \Delta Y^H - \Delta Y^L = (\bar{X}_t^H \hat{\beta}_t^H - \bar{X}_s^H \hat{\beta}_s^H) - (\bar{X}_t^L \hat{\beta}_t^L - \bar{X}_s^L \hat{\beta}_s^L) \quad (4)$$

This change in wage differences over the life course ( $\Delta Y$ ) can be decomposed by looking at the outcome variable group-wise across time. The wage differences over time among workers with lower levels of education ( $\Delta Y^L$ ) were subtracted from the wage differences over time among workers with higher levels of education ( $\Delta Y^H$ ). A positive value of  $\Delta Y$  indicated an increasing wage gap. Formally, this change over time can be decomposed by taking the difference between two KOB decompositions at two time points. We applied a threefold decomposition after rearranging terms following Kröger and Hartmann (2021):

$$\Delta Y = \underbrace{(\bar{X}_t^H - \bar{X}_s^H) \hat{\beta}_s^H - (\bar{X}_t^L - \bar{X}_s^L) \hat{\beta}_s^L}_{\Delta R} + \underbrace{\bar{X}_s^H (\hat{\beta}_t^H - \hat{\beta}_s^H) - \bar{X}_s^L (\hat{\beta}_t^L - \hat{\beta}_s^L)}_{\Delta V} + \underbrace{(\bar{X}_t^H - \bar{X}_s^H) (\hat{\beta}_t^H - \hat{\beta}_s^H) - (\bar{X}_t^L - \bar{X}_s^L) (\hat{\beta}_t^L - \hat{\beta}_s^L)}_{\Delta I} \quad (5)$$

where the subscript  $s$  denotes the starting point of the time interval under investigation at age 28 (2007). This was the initial group-level wage difference that we observed and the baseline for evaluating subsequent changes.  $t$  was a later point of time somewhere between age 29 (2008) and age 38 (2017).<sup>9</sup> The superscripts  $L$  and  $H$  denote the group membership of workers with either a lower or a higher level of educational attainment.  $\bar{X}$  is the temporary employment risk based on the sample means and  $\hat{\beta}$  is the temporary employment vulnerability derived from the estimated regression coefficients of the FEIS models.

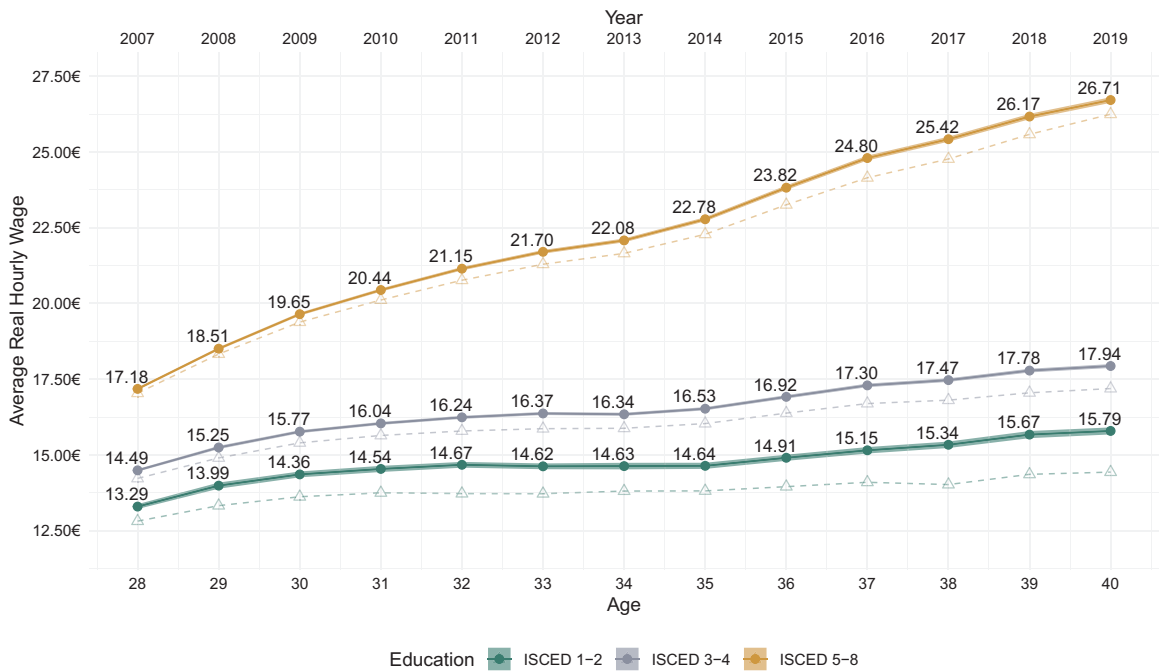
The first component  $\Delta R$  is the part of the change in the wage gap that was attributable to temporary employment risk (i.e., the endowment component). It expresses the extent to which the wage gap changed because of changes in temporary employment risk between time point  $s$  and  $t$  given the initial differences (and no change) in vulnerability. The second component  $\Delta V$  captures the part of the change in the wage gap attributable to temporary employment vulnerability and changes in the intercept (i.e., the coefficient component). Net of the intercept subcomponent of  $\Delta V$ , it expresses how much the wage gap changed because of changes in temporary employment vulnerability between  $s$  and  $t$ , given the initial differences (and no change) in risk. The third component  $\Delta I$  captures the interaction between changes in risk and vulnerability. This component does not carry a substantive interpretation on its own but affects the overall joint contribution of changes in temporary employment risk and vulnerability to changes in the wage gap.

## Results

### Wage inequality between education groups over the life course

How did the wages of continuously observed workers born in 1979 develop over the life course in the Netherlands? Figure 1 shows the average real hourly wage by education group between the ages of 28 and 40. The difference in average wages grew profoundly over the life course. The average wage of higher-educated workers increased steadily, whereas the average wages of the other groups grew only slowly and tended





Source: (S)POLIS, 2007–2019

**Figure 1** Average real hourly wages over the life course among continuously observed workers born in 1979 by educational attainment (Note: Dashed lines with triangles display average wages in the full sample of workers born in 1979.)

to stagnate at various times. At age 28, less-educated workers earned an average of 13.29 €/h in their main job, while higher-educated workers earned 17.18 €/h. Over time, the initial wage gap of 3.89 €/h nearly trebled and reached a difference of 10.92 €/h at age 40. Over the course of 12 years, the average wage of less-educated workers grew only slightly up to 15.79 €/h and did not reach the level of the average wage of higher-educated workers at age 28. In contrast, the average wage of higher-educated workers rose to 26.71 €/h in 2019.

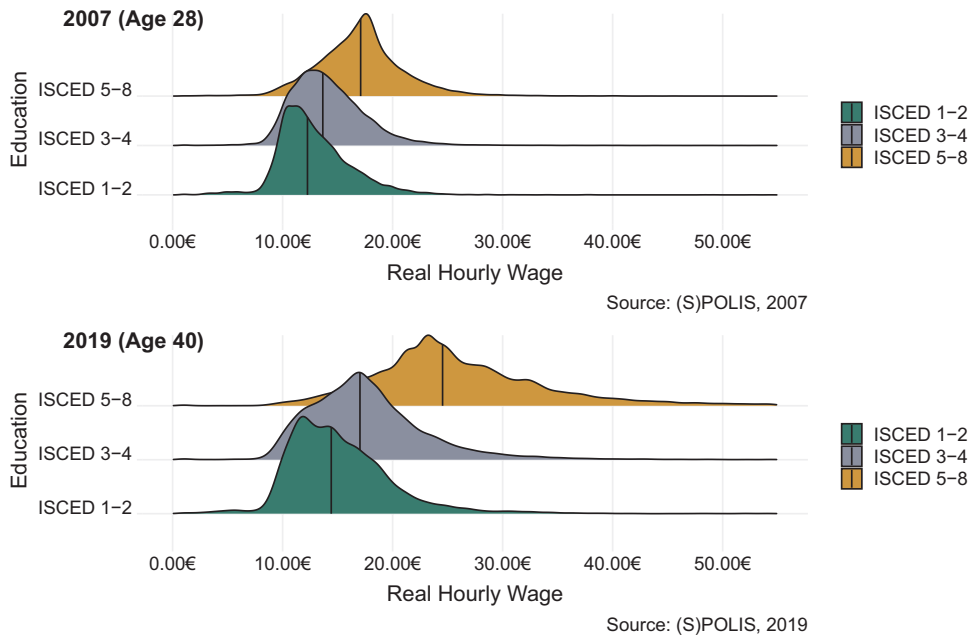
Figure 2 shows how the distribution of real hourly wages developed over the life course within education groups. These distributions illustrate the diverging careers that produced the growth in the wage gap. The wages of less-educated workers tended to stagnate, while those of high-educated workers tended to grow. In general, within-group wage inequality increased over time in all groups. The distribution of hourly wages among less-educated workers aged 40 was right-skewed. While the left tail of the distribution was confined by the legal minimum wage, there were a limited number of less-educated workers who established successful careers with wages higher than 20 €/h. In contrast, the distribution of hourly wages among higher-educated workers was strongly spread by the age of 40. Quite a few higher-educated workers earned very

high wages and were a crucial contributing factor to the rising group average.

Overall, the descriptive results confirmed an education-based cumulative advantage over the life course in the Netherlands, thereby reaffirming earlier findings from the U.S. (Cheng, 2014, 2021). We found a substantive wage gap between education groups that already existed early in the life course and continued to grow over the course of 12 years.

### Education and risk of temporary employment

One way in which temporary employment may have contributed to growing wage inequality between education groups was changes in temporary employment risk over the life course. Figure 3 shows the predicted probability of being temporarily employed based on the state-probability analysis. The argument of differing rationales of organizations to implement temporary employment in relation to a worker’s education predicted a larger reduction in temporary employment risk among higher-educated workers over the life course. The results support this proposition. At the beginning of the observation period, the predicted probability of holding a temporary contract was higher among higher-educated workers (34.7 per cent) than it was among less-educated workers (26.9 per cent). However, temporary employment



**Figure 2** Wage distribution in 2007 and 2019 among continuously observed workers born in 1979 by educational attainment (Note: Distributions are truncated at 55€/h. Median as solid lines.)

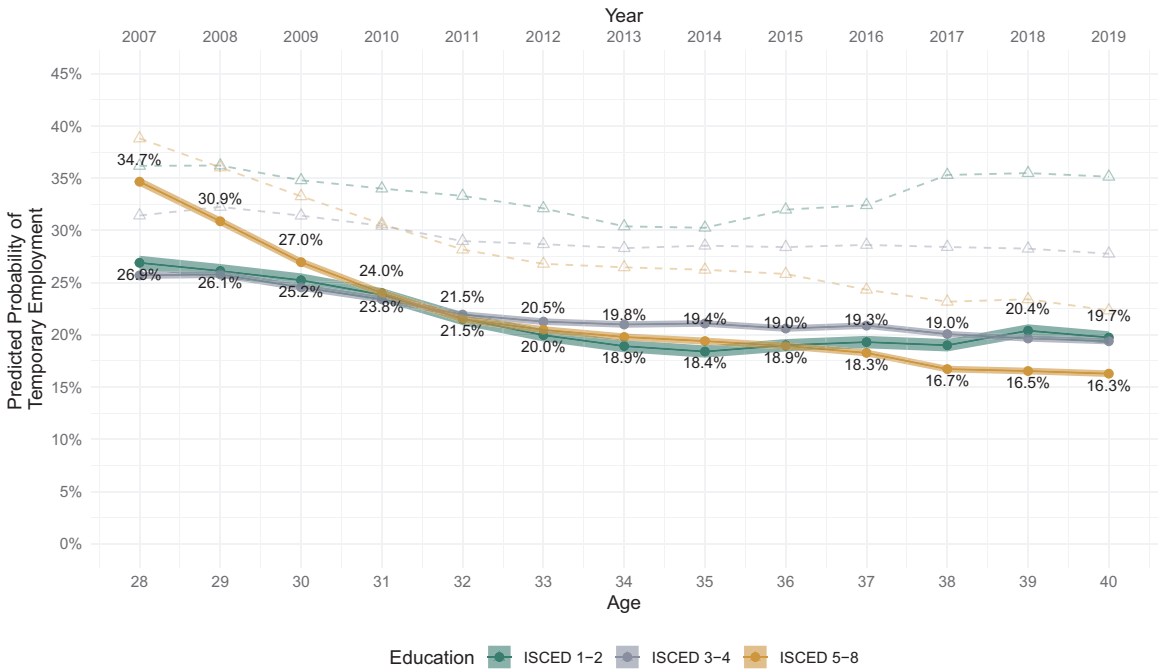
risk decreased more strongly among higher-educated workers between age 28 and 40, specifically during the beginning of the observation period, whereas it remained more stable among less-educated workers. By the age of 40, the risk gap had reversed, as the predicted probability of temporary employment declined to 16.3 per cent among higher-educated workers and reached 19.7 per cent among less-educated workers, thereby supporting the static risk hypothesis during the later life course.

### Education and vulnerability to temporary employment

Besides the risk of temporary employment, changes in vulnerability to temporary employment may have contributed to the growing wage gap. We initially investigated whether the wage effect of temporary employment differed between education groups. Figure 4 shows the estimated average effect of temporary employment on wages during the observation period based on the first set of FEIS models. The results confirm an average wage penalty for temporary employment across all education groups. Larger average negative effects were estimated among less-educated workers (−1.74 per cent) than among higher-educated workers (−0.91 per cent), but these group differences were not statistically significant, thereby not supporting the static vulnerability hypothesis. These estimated average effects are smaller than the wage penalties found in previous research that use either cross-sectional designs or a

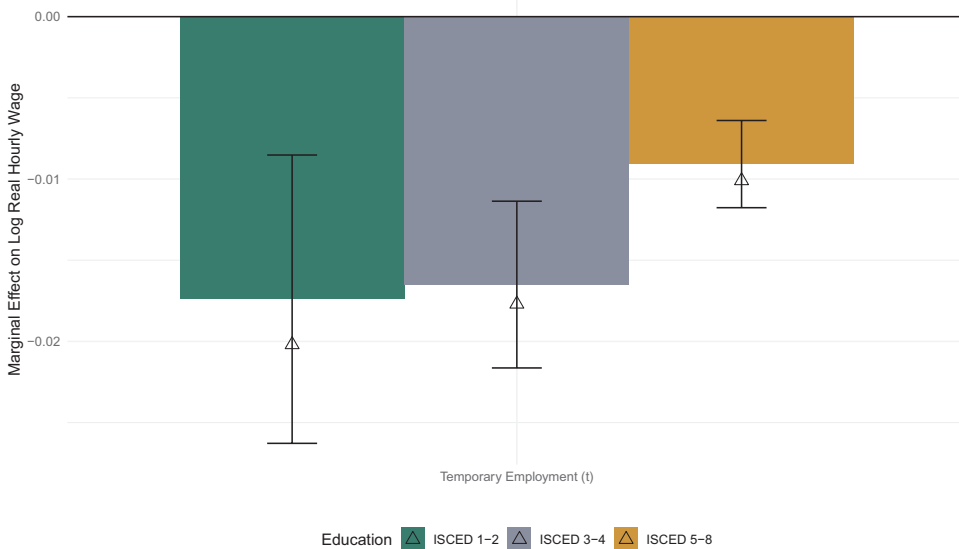
conventional fixed effect estimator. This indicates that the FEIS estimator is better able to account for selection bias.<sup>10</sup>

Figure 5 displays the estimated average effects of distinct job mobility events based on the second set of FEIS models. Two scenarios captured the consequences of remaining in the same organization after being temporarily employed in the previous year. The smaller the wage penalty despite initially holding a temporary contract, the more similar were within-organization wage outcomes compared to being permanently employed throughout. We predicted that higher-educated workers would face less adverse wage outcomes in these scenarios because their temporary jobs would be structurally better connected to other employment positions within the same organization. We find mixed support for this proposition. Wage effects when transitioning from temporary to permanent positions within the same organization were indeed only positive among higher-educated workers (+0.86 per cent). This is in line with compensatory wage gains once an initial screening period was completed, but such wage gains only accrued to higher-educated workers. However, while staying in temporary employment at the same firm, higher-educated workers incurred significant wage losses (−1.28 per cent) similar to less-educated workers (−2.12 per cent). In other words, continued temporary employment within the same organization negatively affected wage outcomes across all education groups.



Source: (S)POLIS 2006–2019

**Figure 3** Risk of temporary employment over the life course among continuously observed workers born in 1979 by educational attainment (Note: Percentages presented for ISCED 1–2 and ISCED 5–8. Dashed lines with triangles indicate alternative estimates with the full sample of workers born in 1979.)

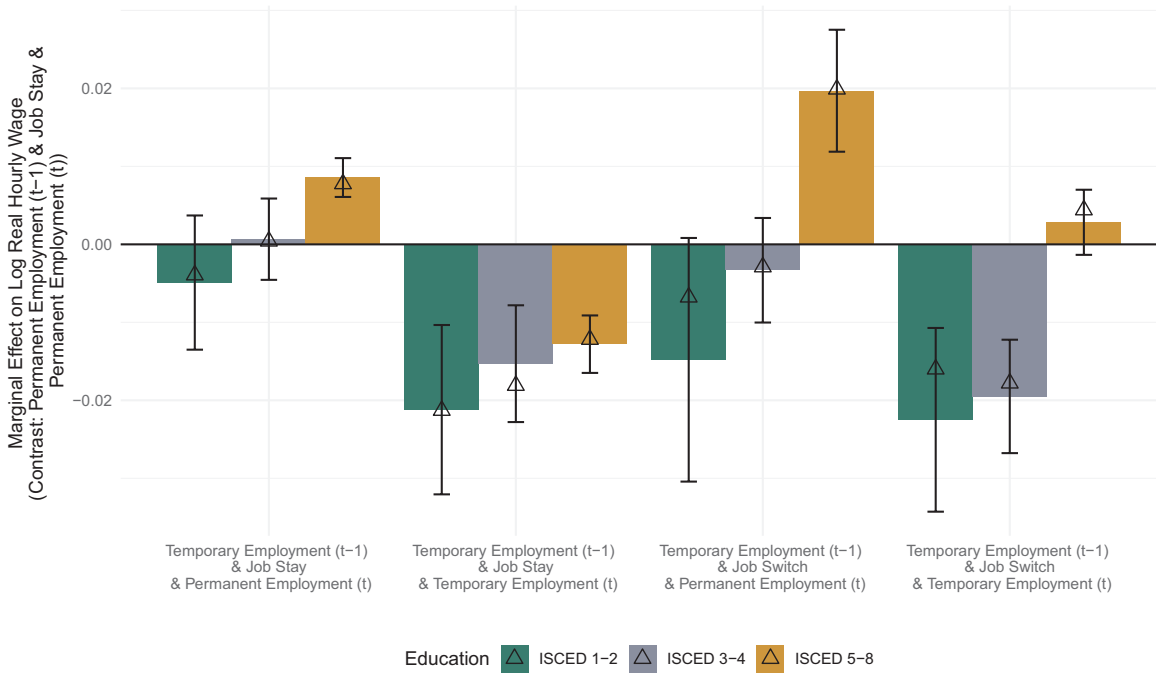


Source: (S)POLIS 2006–2019

**Figure 4** Vulnerability to temporary employment among continuously observed workers born in 1979 by educational attainment (Note: Triangles indicate alternative estimates with the full sample of workers born in 1979.)

Two other scenarios captured the consequences of moving between organizations after holding a temporary contract in the previous year. The larger the

wage penalty, the more adverse the consequences of job mobility under temporary employment. We argued that highly educated workers should be better able to



Source: (S)POLIS 2006–2019

**Figure 5** Vulnerability to temporary employment (job mobility events) among continuously observed workers born in 1979 by educational attainment (Note: Triangles indicate alternative estimates with the full sample of workers born in 1979.)

navigate the external labour market. This proposition is supported by the analysis. Wage effects were neutral among higher-educated workers when they entered temporary positions (+0.28 per cent; not significant) and positive when they switched to permanent positions (+1.97 per cent) in another organization. In contrast, the predicted wage effects among less-educated workers were negative when moving into temporary positions (–2.25 per cent) at another firm. These findings suggest that job mobility between organizations is an important mechanism underlying the contribution of temporary employment to wage inequality between education groups from a career perspective.

### Decomposing growing wage inequality

To what extent did temporary employment contribute to the divergence of group-level wages between the ages of 28 and 30? Table 3 presents the results of the decomposition analysis. The value of  $\Delta Y$  was positive at all times and grew steadily over the life course, indicating that the wage gap monotonically increased each year relative to its initial size in 2007.

Table 3 also shows the relevant sample means ( $\bar{X}$ ) and estimated regression coefficients ( $\hat{\beta}$ ). The sample means ( $\bar{X}$ ) illustrate changes in temporary employment risk by education over the life course. The share of temporarily employed workers decreased at a faster

rate among higher-educated workers. Changes in vulnerability to temporary employment show a more complex pattern. The estimated effects of temporary employment ( $\hat{\beta}$ ) were close to 0 during the earlier years (age 29–32) among higher-educated workers. But wage penalties among the higher-educated worsened in later years, after a presumable initial job-matching phase with more favourable wage outcomes. By contrast, wage penalties among less-educated workers reached lower absolute values during the earlier years, but tended to be of similar size during the later years. Negative cumulative effects were only found among lesser-educated workers.

We find that changes in temporary employment risk ( $\Delta R$ ) contributed between 8.07 per cent (at age 38) and 11.77 per cent (at age 29) to the overall change in the wage gap at different time points under the counterfactual scenario of unchanged effects of temporary employment on wages (Figure 6). We hypothesized that the contribution of risk would persist throughout the life course. This hypothesis received partial support. The absolute size of  $\Delta R$  increased, but the relative contribution to  $\Delta Y$  decreased over the observation period. In other words, despite its continued increase, the absolute contribution of temporary employment risk could not fully keep up with growing wage inequality over the life course ( $\Delta Y$ ). While the divergence

**Table 3** Decomposition of the change in the wage gap between education groups among continuously observed workers born in 1979

	28	29	30	31	32	33	34	35	36	37	38
Age	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
Year											
	(\$)										
<b>Outcome (Y)</b>											
Avg. log real hourly wage	2.8128	2.8866	2.9452	2.9837	3.0144	3.0373	3.0519	3.0806	3.1217	3.1595	3.1824
ISCED 5-8 ( $Y^H$ )											
$\Delta Y^H$		0.0738	0.1324	0.1709	0.2016	0.2245	0.2390	0.2678	0.3089	0.3467	0.3696
Avg. log real hourly wage	2.5530	2.6001	2.6272	2.6382	2.6482	2.6442	2.6405	2.6413	2.6601	2.6739	2.6866
ISCED 1-2 ( $Y^L$ )											
$\Delta Y^L$		0.0471	0.0742	0.0852	0.0952	0.0911	0.0875	0.0883	0.1071	0.1209	0.1336
Change in wage gap		0.0267	0.0583	0.0857	0.1064	0.1334	0.1516	0.1795	0.2018	0.2258	0.2360
( $\Delta Y = \Delta Y^H - \Delta Y^L$ )											
<b>Sample means (<math>\bar{X}</math>)</b>											
ISCED 5-8 ( $\bar{X}^H$ )	0.3431	0.3054	0.2665	0.2372	0.2124	0.2023	0.1935	0.1916	0.1870	0.1804	0.1651
Temporary employment	0.6840	0.9894	1.2559	1.4932	1.7056	1.9079	2.1034	2.2950	2.4820	2.6624	2.8275
Cumulative years of temporary employment since 2006	1.1539	2.2818	3.6001	5.0730	6.6216	8.2844	10.0601	11.9715	13.9330	15.8829	17.7316
Cumulative years of temporary employment since 2006 (squared)											
ISCED 1-2 ( $\bar{X}^L$ )	0.2799	0.2719	0.2628	0.2485	0.2249	0.2087	0.1979	0.1925	0.1988	0.2018	0.1987
Temporary employment	0.5314	0.8033	1.0661	1.3146	1.5395	1.7482	1.9461	2.1385	2.3373	2.5391	2.7379
Cumulative years of temporary employment since 2006	0.9057	1.8773	3.1075	4.5732	6.1914	7.8722	9.6723	11.6190	13.7599	16.0557	18.4105
Cumulative years of temporary employment since 2006 (squared)											
<b>Estimated coefficients (<math>\hat{\beta}</math>)</b>											
ISCED 5-8 ( $\hat{\beta}^H$ )	-0.0144	0.0042	-0.0008	-0.0036	-0.0067	-0.0169	-0.0225	-0.0267	-0.0307	-0.0261	-0.0215
Temporary employment	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076	0.0076
Cumulative years of temporary employment since 2006	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
Cumulative years of temporary employment since 2006 (squared)											

Table 3. Continued

ISCED 1–2 ( $\beta^L$ )										
Temporary employment	-0.0115	-0.0150	-0.0098	-0.0273	-0.0266	-0.0148	-0.0272	-0.0277	-0.0297	-0.0203
Cumulative years of temporary employment since 2006	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007	-0.0007
Cumulative years of temporary employment since 2006 (squared)	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007
<b>Decomposition</b>										
Temporary employment (incl. cumulative effects)										
Risk ( $\Delta R$ )	0.0031	0.0059	0.0083	0.0103	0.0120	0.0137	0.0153	0.0168	0.0182	0.0194
Vulnerability ( $\Delta V$ )	0.0084	0.0077	0.0053	0.0091	0.0054	0.0002	0.0022	0.0010	0.0031	0.0021
Total ( $\Delta R + \Delta V + \Delta I$ )	0.0108	0.0124	0.0122	0.0171	0.0162	0.0142	0.0174	0.0185	0.0212	0.0215
Temporary employment (%) (incl. cumulative effects)										
Risk ( $\Delta R$ )	11.77%	10.20%	9.68%	9.66%	9.03%	9.04%	8.53%	8.34%	8.07%	8.24%
Vulnerability ( $\Delta V$ )	31.59%	13.22%	6.15%	8.56%	4.06%	0.12%	1.24%	0.49%	1.38%	0.88%
Total ( $\Delta R + \Delta V + \Delta I$ )	40.51%	21.32%	14.30%	16.09%	12.16%	9.38%	9.69%	9.15%	9.41%	9.10%

Note: Outcome (Y) describes group-level average log hourly wages and their change over time. Sample means ( $\bar{X}$ ) are the observed group-level sample averages. Estimated coefficients ( $\beta$ ) are the estimated group-level effects on wages. Decomposition components as laid out in Equation 5.

of group-specific temporary employment rates slowed, the divergence of average wages continued steadily. At the same time, the contribution of  $\Delta R$  remained sizeable at 8.24 per cent, and was markedly larger than the contribution of  $\Delta V$  (0.88 per cent) by age 38.

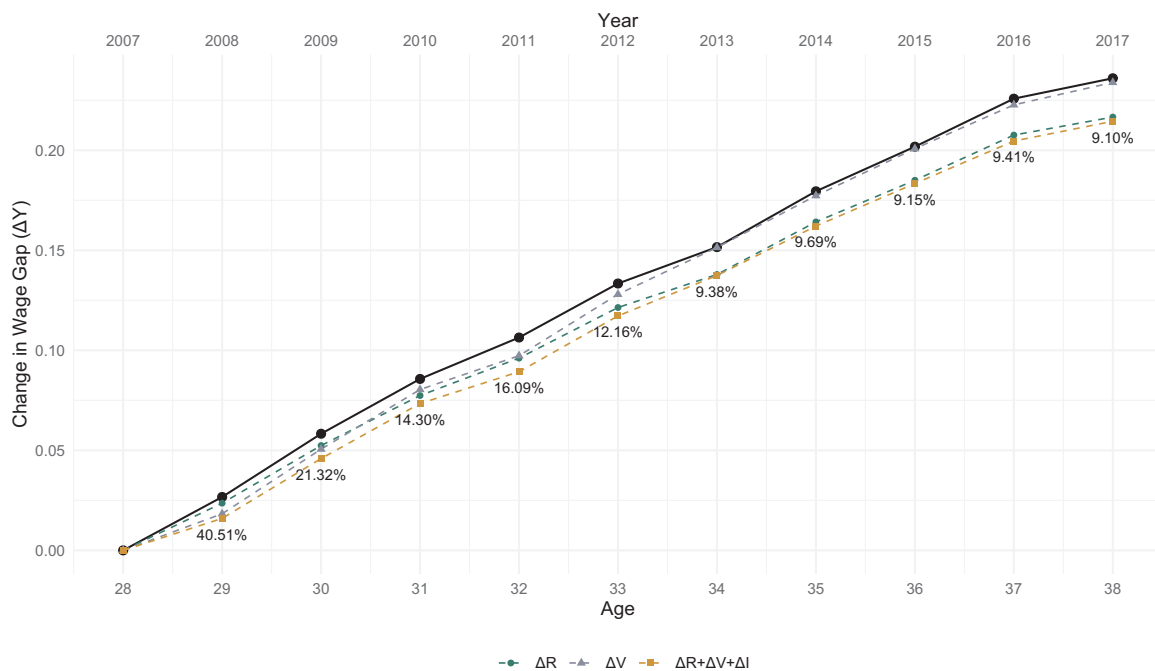
We find that changes in temporary employment vulnerability ( $\Delta V$ ) initially contributed between 6.15 per cent (at age 31) and 31.59 per cent (at age 29) to the change in the wage gap until age 32 under the counterfactual scenario of unchanged risk (Figure 6). This early contribution was driven by an initial divergence of  $\beta_t^H$  and  $\beta_t^L$  during which wage effects of temporary employment were mostly inconsequential for higher-educated workers and more severe for less-educated workers. After age 32, the contribution of  $\Delta V$  approached around 1 per cent as the estimated wage effects tended to converge between education groups. This is more in line with the second dynamic vulnerability hypothesis that predicted a larger contribution of vulnerability particularly during the earlier stages of the life course.

Overall, we find that the combined relative contribution of both components is estimated to range between 40.51 per cent (at age 29) and 9.10 per cent (at age 38) across all year pairings. The estimated contribution close to the reference year was large, but decreased after an initial job-matching phase among higher-educated workers between the ages of 28 and 32, and later settled at a stable share of around 9 per cent until the age of 38. Overall, changes in temporary employment risk were more important than changes in vulnerability for understanding change in the educational wage gap from a long-term perspective.

### Robustness analysis with full education sample

We analyzed the full sample including all workers with available education codes as a robustness check (Supplementary Material S11). The results differed in the following ways. First, the wage gap was larger in the full sample. Second, the group of less-educated workers exhibited a much higher and more durable temporary employment rate of approximately 40 per cent throughout the observation period. In contrast, sustained decreases in temporary employment risk among higher-educated workers were also observed in the full sample. Third, the negative wage effects among higher-educated workers were larger, while they were smaller among less-educated workers, specifically in the later stages of the life course.

Overall, the total decomposition component using the full sample differed mostly towards the end of the observation period, as it reached around 12 per cent in relative size. This slightly larger contribution is mainly an outcome of a larger risk component due to



Source: (S)POLIS, 2007-2017

**Figure 6** Counterfactual change in the educational wage gap of continuously observed workers born in 1979 (Note: ' $\Delta Y$ ' is the change in the wage gap relative to baseline differences at age 28 and depicted as solid black line. ' $\Delta R$ ' describes the contribution of changes in temporary employment risk on ' $\Delta Y$ ' under the counterfactual scenario of unchanged vulnerability. ' $\Delta V$ ' describes the contribution of changes in temporary employment vulnerability on ' $\Delta Y$ ' under counterfactual scenario of unchanged risk. ' $\Delta R + \Delta V + \Delta I$ ' describes the joint contribution of changes in both risk and vulnerability. Percentages indicate the relative reduction of ' $\Delta Y$ ' under ' $\Delta R + \Delta V + \Delta I$ '.)

a stronger divergence of temporary employment rates between education groups. The persistently larger temporary employment rate among less-educated workers in the full sample is likely driven by interrupted employment careers (churning in and out of the labour market) and the arrival of migrant workers, who were mostly incorporated into the labour market via temporary employment (changing composition).

## Discussion

In this study, we analyzed the extent to which temporary employment explains growing wage inequality over the life course. The analysis of the careers of 85,528 continuously observed workers born in 1979 shows that wage inequality between education groups increased profoundly between the ages of 28 and 40. Based on a decomposition analysis, we find that changes in temporary employment risk and vulnerability explain a meaningful part of the growth in the wage gap. The explained portion of the change in the wage gap ranges from 40.51 per cent (at age 29) to 9.10 per cent (at age 38). When comparing the contribution of risk and vulnerability, it is mostly a change

in temporary employment risk that contributes to the growth of the wage gap in the long run. The risk of temporary employment decreases at a substantially slower rate among less-educated workers over the life course.

This study contributes to the literature on intra-generational wage inequality and previous research on the career consequences of temporary employment. First, research on intra-generational wage inequality has only recently begun to identify time-varying life events that explain rising between-group inequality over the life course (Cheng, 2014). By focusing on temporary employment, this study answers the call to determine relevant labour market conditions that are amenable to policy intervention. Second, research on the career consequences of temporary employment has mainly focused on describing the career patterns themselves and not on their combined contribution to wage inequality (see Fauser, 2020 for a recent exception). In this regard, our study represents a move forward from a description of trajectories towards an analysis of their lasting and cumulative consequences for wage inequality between distinct social groups. Overall, the findings show that temporary employment contributes

to growing wage inequality over the life course of the Dutch labour market.

This study has immediate relevance for policy. The results indicate that current labour market regulation in the Netherlands fails to protect many less-educated workers from long-term entrapment in temporary employment, given a persistent risk of temporary employment over the life course and its non-negligible contribution to growing wage inequality. Until 2020, the chaining of successive temporary contracts was restricted to a maximum duration of up to 2 years. However, regulation also allows for a ‘cool-off’-period of 6 months between contracts that resets accumulated contract time and enables an organization to hire the same worker for another 2 years on a temporary contract. Organizations can abuse this regulation, specifically in the case of workers who possess limited options to find employment elsewhere. These workers will have to sit out for a waiting period before re-joining the same organization on a temporary contract instead of having their earlier contract converted into a permanent contract. The relatively stable share of less-educated workers who are temporarily employed and stay with the same organization between the ages of 28 and 40 in the data suggests that this is a potential quagmire for many less-educated workers. Recent policy changes in 2020 that raised the maximum duration of temporary employment to 3 years will likely not reduce group differences in temporary employment risk given the unaltered ‘cool-off’ regulation.

Another policy change introduced by the ‘Labour Market in Balance’ Act in 2020 holds greater promise for achieving a sustained reduction of inequality in risk. Since 2020, unemployment insurance contributions paid by employers have been differentiated based on contract type, with larger mandatory contributions in the case of temporary contracts. The rationale behind this policy is to reduce the usage of temporary employment by increasing its cost for employers. Future research should monitor whether this policy change will result in lower temporary employment rates in the long run. Another policy envisioned by the recent Dutch Commission on the Regulation of Work appears to be equally promising. The commission advises to introduce a mandatory wage premium on temporary work as compensation for higher job insecurity among temporary workers (Commissie Regulering van Werk, 2020: p. 67). This policy might address both risk and vulnerability by raising the costs of temporary employment for employers and simultaneously reducing existing wage penalties. Given the findings of the current study, both of these policies could mitigate growing wage inequality over the life course to the extent that they reduce temporary employment risk, specifically among less-educated workers.

This study has limitations and leaves several open questions that should be addressed in future research. First, our results are likely to be lower-bound estimates of the actual effect of temporary employment on group-level wage inequality. Scarring effects due to extended spells of unemployment after temporary contracts expire and potential spillover effects of temporary employment on the wages of other permanently employed workers in the same organization are not identified. In addition, we strictly relied on within-person variation to identify temporary employment effects. This does not allow us to estimate the effects of workers who are continuously temporarily employed during the observation period. It is possible that the overall contribution of temporary employment to intra-generational wage inequality is larger.

Second, the finding of a roughly 9 per cent long-term contribution of temporary employment to growing wage inequality over the life course begets the question of what else drives wage differentiation between education groups. The results indicate that less-educated workers with permanent contracts are similarly cut off from opportunities for substantial increases in economic rewards over their careers. This necessitates further study of career processes, such as job and promotion network structures within organizations (Bidwell, 2011; Tomaskovic-Devey and Avent-Holt, 2018), and how these structures are linked to persistent group-level inequality over the life course.

Third, we studied only one country: the Netherlands. In the Netherlands, the stratifying effect of temporary employment may be particularly strong by combining institutional labour market dualization with a highly stratified education system. Given national differences in employment protection legislation, education systems, and labour market performance, we should expect cross-national variation in the extent to which temporary employment risk and vulnerability are unequally distributed across education groups. For example, Italy’s two-tier labour market has been shown to exhibit smaller risk differentials between education groups, while producing different patterns of group-level inequality (Barbieri *et al.*, 2019). The risk and vulnerability approach provides a useful conceptual lens to further investigate cross-national variation in the effect of temporary employment on wage inequality in future research.

## Notes

1. When we use the term ‘groups’ throughout the text, we denote people who share similar observed characteristics (i.e., educational attainment).
2. ‘Continuously observed’ implies that a worker was employed at least once during each calendar year.



Employment breaks within individual trajectories may occur. An overview of case numbers with and without available education codes can be found in [Supplementary Table S1](#) of the supplement. [Supplementary Table S4](#) provides an overview of the share of continuously observed workers relative to the full sample.

3. Descriptive statistics for the full sample ([Supplementary Material S6](#)) as well as detailed estimation results for both continuously observed workers and all workers ([Supplementary Material S7–S10](#)) can be found in the supplement.
4. See [Supplementary Table S3](#) in the supplement for additional information.
5. This is likely a simplification. In case the wages of permanent workers are affected by temporary employment, we miss out on parts of the true effect of temporary employment on wage inequality. For example, if wages of higher-educated permanent workers increase due to managerial strategies that rely on a bifurcated workforce including less-educated temporary workers at the same firm, we underestimate the impact of temporary employment on the wage gap.
6. We fit these models separately by education to reduce complexity.
7. We apply this restriction since the possible value range of the cumulative counter varies over time. This renders a comparison of the change in effect size underlying the estimation of  $\Delta V$  unfeasible.
8. Alternative specifications of the decomposition and their result can be found in [Supplementary Materials S11–S16](#).
9. We restrict the decomposition to the period 2008–2017 as we cannot identify the main effects of age for the years 2018 and 2019 in the models due to collinearity.
10. For example, a recent study found a wage penalty of around 15 per cent among workers aged 25–35 in the Netherlands when using cross-sectional LISS data ([Fauser and Gebel, 2023](#)).

## Supplementary Data

Supplementary data are available at *ESR* online.

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Earlier versions of this paper were presented at the ECSR annual conference (2022), the SASE annual conference (2022), and the COIN workshop (2022). The authors thank the participants at those meetings, and the anonymous reviewers for their helpful comments and suggestions on earlier drafts of this paper.

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## Author contributions

Christoph Janietz (Conceptualization [lead], Data curation [lead], Formal analysis [lead], Methodology [lead], Software [lead], Visualization [lead], Writing—original draft [lead], Writing—review & editing [lead]), Thijs Bol (Conceptualization [supporting], Methodology [supporting], Supervision [equal], Writing—review & editing [supporting]), and Bram Lancee (Conceptualization [supporting], Methodology [supporting], Supervision [equal], Writing—review & editing [supporting])

## Data availability

This study uses non-public microdata from Statistics Netherlands (CBS). Under certain conditions, these microdata are accessible for statistical and scientific research. For further information: [microdata@cbs.nl](mailto:microdata@cbs.nl).

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