The early labour market effects of vocational higher education : is there a trade-off?

The effects of workplace learning in higher education on employment and match quality: Is there an early-career trade-off?[1]

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Abstract

We investigate whether the choice for a higher education program with a substantial workplace learning component entails an early-career trade-off between on the one hand higher employment chances and better initial matches (when opting for a program with workplace learning) and on the other hand a lower risk of bad match persistence (when opting for a program without workplace learning). To this end, we rely on longitudinal data of Belgian graduates that track their careers up until the age of 29. We model the program choice, the transition to a good match and the preceding transition to a bad match simultaneously. To account for non-random selection into programs and into bad matches, the Timing of Events method is combined with an exclusion restriction. After accounting for observed and unobserved heterogeneity, we do not find evidence for a trade-off. This result contributes to the debate about the efficiency of vocationalising tertiary education programs through the implementation of workplace learning.

Keywords: vocational education, academisation, workplace learning, mismatch, underemployment, school-to-work transition

JEL: I21, J24, J62, J64

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1. Introduction

Whether educational programs should have a vocational or rather general focus has been at the core of the debate about educational reform for decades (Hanushek et al. 2017; Psacharopoulos 1987). Vocationally oriented programs have long been praised for their success in easing school-to-work transitions. Indeed, they are often found to be associated with reduced youth unemployment (Müller and Gangl 2003), higher starting salaries (e.g., Bishop and Mane 2004; Mane 1999) and better matches between acquired qualifications and required qualifications in first jobs (e.g., Arum and Shavit 1995; Heijke et al. 2003; Giret 2011). However, long-term effects may be rather negative (Goldin 2001; Krueger and Kumar 2004). Given that vocational skills are strongly tied to a specific context, they risk to become obsolete. General programs on the other hand, with their focus on broad knowledge and basic skills, may facilitate learning in a changing context and reduce the costs of occupational mobility. Several studies thus found that the relatively higher employment rates and earnings for more vocationally educated individuals at younger ages comes at a cost of relatively lower employment rates and earnings at older ages (e.g., Golsteyn and Stenberg 2014; Hanushek et al. 2017).

While these long-term risks of vocationally oriented programs are well documented, we focus on a related but alternative trade-off that may already take place much earlier in the career. Could it be that lack of flexibility also hinders individuals with a more vocationally-oriented program if they start their career in a bad match? Indeed, descriptive research suggests that, whereas initial mismatches may serve as a stepping stone to a good match for more generally educated individuals (cf. Sicherman and Galor 1990), more vocationally educated individuals risk getting stuck if they do not manage to find a matching job quickly. Pollman-Schult and Büchel (2004), for instance, found that young German workers with a low-quality vocational degree are not more likely to move to a skilled job than their unskilled colleagues. Verhaest and Van der Velden (2013) found that European graduates with a more vocationally oriented program in tertiary education are less likely to be overeducated for their first job than generally educated graduates are. However, if being overeducated for the first job, they were found to be more likely to stay overeducated. Finally, Verhaest et al. (2015) found Belgian secondary education graduates from the general track to be less likely to be persistently overeducated during the early career.

In this paper, we investigate in more detail whether the choice for a more vocationally-oriented program indeed implies an alternative trade-off between on the one hand higher employment chances and better matches at the start of the career and on the other hand a lower risk of bad match persistence for those who nevertheless start their careers in a bad match. For this, we rely on longitudinal data of Flemish (Belgian) tertiary education graduates that track their careers up until the age of 29. We differentiate between vocationally and generally oriented programs on the basis of the presence of a significant component of workplace learning in the curriculum.

Our analysis adds in four main ways to the literature on the early labour market effects of vocationally oriented programs and workplace learning in education. To begin with, we are the firsts to investigate the early-career trade-off related to these programs within one econometric framework. We simultaneously investigate the impact of the program on entrance joblessness, the match status of the first job and the persistence of bad matches. We model both the transition to a bad match position and the transition to a good match. This allows to assess whether differences in joblessness duration either result from differences in transitions to any job or rather from differences in transitions to good matches. The persistence of bad matches is investigated by considering previous entrance into a bad match to be a determinant of the transition to a good match. This modelling aligns with the one in Baert

et al. (2013), in which these authors investigated whether staying unemployed is a better career strategy than accepting a bad match. Although we rely on a similar modelling approach and on a similar (and partially overlapping) dataset in this study, the focus is now rather on the question which educational program offers the best protection against a first bad match and against the persistence of this bad match.[4]

Secondly, we account for two types of selection on unobservables. As Ryan (2001) remarks, few studies account for non-random selection on unobservables in vocational programs. That this may be important is illustrated by Malamud and Pop-Eleches (2010) who found that the estimated labour market effects of vocational versus general education disappear after accounting for selectivity by means of a regression discontinuity approach. We account for this type of selectivity by modelling the transitions to bad and good matches simultaneously with the choice of the program and by adding an exclusion restriction, based on the orientation of the programs offered by colleges and universities within the vicinity of the home residence. Further, we account for non-random selection in mismatch positions by applying the Timing of Events approach (cf. Abbring and van den Berg 2003).

Thirdly, we focus on higher education graduates, which is interesting for two main reasons. First, the bulk of the research on the labour market effects of vocationally oriented programs focuses on secondary education. Studies focussing on tertiary education graduates remain scant (Giret 2011; Verhaest and Van der Velden 2013; Humburg et al. 2015) and, hence, more research is needed to reassure that the aforementioned conclusions also apply to them. At least, a recent study by Brunello and Rocco (2015) suggests that the labour market effects of more vocationally oriented programs are less favourable in the case of tertiary than in the case of secondary education. Second, sorting along general and vocational tracks in secondary education is often based on family background and ability (Brunello and Checchi 2007). This may generate negative signals that also affect the more able. Moreover, in response to this sorting, also the difficulty of the program may be reduced. Hence, differences in labour market outcomes between vocational and general tracks may not just reflect a difference in orientation, but also differences in level and prestige. In higher education, a similar sorting between programs with and without workplace learning is much less present. Hence, the estimated effects are much more likely to reflect differences in the orientation instead of variations in level and prestige.

One last contribution is related to our focus on workplace learning. Workplace learning is an important dimension of vocationally oriented programs, along with a strong specialisation and a stronger focus on specific instead of general skills. The difference in emphasis along these dimensions of vocational orientation results in a large range of programs that all are officially labelled as vocational according to national qualification frameworks, but are in fact largely incomparable across countries or even across institutions (Hanushek et al. 2017). Although the differences in outcomes across countries suggest that it matters how programs are vocationalised, few studies have already investigated the labour market effects of the underlying dimensions of vocational orientation in greater depth. Regarding workplace learning in higher education, some insights are gained from recent studies focussing on internships. These studies find internship experience to have a positive effect on job invitation rates, employment chances and wages (Saniter and Siedler 2014; Le Saout and Coudin 2015; Nunley et al. 2016). However, most of these studies either focus on internship experience on top of one's regular education, or do not

[4] Given this alternative focus, there are also several other differences with the analysis in Baert et al. (2013) (cf. infra). For instance, given that the focus is less on job search strategies and more on the labour market effects of educational choices, we investigate joblessness spells instead of unemployment spells and estimate a more extended model.

differentiate between voluntary internships and mandatory work placements that are an integral part of one's program. Their effects may thus simply reflect returns to work experience in addition to returns to education. Therefore, it largely remains a black box whether making programs more vocationally oriented by substituting part of the in-class instruction time for workplace-based learning is an effective strategy.

The remainder is structured as follows. First, we give a brief overview of the institutional setting regarding higher education in Flanders. Next, we present our data and variable measurements. Thereafter, we outline our econometric model. Further, we present our estimation results. We end with a discussion and conclusions.

2. Background: Higher education in Flanders

In the pre-Bologna era, which applies to the analysed sample in this study, Flemish higher education[5] was structured along three main tracks: (i) a short-term non-university track (lasting three years), (ii) a long-term non-university (lasting four years or more) and (iii) a university track (lasting four years or more). The first two tracks were offered by colleges ("Hogescholen") and were often perceived to be rather labour market and vocationally oriented; the last one was offered by universities and perceived to be more general and academic (Verhoeven et al. 2000). Consistent with the aforementioned potential virtues of more vocationally oriented education, individuals from the short-term non-university track experienced on average shorter periods of unemployment after labour market entrance and lower levels of mismatches in their first jobs in comparison to those from the university track (Vanoverberghe et al. 2008).

For several reasons, however, this focus on higher education tracks may be misleading when assessing the virtues of a more vocationally-oriented curriculum in higher education. First of all, these tracks are different in study duration and are assumed to cater for different functional levels. While the short-term track prepares for typical bachelor level jobs, the long-term tracks rather prepare for master level jobs.[6] Secondly, there is substantial selectivity along these tracks (see Verhoeven et al. 2000). The lower the performance record in secondary education, the more often students opt for a college track and the more often they start in the short-term program. The same is true for students from the less prestigious vocational and technical (as opposed to the general) secondary education track. This may explain to some extent the mixed performance of the long-term college track. Similarly, the performance of the short-term track may be even underestimated.

A focus on higher education tracks also masks substantial heterogeneity in the degree to which programs are truly vocationally oriented. This is clearly illustrated by the extent to which workplace learning is part of the curriculum. Within higher education in Flanders, workplace learning usually takes the form of work placement, which is the practice of learning through a period of unpaid work experience in a particular firm or organisation (see Flemish Government n.d.). Within each track, the inclusion of work placement in the curriculum largely diverges across fields of study. In the university track, for instance, most programs indeed provide in no (e.g., Philosophy) or only

[5] In Belgium, education is a regional duty.

[6] In the pre-Bologna era, these qualifications were labeled as 'graduate degree' in the case of a short-term degree and 'licentiate degree' in the case of a long-term degree. In the long-term tracks, individuals were also awarded a so-called 'candidate degree' after two years. However, this degree was not intended to be a terminus and almost all students proceeded thereafter with at least two more years of education to achieve their licentiate degree.

a short-term (e.g., Business) work placement. Yet, there are several exceptions, with work placements ranging from a couple of months (e.g., in psychology) to even several years (e.g., in medicine). Moreover, given that colleges and universities have substantial autonomy in determining the content of their programs (see Flemish Government n.d.), there is also considerable heterogeneity within fields of study, depending on the specific focus of the program or the specific college or university.[7] Although the time spent in these work placements is usually much lower than the time apprentices in secondary education spend on the work floor, they nonetheless often cause a substantial amount of classroom training to be replaced by workplace learning.[8] Hence, a critical assessment of the virtues of focussing relatively more on vocational skills in higher education requires to take this heterogeneity into account.

An inquiry into the merits and pitfalls of vocationally and generally oriented higher education in Flanders is particularly interesting in view of a number of recent reforms resulting from the implementation of Bologna regulations. One of the main reforms was the so-called 'academisation' of the long type non-university programs. These programs had to integrate more scientific research into education and, from 2013 on, were transferred to the classic universities. These universities now bear full responsibility over all long programs and only award so-called academic bachelor and master's degrees. Within fields of study such as business and engineering, they now offer programs that are similar in content but somehow different in the extent to which they are vocationally oriented. Against a background of budgetary constraints, universities may want to rationalise and merge some of these programs. Our analysis may provide some advice regarding the best way to follow. The colleges remain responsible for the original short-type programs that now lead to a so-called professional bachelor degree. Because of the introduction of more flexibility, however, an increasing number of students use these professional bachelor programs as an intermediate step towards an academic degree. This may indeed be a good option if this additional academic education provides them with useful generic skills that foster long-term career development.

3. Data and descriptive statistics

3.1 Data and sample

Our analysis relies on data from representative samples of three birth cohorts (birth years 1976, 1978 and 1980) in Flanders. The data result from the so-called SONAR surveys, which were conducted each among 3000 individuals at age 23.[9] We also use data from follow-up surveys, conducted at age 26 for the 1976 and 1978 cohorts and at

[7] In some cases, there may also be heterogeneity across students within programs when work placement is only elective, although this was less usual in the pre-Bologna era and usually resulted in a short period of work placement only (e.g., one month; see below).

[8] Although the exact modalities largely differ across programs and institutions, there are also a number of other differences with apprenticeships. Work placements are usually, but not always, concentrated in the last years of the program. Depending on the overall time spent in work placement, they may or may not be restricted to employment at one organization. The days of work placement may be scheduled either during a compact period or may alternate with days of classroom training. Like in the case of apprenticeships, the guidance of the student is usually shared by a mentor at work and a mentor at college or university. While the educational institution is responsible for the determination of the evaluation criteria and the final grading (Flemish Government n.d.), they usually rely (at least partly) on a report written by the trainee and on the input and evaluation of the mentor at work.

[9] The data were collected on the basis of face-to-face computer-aided structured interviews at the home place of the interviewees. The interviewers were trained and got detailed survey instructions regarding how each of the questions should be interpreted.

age 29 for the 1976 and 1980 cohorts. Response rates for these follow-ups range between 60% and 70%.[10]

The SONAR surveys focused on the transition from school to work and collected detailed information on both school and work transitions. Regarding the school career, the data contain essential information such as the level of attained education, the type of the program, field of study, the presence of work placement in the curriculum and the geographical location of the school or university. Labour market histories are registered on a monthly basis and provide information such as changes in working status (working or jobless), employer or bundle of tasks (also with the same employer). For each function, also information regarding the tasks that were executed is available, enabling to assess the quality of the match. Further, the data distinguish between standard jobs and jobs that are related to the educational career such as apprentice jobs, work placement or student jobs.

We focus our analysis on individuals with a higher-education degree. Among the 9007 individuals in the overall sample, 3858 individuals (42.8%) had a higher-education degree at the time they first left education.[11] After further exclusion of individuals with missing values on any of the variables used in the analysis, we keep a final sample of 3536 individuals for our econometric analysis. For these individuals, we analyse the time between the date of leaving higher education and date they enter a job with a good match (cf. infra) for the first time.

3.2 Workplace learning

As indicator for the importance of workplace learning and the vocational orientation of the program, we rely on the presence of work-placement experience in the curriculum. Of course, a vocational orientation requires more than providing students with practical experience. Yet, work placement entails substantial effort for higher education institutions in terms of the search to find suitable places, the guidance of the students and their evaluation. Hence, institutions that are not convinced about the value of vocationally oriented education are not likely to invest in a system of work placement. In addition, work placement experience is the most visible aspect of the extent to which higher education programs are vocationally oriented and, in that way, may have a strong signalling value towards employers.

In the SONAR survey, individuals were asked whether they had participated in work placement during their higher education and, if so, for how much time. In order to distinguish between the programs, we consider three alternative criteria. In our benchmark analysis, we compare students having participated for at least three months in work placement with other students. With this criterion, we aim at selecting only those programs that include a substantial workplace learning component.[12] This delivers a fairly equal division of the graduates over the two

[10] Analyses based on the 1976 cohort revealed some selectivity in terms of participation in the follow up survey (Laurijssen 2005). In particular, participation was lower for the lower and medium educated than for the higher educated. However, among the higher educated, participation was similar for individuals with a short and long program degree. Among those who finalized their higher education at or before the age 23, we also did not find a statistically significant difference in attrition between those with and those a without workplace learning program degree.

[11] Another 29 individuals also had a higher-education degree without having yet left education at the time of the last interview.

[12] While we cannot exclude that our measure of programs with workplace learning also includes a number of students having participated in work placement as an elective course or in a voluntary internship during their education, we assess this risk to be low. First of all, Flanders has no tradition of combining higher education with participation in voluntary internships and study-related work experiences. This was even more so the case fifteen years ago (see, e.g., Allen 2011). Second, the maximum duration for work placements as electives and voluntary internships

types of programs (see table 1). As expected short programs are predominantly classified as programs with a focus on workplace learning, while long programs usually are classified as programs without substantial workplace learning component. Nevertheless, also a significant minority of the students in the short track are classified as programs without workplace learning according to this definition, while almost 30% of all long programs are classified as programs with workplace learning. We also execute some sensitivity analyses relying on two alternative criteria. The first alternative criterion uses one month of work-placement experience to distinguish between the programs, while the second alternative is more strict and uses four months of work-placement experience as criterion. According to these alternative definitions, respectively 74.3% and 39.1% of all programs are programs with a significant component workplace learning.

<Insert table 1 here>

In Appendix A, we report more detailed statistics depending on the field of study and, in the case of long program degrees, depending on whether they were obtained at college or university. Although the overall proportion of workplace learning programs is similar among long-run college and university programs, this is largely due to the unequal distribution of fields of study across institutions and the difference in proportions of workplace learning programs across fields of study. The field of Economics, Business and Law and that of Natural Sciences and Engineering together represent about 70% of all students in long-run college programs. For each of these fields, the proportion of workplace learning programs in the long-run college track is about twice as large as in the university track. Even so, these proportions are below those for the short-term track. Within fields of study, long-run college degrees are thus on average between short-run college and university degrees in terms of vocational focus. Also the proportions across fields of study are in line with expectations, with relatively high proportions within health care, education and social sciences fields of study and relatively low proportions within humanities.[13]

3.3 Joblessness spells

We analyse the duration between the time of leaving the educational system and the time of entrance into a good match. By taking the time of leaving education as point of departure, we focus rather on joblessness instead of unemployment as indicator for youth employment problems (cf. Rees 1986; Ryan 2001). The reason is threefold. First, in the period under investigation, Flemish youth entering the labour market only became entitled to unemployment benefits after a period of nine months. Hence, many young labour market entrants do not register for unemployment. Particularly for higher education graduates, who have relatively good employment opportunities, this lowers the incentive to register at the employment service. Second, we do not have administrative data and have to rely on the assessment of the respondents for the measurement of the unemployment status. For individuals, it may not be clear what the subtle difference is between being unemployed and being out of work. Thirdly, young people may become discouraged when they face problems to find jobs, pushing them into inactivity. As Rees (1986) argues, this may be as or even more problematic than being

are regulated in Flanders to be one month and 60 days respectively. Hence, our criterion of three months of work placement should exclude most of the individuals having only participated in one of these alternative types of work placements and internships.

[13] The high proportion of workplace learning programs in social sciences is attributed to the large numbers of individuals with a degree in social work or a degree in psychology.

unemployed since also these individuals do not invest in their human capital and risk to become permanently detached from the labour market.

3.4 Mismatch indicators

For our benchmark analysis, we measure match quality by means of the correspondence between the graduates' education and the education required for the job, with those having excess education being considered to have a bad match. Although this is just one way to define match quality, this educational mismatch or so-called over-education is found to be predictive for a large number of other negative outcomes, such as lower wages, lower job satisfaction, less on-the-job training participation and higher quit rates (Hartog 2000; Hersch 1991; McGuinness 2006).[14] The job requirements are measured in an objective way and derived from the Standard Occupation Classification of Statistics Netherlands (CBS 2001). This classification considers five functional levels, with each a corresponding level of required education: elementary (the required level is at least ISCED 0 and 1), lower (ISCED 2), intermediate (ISCED 3 and 4), higher (ISCED 5 – Bachelor) and scientific (ISCED 5 – Master). We consider those with a long-term higher education degree to have a bad match if employed at any level below the scientific level; those with a short-term degree are assumed to have a bad match if they are employed at a level below the higher functional level. Those with a short term degree who are employed at the scientific level are thus also considered to have a good match. Given that it is usually found that these undereducated workers earn at least as much as those with an educational level that adequately educated workers (Hartog 2000), this seems valid.

Although objective educational mismatch measures have some advantages over more subjective ones, such as being less prone to social desirability bias or relying on uniform coding instructions, there are also several disadvantages[15]. In particular, these measures are often criticised on the fact that they are rather static and insufficiently take into account that educational requirements within occupations may change over time. Moreover, the decisions of job seekers are likely to be driven rather by their subjective assessments of the quality of their match than about objective job quality. Therefore, in a sensitivity analysis, we also investigate the impact of the program on subjective educational mismatch. Subjective mismatch is usually derived from a survey question regarding the educational requirements for one's job. Such information is available in the SONAR data for the first job of the individuals born in 1978 (in the survey at age 23) and 1980 (in the survey at age 23 and 29). These individuals got the following question: "What is (was), according to your own opinion, the most appropriate educational level to execute your job?". Given that this question was not posed to all individuals and not for later jobs, we develop the following procedure. In a first step, we compute the median subjectively assessed required level of education within each occupation. This delivers an alternative, more subjective assessment of the functional level for each occupation. In a second step, we assess for every individual and for every job whether someone was subjectively mismatched by comparing the attained level of education with this alternative functional level.

While these match indicators align with most of the literature on the match between education and work, some studies also account for the horizontal dimension of this match—that is, whether the content of one's job matches with her field of study. Some of these studies suggest that particularly a combination of overeducation and field-

[14] Similar results are also found relying on the same data as in this study (e.g. Verhaest and Omey 2009).

[15] For discussions on this issue, see, amongst others, Hartog (2000) and Leuven and Oosterbeek (2011).

of-study mismatch is detrimental to wages and subjective well-being (Robst 2008; Béduwé and Giret 2011). Hence, in another sensitivity analysis, we only consider those experiencing such a combination, called 'full educational mismatch' hereafter, as having a bad match. The reason not to focus on field-of-study mismatch itself, i.e. independent of whether one is overeducated, is twofold. First of all, in contrast to having a full educational mismatch, having a field-of-study mismatch without being overeducated is usually not found to be associated with any wage penalty (Béduwé and Giret 2011; Sellami et al. 2017). Secondly, merely having a field-of-study mismatch may actually be the consequence of being able to learn in a new context and therefore need not indicate a true mismatch in terms of skills. As with our benchmark overeducation indicator, we rely on the CBS classification for the measurement of field-of-study mismatch. Along with a required level of education, this classification also defines the required field of study for each occupation. Given that the classification was originally developed with the Dutch educational system as benchmark, this was translated to the Flemish context by Sellami et al. (2016).

Even if most individuals with an educational mismatch face an earnings penalty, this should not be the case for all of these individuals. Therefore, as a last sensitivity analysis, we rely on a so-called 'occupational wage mismatch' indicator. Ideally, we would compare each individual's actual wage with one's potential wage on the labour market. However, since such detailed data are not available for all jobs in our data, we construct our wage mismatch indicator in an indirect way. More concretely, we rely on information regarding wages in the individual's job at age 29, which is available for individuals born in 1976 and those born in 1980. The potential wage of an individual at age 29 is assessed by the median wage within one's labour market segment of individuals having a full educational match (i.e. not being overeducated nor having a field-of-study mismatch), with labour market segments being defined as combinations of broad fields of study and levels of education. To assess wage mismatch, we compare this potential wage with the median wage at age 29 within each occupation. This information is not only used to assess wage mismatch in the job at age 29 and for individuals with reported wages, but also for all other preceding jobs and all other individuals. While wages at earlier ages are likely to be lower than those at age 29, we consider wage information at later ages to be more representative for one's overall earnings potential within an occupation than one's wage at the start of the career. As such, our indicator assesses wage mismatch from a more long-run perspective. We define a wage mismatch as a situation whereby the median wage within one's occupation is at least 5% below one's potential wage. Average estimated returns to a year of education within Europe range from 6% on the basis of OLS estimation to 9% on the basis of IV estimation (Harmon et al. 2001). Our 5% criterion thus implies that a wage mismatch is associated with a loss of investment that represents at least one half to one academic year.

3.5 Descriptive analysis

Before we present our econometric model, we report some general descriptive evidence on the difference in labour market transition between the two groups of graduates. We focus on our benchmark definition for programs with workplace learning (i.e. three months of work-placement experience) and measure mismatch by means of the objective educational mismatch indicator.

<Insert table 2 here>

In figure 1, we present Kaplan-Meier estimates of the monthly transition to any first job after graduation (i.e.

irrespective of the quality of the match). Consistent with previous findings in the literature on the effects of vocational education, we find that individuals that participated in a program with workplace learning enter more quickly into their first job than other individuals. However, the difference is rather moderate. While the median joblessness period is three months for those with a program without workplace learning, it is only two months for the other ones (see Table 2). The average durations are 4.4 and 3.7 months respectively. This seems to be predominantly explained by higher hazard rates during the first and the third month after graduation.

<Insert figure 1, 2 and 3 here>

Figure 2 presents Kaplan-Meier estimates of the number of months that it takes to find a first objective good match. The transition to a good match occurs at a much slower rate than the transition to any job, indicating that many young workers start their career in a bad match (cf. Baert et al. 2013). More importantly, we find that the restriction to good matches delivers a much more pronounced difference between the two types of education. While the median duration until a good match amounts only five months for graduates from workplace learning programs, other individuals have a median duration of 50 months (see table 2). Also this fits with previous findings in the literature. These differences are predominantly explained by differences in hazard rates during the first half year after graduation. Beyond the first year, hazard rates seem to be similar.

Finally, we assess the persistence of bad matches by means of the duration between the start of a bad match and entry into a first good match (Figure 3). Conversely to expectations, workplace learning programs are not outperformed by programs without workplace learning. On the contrary, during the first two and a half year, the former are on average associated with a higher hazard regarding indirect entry into a good match. Beyond the first two and a half years, both programs seem to perform similar. This is not consistent with the hypothesis that there is a short term trade-off in the choice between vocationally and generally oriented programs. However, since this descriptive analysis does not take into account any difference in observed and unobserved heterogeneity, it is too early to make a final conclusion.

In Appendix B, we also report some descriptive statistics relying on other program and mismatch indicators. When relying on alternative criteria to distinguish between the two types of programs, conclusions are largely similar. Relying on our subjective indicator for bad matches, we find substantially shorter spells to a first good match in comparison to the benchmark case. This indicates that the perceived match quality of jobs is, on average, better than the match quality as measured by our objective method. However, also this measure delivers shorter durations to a first match for individuals that had participated in a program with workplace learning. Similar results are also found when relying on full mismatch or occupational wage mismatch as bad match indicators.

4. Econometric model

4.1 Selection problems

With our analysis, we aim to identify to what extent graduates that participated in a program with a significant workplace learning component differ from their counterparts in their transition to a job with a good match. We consider that these individuals have two options when they search for a good

match while staying jobless or they accept a bad match and proceed with their job search while being employed. Hence, we investigate to what extent the orientation of the program influences the following three types of transitions: (i) the transition to a bad match, (ii) the direct transition to a good match and (iii) the transition to a good match conditional on having entered in a bad match previously.

When analysing differences in the aforementioned transitions, we face several selection problems. The first two selection problems are related to the modelling of the labour market transitions, and are similar to those solved by the model of Baert et al. (2013), on which we build. First, we face a classic selection problem with respect to the inflow of individuals in good and bad matches. Individuals who are more likely to accept bad matches may have a systematically lower (or higher) likelihood of finding an adequate job than those who are less likely to accept these jobs. Ignoring this first selection problem may result in a downward (upward) bias of the overall transition rate from a bad match to a good match. Second, a so-called dynamic selection problem may emerge, even if the unobserved determinants of entry into a bad match are not systematically related to those of entry into a good match. This results from the fact that individuals may only enter into a bad match if they did not find a good match beforehand. This biases the estimated effect of accepting a bad match on the transition to a good match towards zero (see Lancaster 1990).

To take into account these first two sources of bias, we build on the Timing of Events method as developed by Abbring and van den Berg (2003). Within this approach, the transitions to a good and a bad match are jointly modelled allowing correlation between the unobserved time-constant individual determinants of both transitions. In addition, the entrance in a bad match is considered to be a treatment that may or may not affect the transition to a good match. Identification of the selection effect regarding entry into a bad match relies on the idea that unobserved time-invariant individual determinants of the transition to a good match affect this transition from the moment of leaving education while entry into a good match may only affect this transition from the moment at which this entry occurs. While this identification does not require exclusion restrictions, there are several identifying assumptions (Abbring and van den Berg 2003). For a discussion of these assumptions within the context of the impact of accepting bad matches on the subsequent probability to find a good match, we refer to Baert et al. (2013).

Another selection problem is related to the non-random assignment of individuals to the two types of programs. While part of this heterogeneity may be captured by observable variables such as social background and secondary education background, individuals who choose for a program with workplace learning may also be different in terms of unobservables such as innate ability and motivation. Hence, the effect of a program with workplace learning on the likelihood to find a job will be upwardly (downwardly) biased if the more able and the more motivated choose more (less) often for such a program. We solve this problem by modelling the transitions to bad and good matches simultaneously with the choice for a program with versus without workplace learning, allowing the unobserved time-constant individual determinants of this choice to be correlated with the unobserved determinants of flowing into good and bad jobs. To further control for the selection effect, we add an exclusion restriction, i.e. a variable that influences the program choice, but has no impact on the transition to jobs. For this, we rely on the relative supply of programs with workplace learning in the vicinity of the home residence (cf. infra). After first having outlined our model specification, we will explain how this supply variable is measured and discuss in detail the validity of this exclusion restriction in the specific context of our study.

4.2 General model specification

Our econometric model consists of three equations, two duration equations representing the transition to a bad match (indicated by index *b*) and a good match (indicated by index *g*) respectively, and one representing the choice for a degree with or without workplace learning. The respective hazard rates $\vartheta_b\left(t\middle|x,V_b\right)$ and $\vartheta_g\left(t\middle|t_b,x,V_g\right)$ are modelled according to the following Mixed Proportional Hazard (MPH) form:

$$\begin{cases}\ln\vartheta_b\left(t\middle|x,V_b\right)=\ln\lambda_b\left(t\right)+\alpha_b y+x'\beta_b+V_b\\ \ln\vartheta_g\left(t\middle|t_b,x,V_g\right)=\ln\lambda_g\left(t\right)+\alpha_g y+x'\beta_g+\delta\left(t\middle|t_b,y,x\right)1\left(t>t_b\right)+V_g\end{cases}, \tag{1}$$

where t is the elapsed duration since the individual left the educational system, while t_b represents the realised joblessness duration at the time of entry into a bad match. Both hazard rates are modelled as a function of the orientation of the program y (y=1 for workplace learning program), a vector of other observed characteristics x, and transition-specific unobservable components V_b and V_g. In addition, the hazard rate regarding the transition to a good match is also modelled as a function of previous entry into a good match. This is represented by indicator function 1(.), which is one if the argument is true and zero otherwise.

δ thus represents the treatment effect of a bad match on the transition rate to a good match. It measures to what extent acceptance of a bad match accelerates ($\delta > 1$) or delays ($\delta < 1$) the transition to a good match. This effect can be modelled as any function of t, t_b, y and x. In our benchmark analysis, we allow the treatment effect to depend on the elapsed joblessness duration at the time of entry into a bad match t_b and the orientation status y:

$$\delta\left(t\middle|t_b,y\right)=\delta_0+\delta_1\cdot(t_b)+\delta_2\cdot(t_b)^2+\delta_3\cdot y\,. \tag{2}$$

The dependence on the elapsed joblessness duration is in line with Baert et al. (2013), who found that the delay in transition to a good match is stronger if a bad match is accepted more early in the unemployment spell. With the dependence on the orientation of the study program, we aim to test whether bad matches are more persistent for graduates with a degree with workplace learning than for other graduates. Note that $\delta_3 < 0$ is not a sufficient condition to conclude that a program with workplace learning slows down the transition to a good match conditional on previous entry into a bad match. This would only indicate that the delay (acceleration) in transition to a good match by looking for a job while being in a bad match instead of being jobless is less (more) pronounced for those without than for those with workplace learning. To the extent that individuals with a program without workplace learning may have a lower direct transition rate to a good match ($\alpha_g > 0$), bad matches may be still more persistent for them. In order to conclude that bad matches are less persistent for individuals with a degree without workplace learning, it is required that $\alpha_g+\delta_3 < 0$.

Regarding the baseline hazards $\lambda_b(t)$ and $\lambda_g(t)$, we follow the literature and specify them as piecewise constant:

$$\begin{cases}\ln\lambda_b\left(t\right)=\alpha_m^b\\ \ln\lambda_g\left(t\right)=\alpha_m^g\end{cases}, \tag{3}$$

for $t\in\left[t_{m-1},t_m\right)$, where m is an indicator of the time interval and where in the application $m \leq 4$ and $t_0 = 1$, $t_1 = 3$, $t_2 = 5$, $t_3 = 10$, $t_4 = +\infty$.

As indicated in our descriptive analysis, the difference in transition rates between the two types of programs seems to differ depending on the elapsed duration since labour market entry. Therefore, in a more extended specification, we also include interaction terms between the baseline hazard and our program dummy:

$$\begin{cases} \ln \vartheta_b\left(t \mid x, y, V_b\right) = \ln \lambda_{b,c}\left(t\right) + \ln \lambda_{b,y}\left(t\right) \cdot y + \alpha_b y + x'\beta_b + V_b \\ \ln \vartheta_g\left(t \mid t_b, x, y, V_g\right) = \ln \lambda_{g,c}\left(t\right) + \ln \lambda_{g,y}\left(t\right) \cdot y + \alpha_g y + x'\beta_g + \delta\left(t \mid t_b, y, x\right) 1\left(t > t_b\right) + V_g \end{cases}. \tag{4}$$

Finally, we model the probability of choosing for a program with vis-à-vis without workplace learning. For this, we assume the following logistic specification:

$$Pr\left(y = 1 \mid x, z, V_h\right) = \frac{exp\left(x'\gamma + \varphi z + V_h\right)}{1 + exp\left(x'\gamma + \varphi z + V_h\right)}, \tag{5}$$

where *z* represents a variable affecting program choice but not any of the transitions, and where V_h represents an unobserved heterogeneity term.

The model is estimated by Maximum Likelihood estimation techniques. To obtain the likelihood contributions, we integrate the individual contributions related to the Mixed Proportional Hazard model (with respect to the labour market outcomes) and to the logistic model (related to the program choice) over the unobserved heterogeneity distribution. More concretely, we adopt a discrete non-parametric distribution in the spirit of Heckman and Singer (1984). We estimate, by analogy with van den Berg et al. (2002), our model for an optimal (according to the Akaike Information Criterion; Gaure et al. 2007) and a priori unknown number *K* of heterogeneity types. Their proportions are specified as logistic transforms:

$$p_k = \frac{\exp(q_k)}{\sum_{j=1}^{K} \exp(q_j)}, \tag{6}$$

with $k=[1,K]$ and q_k parameters to be estimated (q_1 normalized to 0). In addition to the estimation of these type probabilities, this approach is based on the estimation of one mass point for V_b, V_g and V_h for each heterogeneity type (with the mass points for the first type normalised to 0).

4.3 Control variables

To account for differences between graduates from the two different types of programs and between those entering into bad matches and those staying unemployed, we control for a large subset of observables (x'). These variables are dummies for gender (1 dummy), foreign background (1), province of residence (4), degree of urbanisation of the home municipality (3), educational track in secondary education (3), master programs (1), broad field of study (6), mark in final year of higher education (1), participation in student work during higher education (1), and month of leaving the educational system (1). As continuous variables, we include the level of education of the father, the minimum duration of the program (in the case of a master program) and the youth unemployment rate at labour market entry. Descriptives on these control variables are reported in Appendix C.

The inclusions of the higher education track (short-term non-university, long-term non-university and long-term university) and the field of study as control variables requires further clarification. As discussed in section 2, the

degree of vocationalisation through the implementation of workplace learning largely differs between higher education tracks and between fields of study. On the one hand, by including these variables in the model, we may pick up part of the effect of vocationally oriented programs because employers may use the track and field of study as signal for the vocational character of the job seekers' education. On the other hand, differences in labour market transitions between alternative tracks and fields of study also result from differences in demand and supply conditions on the labour market. The better performance for the short track in comparison to the long tracks for instance may result from a higher demand for labour at the higher functional level in comparison to the scientific functional level. Similarly, the better performance for those with a medicine degree may result from labour shortages in the medical sector. Therefore, regarding the track, we opt to control for the level of the degree (master versus bachelor), but not for the type of institution (college versus university). Further, we only account for broad fields of study. Within each broad field of study, individuals may serve as imperfect substitutes and hence the most significant differences in demand and supply should be captured. Nevertheless, there remains substantial variation in the vocational degree of the programs within these fields to identify its effect.

4.4 Exclusion restriction

As mentioned before, we extend Baert et al. (2013) by simultaneously modelling the program decision. To control for the endogeneity of this decision with respect to later labour market outcomes, we add an exclusion restriction, i.e. a variable that influences the program choice, but has no impact on the transition to jobs. In the spirit of Card (1995), our exclusion restriction is based on the relative supply of programs with workplace learning in the vicinity of the home residence. As for other countries, evidence shows participation in tertiary education in Belgium to depend on the proximity of colleges and universities (Duchesne and Nonneman 1998). Our supply variable r^v is derived from additional information in the SONAR data regarding the address of the higher education institution of the graduate. Firstly, we estimated the overall supply of educational services at a particular postcode by the number of students in the SONAR data that followed their program in an institution located at that postcode (s_p). Secondly, we assessed the degree to which the programs offered at the postal code were with or without workplace learning. For this, we computed the proportion of the degrees awarded at a particular postcode that include at least three months of work placement (voc_p). Thirdly, we weighted the supply of programs with workplace learning by the distance between each location with at least one higher education institution and the location of the residence. [16] For this we relied on the following distance weighting function: $exp(-(d_{pi}/40)^3)$ with d_{pi} the distance in kilometres between postal code p with an institution and the home residence of individual i. On the basis of this function, the weight strongly decreases for programs beyond 40 km from the home residence. Our variable that measures the relative supply of programs with workplace learning for individual i is then measured in the following way:

[16] While information on the home address ideally corresponds to the situation at the start of graduation (mostly age 18 to 20), we only have information on the official address at age 23. For several reasons, the number of individuals with a (substantial) change in the geographical location of their official address is likely to be small. At age 23, individuals in our sample only recently graduated or were still at college or university. Further, while many students rent a room near college or university, almost all students in Flanders turn home during the weekend. Parents also get child benefits for children officially residing at their address up to 12 months after graduation (conditional on not having a job with a standard labour contract). Hence, it is usual in Belgium to keep the official address unchanged up until a significant period after graduation. Also overall geographical mobility is considered to be low in Flanders (Estevão 2002).

$$r_i^v = \frac{\sum_{p=1}^{m} voc_p \cdot s_p \cdot \exp(-(d_{pi} / 40)^3)}{\sum_{p=1}^{m} s_p \cdot \exp(-(d_{pi} / 40)^3)}, \quad (7)$$

with m = the number of locations with a supply of tertiary education. The denominator represents the distance-weighted overall higher education supply for the individual, while the numerator represents the distance-weighted supply of higher education programs with workplace learning. The ratio then measures the relative importance of programs with workplace learning in the vicinity of the home residence.

Exclusion restrictions based on college and program proximity are widely used in the literature on the impact of educational choices.[17] Nonetheless, they are not uncontested since individuals living near (particular) colleges may perform different on the labour market than others. While we cannot completely rule out that our exclusion restriction is not valid, we are confident that this problem is limited in our study and, at least, no more severe than in other studies relying on similar exclusion restrictions. In what follows, we will argue why this is the case.

A first problem may be that the relative supply of programs is geographically not evenly spread across the region and, hence, may capture local labour market effects. In Flanders, universities are indeed more concentrated in the big cities and in three of the five provinces. Also the extent to which colleges and universities include work placement in the curriculum may differ across Flanders. However, by controlling for province of residence and the degree of urbanisation of the home municipality, we aim at solving this problem.

A related problem is that firms may base their location in function of the location of particular higher education institutions. However, this is only problematic if firms not only account for the location of colleges and universities and the programs they offer in terms of level and field of study, but also for the extent to which these programs include work placement. Although we cannot exclude that a few firms account for this, we consider it unlikely to be a decisive location factor. Moreover, even if firms would be willing to take this into account, the number of colleges and universities are limited and, hence, there is often no real choice. The opposite, with higher education institutions adapting the orientation of their programs to the availability of firms, may be more likely. For instance, the extent to which colleges are willing to include work placement in their curricula may depend on the availability of firms and organizations in their vicinity that are willing to collaborate. Hence, a high relative supply of programs with workplace learning within a certain field of study may also indicate the presence of firms and organizations that employ workers in matching occupations. This should only be a problem as long as a significant fraction of the potential jobs in the graduate's job search area are offered by firms and organizations located near higher education institutions. Although this cannot be ruled out for those residing close to these institutions, this should not be the case for most of the graduates.

Further, our variable on the supply of programs may capture rather the supply of graduates in one's region. However, for several reasons, our supply variable has little to say about the number of competitors for graduates with respect to the labour market. First of all, individuals choosing for the same college or university may reside in districts that are geographically largely distinct. This is in particular the case for Flanders, which is a highly

[17] Some recent applications are those by Carneiro et al. (2011), Kämhofer and Schmitz (2015), Kolstad and Wiig (2014) or Reynolds (2012).

densely populated region. The overlap of the geographical area in which individuals from the same institution look for jobs may thus be limited. Moreover, this overlap may even be absent since job opportunities are much more well spread across the country than colleges and universities. Secondly, we rely on a distance function rather than on separately delineated districts. Hence, even within a district and among graduates applying for similar jobs, the relative supply of programs differs depending on the postal code of one's residence. Thirdly, our supply variable is measured relying on the programs of individuals across all age cohorts, while graduates above all compete with graduates entering the labour market at the same time. Given that labour market entrance of the graduates in our sample is spread over a period of about one decade, this divergence is likely to be strong. Fourthly, the supply is measured in relative instead of absolute terms and, hence, a higher value on this variable does not necessarily indicate a larger number of graduates. Finally, we condition on the level and field of study of the program and thus investigate the impact of the orientation of the program assuming they are in the same labour market segment. Hence, even if our program supply variable is positively correlated with the absolute number of graduates with a degree with workplace learning, a higher relative supply of graduates with such a degree should not indicate a higher number of graduates with which they have to compete.

Finally, individuals may choose their residence in function of the supply of educational services. This may be a problem if this is relatively more the case for families with more able and more motivated children (Card 1995). However, even if parents take into account the overall availability of colleges and universities and their supply in terms of fields of study when deciding on the family residence, it is unlikely that they also account for the extent to which they include work placement in their programs. After all, at the time the family residence is chosen, parents usually have little or no information about their children's specific preferences regarding this issue. And even if so, this problem is further accounted for by the fact that we control for the educational level of the father and the track choice in secondary education at age 16.

To test whether these assumptions are realistic, we end with a variant of a balancing test. We regress predetermined variables on a dummy indicating whether individuals have an above-median supply of programs with workplace learning or not and on urbanisation and province of residence as control variables. Along with the predetermined variables that are included as control variables in our model, we also look at the reason for having participated in higher education. The latter is derived from a survey question at age 23, which proposed ten possible reasons to participate and each time asked to indicate the extent to which the reason applied to the respondent. As a benchmark, we also conduct regressions with a program dummy instead of the workplace learning supply dummy. As shown in Appendix D, the program dummy is correlated with most of the predetermined variables. Those participating in a program with workplace learning are of lower social backgrounds, more often female and participated more often in less prestigious tracks during secondary education. They are also different from others in terms of eight out of ten reasons to participate in higher education; they more often participate because of personal interest in the topic or to be able to conduct a particular occupation and less often because of extrinsic reasons or because of social pressure and external expectations. This selectivity is much less pronounced when comparing those with an above-median supply of workplace learning programs with those below the median. We do not find any indications on selectivity in terms of social background, nationality or gender. Also in terms of reasons to participate in higher education, few differences are found. Moreover, although there are some differences in track choice in secondary education, the difference in the prestige level of their track is barely significant at the 10% level ($p=0.099$). Adding other control variables, such as level of education and field of study,

further reduces these differences and eliminates any statistically significant difference in track prestige. Moreover, also the difference in participation in the general secondary education track in comparison to the other tracks becomes statistically insignificant. Given that the general track is considered to be the most prestigious one, this is reassuring. Only among the three less prestigious tracks, some statistically significant differences remain, with those with an above-median supply more often having participated in the technical track and less often in the vocational or arts track. An explanation may be that arts schools and purely vocational schools are geographically relatively more concentrated than other secondary education schools. If so, this remaining correlation should not be attributed to differences in unobserved abilities and, hence, adding the secondary education track as control variable should be sufficient.

5. Estimation Results

5.1 Benchmark model

In Table 3, we report the main estimation results on our benchmark model, with three months of work-placement as criterion to distinguish between the two types of programs and relying on the objective mismatch indicator. We report results on both models without and with unobserved heterogeneity being taken into account. The full estimation results regarding the model that accounts for unobserved heterogeneity are reported in Appendix E. On the basis of the Akaike Information Criterion, we retain seven heterogeneity types for this model. However, most of the individuals seem to pertain to three classes, with respective probabilities of the points of support of 66.2%, 19.9% and 7.3%.

We first focus on the estimates that are based on the model that does not take into account unobserved heterogeneity (Table 3, Model (1)). Regarding the program equation, the main variable of interest is the variable that measures the relative supply of workplace learning programs within the vicinity of the home residence. The coefficient of this variable has the expected sign and is strongly statistically significant ($\varphi > 0$). The higher the relative supply of workplace learning programs in one's region, the more likely one is to participate in such a program. Regarding the two hazard rates, both coefficients regarding the direct effect of having a degree with workplace learning have the expected sign ($\alpha_b < 0$; $\alpha_g > 0$). However, they are statistically insignificant. This result deviates from the one on the basis of the descriptive analysis and suggests that the difference in transition rates between the two types of programs are attributed to differences in observed characteristics. Further, in line with previous evidence, we find a negative treatment effect of previous entrance into a bad match for entrance into a good match ($\delta_0 < 0$), although the effect seems to diminish with the duration between labour market entry and entrance into a bad match ($\delta_1 > 0$). Finally, as expected, the treatment effect of previous entrance into a bad match is found to be relatively more negative for graduates from a program with workplace learning ($\delta_3 < 0$). However, also this difference is not statistically significant. Hence, we cannot conclude on the basis of this specification that a bad match delays the transition to a good match more profoundly for more vocationally educated individuals. Accounting for unobserved heterogeneity does not change these conclusions (Table 3, Model (2)). Neglecting statistical significance, we even find a less negative treatment effect for graduates from programs with workplace learning. Consequently also these estimates do not indicate that bad matches are more persistent for these more vocationally educated individuals.

<Insert table 3 here>

5.2 Extended model

We also estimate a more extended specification, in which we interact the baseline hazard with the program choice dummy (see Table 4, Model (1)). Regarding the transition to a bad match, these interactions are not statistically significant. Regarding the transition to a good match, however, we find the impact of the program orientation to depend on the elapsed duration. First of all, the baseline effect for programs with workplace learning is found to be negative ($\alpha_g < 0$). This is equivalent to a decrease in the direct monthly transition rate by 21.3% for workplace learning degrees as opposed to other degrees.[18] Further, we find positive and statistically significant interaction effects between the program orientation and the period between three and nine months after entering the labour market. To conclude that the direct monthly transition rates during this period are relatively higher for those having participated in a workplace learning program, the sum of the baseline effect and the respective interaction effect needs to positive and statistically significant as well ($\alpha_g + \ln\lambda_{g,y}(t) > 0$). This is the case for the period of three to four months after graduation only (significant at the 5% level).[19] The direct effect for this period is equivalent to an increase in the monthly transition rate by 42.3% in the case of a program with workplace learning as opposed to one without workplace learning.[20] Although the interaction between the treatment effect and the program dummy now again has the expected negative sign, it is also statistically insignificant in this case. Also the differences in indirect monthly transition rates are statistically insignificant for any elapsed duration since labour market entry.[21]

<Insert table 4 here>

5.3 Sensitivity analyses

We end with a number of sensitivity analyses. A first number of sensitivity analyses are based on alternative criterions to distinguish between programs with and without significant component of workplace learning. First, we re-estimate our extended model relying on one month of work placement as alternative criterion.[22] We now find both a more pronounced negative baseline effect of programs with workplace learning on the transition to a good match (α_g) and a more pronounced positive interaction effect between workplace learning programs and the period between three and four months after labour market entry. However, the impact of the relative supply variable on the probability to participate in such a program is not statistically significant in this case. Hence, the validity of the estimates for this alternative indicator is questionable. Second, we estimate our model relying on a

[18] Exp(-0.240)-1=-0.213

[19] The estimated effect for t = [3,4] is equal to -0.240+0.593=0.353 and has a Chi² value of 4.34; the estimated effect for t = [5,9] is equal to -0.240+0.505=0.265 and has a Chi² value of 1.94.

[20] Exp(0.353)-1=0.423.

[21] The effects on the indirect transition rates are equal to the sum of the baseline effect (α_g), the interaction effect between the treatment effect and the program dummy (δ_3) and, eventually, the interaction between the baseline hazard and the program dummy ($\ln\lambda_{g,y}(t)$). Test results on the statistical significance of these effects are available upon requests.

[22] These results are not reported, but available upon request.

more strict definition of four months of work placement experience to categorise programs as having a significant component of workplace learning (Table 4, Model (2)). Conversely to the aforementioned results, these estimates do not indicate that those with a workplace learning program have a lower direct monthly transition rate to a good match during the first two months after graduation. Also the estimated differences in direct monthly transition rates during the period of three to nine months after graduation are smaller than those on the basis of the benchmark indicator for workplace learning programs. The treatment effect for previous entrance into a bad match is again not found to be statistically different between the two programs.

Finally, we estimate our extended model relying on three alternative mismatch indicators. First, we rely on a more subjective indicator for bad matches (Table 4, Model (3)). The conclusions on the basis of this indicator are largely similar to those on the basis of Model (2), that combines the objective mismatch indicator with four months of workplace learning indicator. Next, we also use full mismatch (i.e. a combination of objective overeducation and field-of-study mismatch) as bad match indicator (Table 4, Model (4)). The results regarding the effects of workplace learning programs on the direct transition to a good match are similar to those on the basis of Model (1): a statistically significantly negative baseline effect (α_g) in combination with statistically significantly positive interaction effects with the periods between three and nine months after graduation. Moreover, in contradiction with our hypothesis, we now find the treatment effect for previous entrance into a bad match to be more positive in the case of workplace programs. However, this interaction effect is merely statistically significant at the 10% level. The results on the basis of this indicator also suggest that the difference in indirect transition rates are statistically significant for the period between three to nine months after graduation.[23] In a last sensitivity analysis, we use occupational wage mismatch as bad match indicator (Table 4, Model (5)). Also this indicator delivers little evidence on systematic differences in transition rates between the two types of programs, although the estimates are relatively imprecise in this case.

6. Discussion

The hypothesis that the choice between vocationally and generally higher education implies a trade-off already at the beginning of the career is clearly refuted by our results. Neither clear evidence for a higher direct transition rate to a good match nor for a lower indirect transition rate to a good match for individuals with a program with workplace learning can be detected. Although some evidence is found on a higher direct and indirect transition rate between month three to nine after graduation for those with a workplace learning program, we also find some limited evidence on a lower direct transition rate during the first two months. Moreover, no evidence is found for a difference in transition rate beyond the period of nine months after graduation.

6.1 Simulations

The lack of substantive difference between both groups of programs in the transition from higher education to work is also apparent on the basis of Table 5, which reports some simulated durations based on the estimates for

[23] The estimated effect for t = [3,4] is equal to -0.160+0.416+0.332=0.588 and has a Chi² value of 5.86; the estimated effect for t = [5,9] is equal to -0.160+0.429+0.332=0.601 and has a Chi² value of 5.58.

our benchmark measures for match quality and workplace learning programs. We conducted simulations for the following four types of durations: (1) until any job, (2) until a bad match assuming no one finds a good match, (3) until a good match assuming no one accepts a bad match and (4) until a good match assuming everyone starts in a bad match right after graduation. For each duration, we report the median and third quartile duration, on the one hand assuming everyone has a workplace learning program and on the other hand assuming nobody participated in a workplace learning program. The simulated durations hardly differ between the two programs. The median duration to any job, for instance, is estimated to be equal to 1.7 months in the case of workplace learning programs and 1.5 months in the case of other programs. Similarly, both types of programs are estimated to have a median duration to a good match of 2.6 months, assuming that no one accepts a bad match.

<Insert table 5 here>

6.2 Unobserved heterogeneity

Our findings that programs with workplace learning do not differ from those without workplace learning in terms of the duration until the first job and in terms of the match quality of the first job contrast with those from many other studies that found favourable short-run effects of vocationally oriented programs. At first sight, this seems not attributed to the fact that we accounted for unobserved heterogeneity since similar results were found on the basis of our estimates that did not account for selectivity. This also contradicts with the general perception that those with lower abilities and less favourable social backgrounds are more likely to choose for vocationally oriented programs (Ryan 2001). However, the often-mentioned negative selectivity in terms of abilities for vocational programs usually refers to the tracks within secondary education. Within tertiary education, such selectivity in terms of abilities is much less apparent once the level of the program (Master versus Bachelor) and field of study is accounted for. Some more vocationally-oriented programs, for instance within the domain of Medicine, are even among the most prestigious programs at Belgian universities. Moreover, the unobserved component does not just capture ability, but also other factors such as motivation to find a job. As reported, graduates from a workplace learning program more often participate in higher education because of intrinsic motivations such as because they are interested in the topic of the program or in order to be able to conduct the profession they prefer. And they less often participate because of external expectations and pressure. Hence, it seems reasonable to assume that graduates from a program with workplace learning are also more motivated to find jobs that match their education. This may counteract the negative effect resulting from lower average ability levels and explain why the model that did account for selectivity delivered similar results as the one that did not account for selectivity.

Note however that our assessment regarding the role of unobserved heterogeneity is a bit blurred by the fact that, by relying on an exclusion restriction, our estimates resemble rather a weighted average of local average treatment effects (Imbens and Angrist 1994). Some individuals are likely to be more strongly influenced by the relative supply of programs in the proximity of their residence than others. For instance, proximity of the college and university may matter more for graduates from lower social backgrounds than for others. Similarly, the composition of the programs may have a stronger influence for those residing closer to college and university campuses. While we cannot rule out that the absolute value of the treatment effect on the transition to a good match is lower for these two groups than for the full sample, also the opposite may be the case. For instance, since

graduates from lower social backgrounds are likely to have parents with less extended and influential professional networks, they are likely to gain more from the institutional ties between their higher education institution and firms. Similarly, jobs offered by tied firms, which are more likely to be located in the region of the higher education institution, will be more attractive for those residing nearby. Hence, unobserved heterogeneity may matter more than what is suggested on the basis of a simple comparison of the model that does and the one that does not account for selectivity.

The correctness of our interpretation crucially depends on the validity of our exclusion restriction. A particular concern is that colleges and universities may only include work placement in their curricula if a sufficient number of firms are available in their vicinity to cooperate with. If so, a high proportion of vocationally oriented programs offered at the college and university campuses within a district may also indicate high local labour demand. Hence, whatever the orientation of their program, graduates residing in such a district may be more likely to find a matching job. As a consequence, the impact of workplace learning programs on the transition to a good match may be overestimated. However, given that our results were mostly statistically insignificant, this eventual bias cannot explain why our conclusions on the short-run effects of workplace learning programs are less favourable than those made in other studies on this topic. Another concern may be that our instrument correlates with unobserved abilities that determine the transition to a job. However, our balancing test results are reassuring in this respect. This test did not indicate selection problems in terms of social background and nationality while both variables were predictive factors for the transition to work (see Appendix E). Moreover, even if there were some minor differences in terms of track choice in secondary education, we did not find an overall relationship with the prestige of the track in general and with the most prestigious general track in particular. This is important given that the individuals from the general track are found to be more successful in finding a good match (see Appendix E). We are therefore confident that there our results are not driven by selectivity problems in terms of unobserved abilities that affect the transition to a good or bad match.

From an overall point of view, our results are consistent with those of Malamud and Pop-Eleches (2010), who did not find much evidence for differences in labour market returns either once accounting for selectivity in terms of unobservables. More recently, however, Golsteyn and Stenberg (2014) did find a trade-off in terms of earnings for secondary education graduates even after controlling for GPA and family fixed effects. Further, after having executed a number of robustness checks by including additional controls and conducting propensity-score matching, also Hanushek et al. (2017) concluded that their findings on a trade-off in terms of employment are not driven by selectivity. Hence, the question remains why we did not find an effect in our study.

6.3 Other explanations

Several other reasons can be advanced why little evidence was found in our study for a trade-off effect between on the one hand higher employment chances and better matches at the start of the career and on the other hand a higher risk of bad match persistence. A first explanation may be provided by the average length of the observed period after graduation in this study. Golsteyn and Stenberg (2014) found a turning point in terms of earnings for men about eight years after graduation. In their basic analysis, Hanushek et al. (2017) even noted a turning point in terms of employment only around the age of 50. In contrast, we focussed on the first years on the labour market – the observation period was on average about four years. While this length cannot explain why no effects were

observed regarding the length of the first unemployment spell and the quality of the match in the first job, it may explain why no evidence was noted regarding differences in bad match persistence. Probably, just like regarding earnings and employment, it takes much more time for more generally oriented degrees to deliver an advantage.

Another explanation may be that, even if the curriculum includes a substantial component of work placement, most of these tertiary education programs remain sufficiently general not to generate any adverse persistence effects. Also the institutional ties, which may help explaining the often-found reduction in entrance joblessness in other studies, may remain limited in this case. At least, we did not find that the effect of workplace learning programs is the most pronounced immediately after graduation, what could have been expected if institutional ties indeed are important. The explanation that only more extreme types of vocational education result in a trade-off would also be consistent with Hanushek et al. (2017), who found the most pronounced trade-off effects in terms of employment for countries with strongly developed apprenticeship systems. Similarly, the aforementioned research of Golsteyn and Stenberg (2014) focussed on vocational programs in secondary education spending half or even up to four fifths of the class hours on pure vocational subjects.[24]

A related argument is that, even if work placement is the most visible component of vocationally oriented programs within tertiary education, programs may differ in many more dimensions. Work placement is a critical indicator for the extent to which a program includes practice-based learning. However, vocationally oriented programs are also often associated with strong specialisation in terms of the number of subjects and with a stronger focus on specific instead of general skills. That each of these dimensions should not necessary have the same implications for labour market outcomes is illustrated by Dolton and Vignoles (2002), who found a strong impact of mathematics A levels on earnings but not of a broader curriculum. Similarly, Humburg et al. (2015) found both analytical thinking skills and mastering one's own field to be associated with lower degrees of overeducation among graduates. Probably, each of these dimensions also have different short-run and more long-run labour market implications.

Finally, as opposed to our study, most of the literature on the effects of vocationally oriented programs focusses on programs within secondary education. For several reasons, results may differ for tertiary education graduates. First of all, minimum wages are not likely to be binding for tertiary education graduates. Consequently, differences in productivity at the start of the career are less likely to be translated in differences in joblessness spells. More importantly, the jobs of high-skilled workers are much less routinised and much less standardised than those of medium- and low-skilled workers. Technological changes in the past decades may even have further intensified this difference between both types of workers (Autor et al. 2003). Within such a context, shaping programs that provide each tertiary education graduate with the specific skills needed in her first job becomes a much more difficult task. Moreover, even if useful specific skills can be acquired through work placement, further training will in general still be necessary. Hence, the comparative advantage of graduates with work placement experience may be rather limited. This interpretation aligns with the findings of Brunello and Rocco (2015), who found much less favourable effects of vocational education at the tertiary level than at the secondary level.

[24] To test whether the trade-off effect shows up for more extreme types of vocationally oriented programs, we also estimated our model relying on at least six months of work placement as criterion to distinguish between the two types of programs. However, the model did not converge when using this criterion.

7. Conclusion

We investigated whether the choice for a more vocationally-oriented higher education program implies a trade-off between on the one hand higher employment chances and better matches at the start of the career and on the other hand a higher risk of bad match persistence for those who nevertheless start their careers in a bad match. For this, we relied on data for Flemish tertiary education graduates and differentiated between vocational and general programs on the basis of the presence of curriculum-based workplace learning. To account for selection on unobservables in programs with a workplace learning component, we relied on an exclusion restriction. Selection on unobservables in bad matches was accounted for by means of the Timing of Events model. Overall, we found little evidence on the aforementioned trade-off. A potential explanation may be that, due to the complex and unstandardised character of high-skilled jobs, work placement offers little comparative advantages to tertiary education graduates.

From a policy point of view, our results contribute to the debate about the efficiency of workplace learning and vocationally oriented programs in higher education. In general, vocationally oriented programs are considered to be more costly than generally oriented programs (Psacharopoulos 1987; Ryan 2001). In the case of work placement, colleges and universities need to invest in the matching between students and jobs and in individual guidance. Also the evaluation of students may be more time-consuming. Particularly in the case of short work placement durations, the fixed costs involved may exceed reduced classroom instruction costs. If work placement indeed delivers no direct short-run benefit, it may therefore be efficient for colleges and universities to drop work placement from their curricula. However, this reasoning neglects that individuals may differ depending on their comparative advantage for different learning methods and program orientations. Even if both types of programs are on average as effective, some individuals may benefit most from a practice-based learning environment while others may realise higher skill gains through class-room instruction and more academic learning methods. If so, a rationalisation could reduce the opportunities for those having a comparative advantage in more vocationally oriented programs and, hence, the best option could nevertheless be to maintain both types of programs.

We should also point out that more research on this issue is required to establish a final conclusion. In particular studies focusing on other institutional contexts, relying on other dimensions of vocationally oriented programs and also those covering more extremely vocationalised programs are needed. Also research tracking individuals beyond the first four years after graduation is needed to allow a more complete assessment regarding the impact of the program on the persistence of mismatches. Further, given that complete validity of exclusion restrictions cannot be ruled out, also studies relying on alternative identification strategies would be welcome. Finally, also more research focusing on the impact of vocationalised higher education programs on other match quality indicators and on other labour market outcomes such as wages would enrich this discussion.

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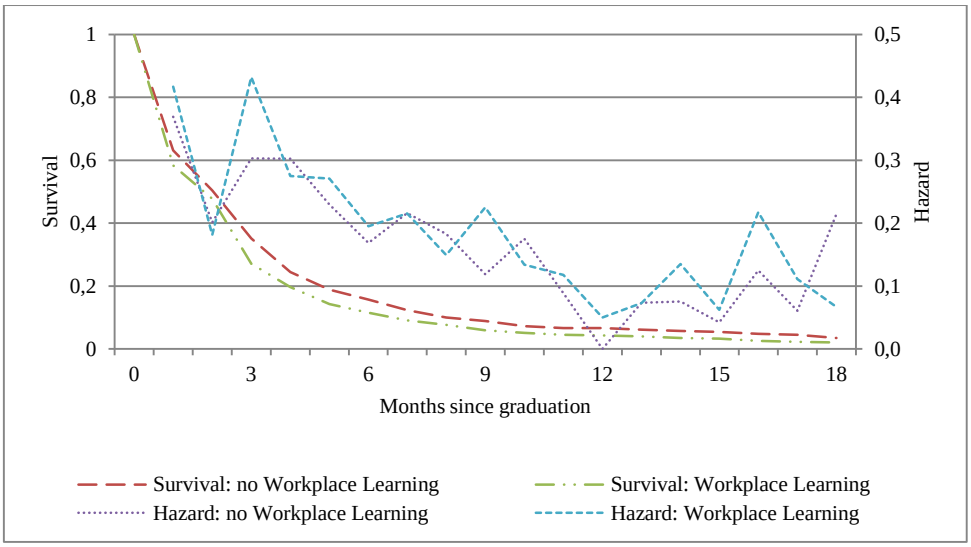
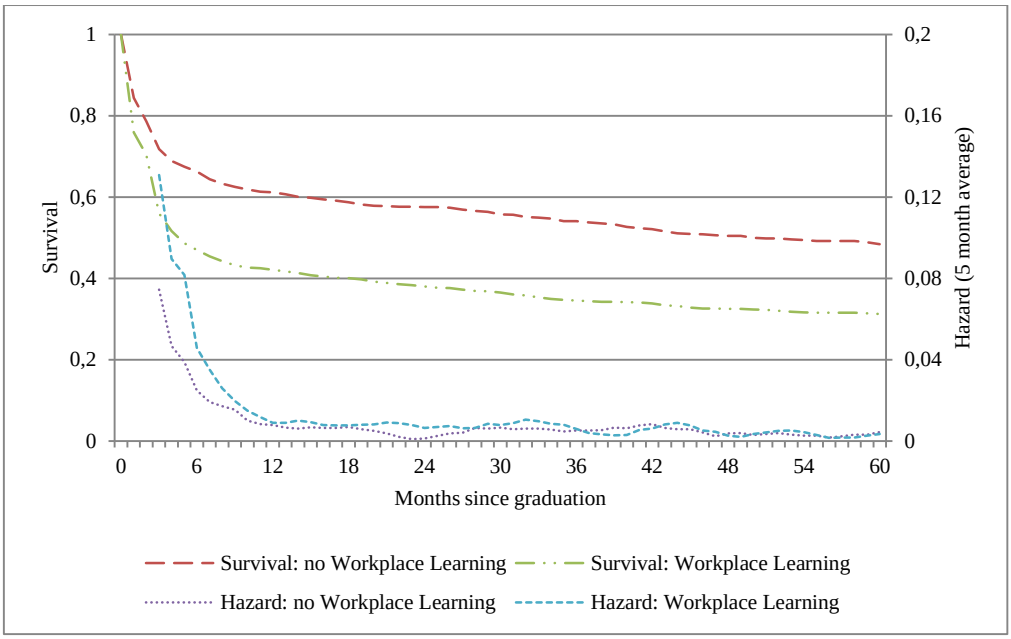
Figure 1: Kaplan-Meier estimates – duration between date leaving education and entry in first job by orientation (benchmark definition)



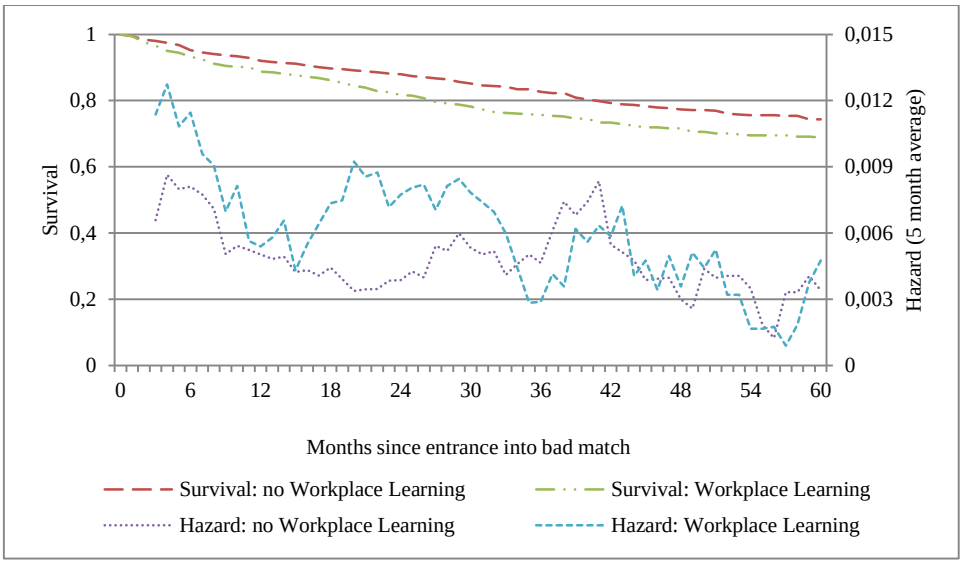
Notes. Data source: SONAR, own calculations. N = 3680.

Figure 2: Kaplan-Meier estimates – duration between date leaving education and entry in first good match (objective) by orientation (benchmark criterion)



Notes. Data source: SONAR, own calculations. N = 3680.

Figure 3: Kaplan-Meier estimates – duration between start bad match and entry in first good match (objective) by orientation (benchmark criterion)



Notes. Data source: SONAR, own calculations. N = 1719.

Table 1: Orientation of study programs – sample distribution

	Overall sample	Short programs	Long programs
Program with workplace learning: Benchmark criterion	52.8%	69.6%	28.6%
Program with workplace learning: Alternative criterion 1	74.3%	92.9%	47.6%
Program with workplace learning: Alternative criterion 2	39.1%	50.5%	22.6%

Notes. Data source: SONAR, own calculations; N = 3680.

Table 2: Descriptive statistics on the transition from education to work by orientation (benchmark crit.)

	Program without workplace learning		**Program with workplace learning**		**Log rank test**
	Median	Mean	Median	Mean	Chi^2
Months until first job	3	4.4	2	3.7	16.9***
Months until first good match (objective)	50	72.0	5	44.3	127.3***
Months since entry into bad match until first good match (objective)	-	108.5	-	92.9	8.4***

Notes. Data source: SONAR, own calculations. The log rank test tests the equality of the survival distributions.

Table 3: Benchmark model – Main estimation results

	(1)		(2)	
	Coeff.	SE	Coeff.	SE
Participation in program with workplace learning				
φ: relative supply of programs with workplace learning	4.876 ***	(1.608)	11.872 ***	(3.926)
Hazard to bad match				
α_b: program with workplace learning	-0.013	(0.058)	-0.042	(0.086)
Hazard to good match				
α_g: program with workplace learning	0.065	(0.064)	-0.043	(0.091)
δ_0: treatment effect – constant	-2.662 ***	(0.125)	-7.341 ***	(0.272)
δ_1: treatment effect – interaction with t_b	0.659 ***	(0.194)	2.573 ***	(0.298)
δ_2: treatment effect – interaction with t_b^2	-0.189 *	(0.098)	-0.224 *	(0.133)
δ_3: treatment effect – interaction with program with workplace learning	-0.136	(0.116)	0.109	(0.141)
Model diagnostics				
Log-Likelihood	-12328.828		-11877.066	
AIC	24837.656		23982.132	
Number of heterogeneity types	1		7	
Parameters	90		114	
Model specification and measurement				
Accounting for unobserved heterogeneity	No		Yes	
Mismatch measure	Objective Educational Mismatch		Objective Educational Mismatch	
Workplace learning measure (months of work placement)	3 Months		3 Months	

Notes. ***(**)((*)) indicates significance at the 1% (5%) ((10%)) level. N = 3536.

Table 4: Extended model and sensitivity analyses – Main estimation results

	(1)		(2)		(3)		(4)		(5)	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Participation in program with workplace learning										
φ: relative supply of programs with workplace learning	11.669 ***	(3.882)	16.069 **	(6.327)	11.679 ***	(3.808)	7.967 ***	(2.520)	8.015 ***	(2.515)
Hazard to bad match										
α_b: program with workplace learning	0.038	(0.098)	0.090	(0.104)	-0.116	(0.110)	0.013	(0.138)	-0.028	(0.081)
ln $\lambda_{b,y}$ (t): t = [3,4] x program with workplace learning	-0.045	(0.127)	-0.100	(0.143)	-0.023	(0.147)	0.272	(0.365)	-0.251	(0.183)
ln $\lambda_{b,y}$ (t): t = [5,9] x program with workplace learning	0.122	(0.121)	0.065	(0.135)	0.190	(0.139)	0.134	(0.246)	-0.094	(0.188)
ln $\lambda_{b,y}$ (t): t > 10 x program with workplace learning	0.042	(0.148)	0.083	(0.159)	0.052	(0.163)	-0.302	(0.318)	0.035	(0.295)
Hazard to good match										
α_g: program with workplace learning	-0.240 **	(0.103)	-0.106	(0.101)	-0.144	(0.090)	-0.160 **	(0.067)	-0.142	(0.087)
ln $\lambda_{g,y}$ (t): t = [3,4] x program with workplace learning	0.593 ***	(0.182)	0.393 ***	(0.148)	0.547 ***	(0.169)	0.416 **	(0.186)	0.958 **	(0.395)
ln $\lambda_{g,y}$ (t): t = [5,9] x program with workplace learning	0.505 ***	(0.187)	0.294 *	(0.165)	0.358 **	(0.147)	0.429 *	(0.244)	0.755	(0.460)
ln $\lambda_{g,y}$ (t): t > 10 x program with workplace learning	0.351	(0.219)	-0.064	(0.169)	0.271	(0.201)	-0.133	(0.554)	2.325	(3.627)
δ_0: treatment effect – constant	-7.183 ***	(0.291)	-6.867 ***	(0.272)	-6.803 ***	(0.276)	-4.579 ***	(0.179)	-4.457 ***	(0.188)
δ_1: treatment effect – interaction with t_b	2.644 ***	(0.299)	2.300 ***	(0.292)	1.919 ***	(0.275)	1.237 ***	(0.242)	1.041 ***	(0.183)
δ_2: treatment effect – interaction with t_b^2	-0.266 **	(0.131)	-0.215 *	(0.128)	0.025	(0.127)	-0.088	(0.117)	0.004	(0.088)
δ_3: treatment effect – interaction with workplace learning	-0.180	(0.252)	0.215	(0.243)	0.157	(0.241)	0.332 *	(0.192)	-0.309	(0.218)
Model diagnostics										
Log-Likelihood	-11865.440		-11765.247		-11203.222		-10323.339		-11674.743	
AIC	23954.880		23754.494		22638.444		20846.678		23549.486	
Number of heterogeneity types	5		5		6		2		2	
Parameters	112		112		116		100		100	
Model specification and measurement										
Accounting for unobserved heterogeneity	Yes		Yes		Yes		Yes		Yes	
Mismatch measure	Objective Educational Mismatch		Objective Educational Mismatch		Subjective Educational Mismatch		Full Educational Mismatch		Occupational Wage Mismatch	
Workplace learning measure (months of work placement)	3 months		4 months		3 months		3 months		3 months	

Notes. ***(**)((*)) indicates significance at the 1% (5%) ((10%)) level. N = 3536.

Table 5: Simulated durations (months)

	Assuming everyone participated in …	
	Program with Workplace Learning	**Program without Workplace Learning**
Median duration until…		
any job	1.7	1.5
bad match, assuming no one finds a good match	2.5	2.5
good match, assuming no one accepts a bad match	2.6	2.6
good match, assuming everyone starts in bad match right after graduation	133.6	> 142
Third quartile duration until…		
any job	3.1	3.4
bad match, assuming no one finds a good match	4.6	5.4
good match, assuming no one accepts a bad match	4.8	4.9
good match, assuming everyone starts in bad match right after graduation	> 142	> 142

Notes. simulations based on the extended model specification, with the objective bad match indicator and 3 month of work placement as indicator to distinguish between workplace learning and other programs (results reported in Table 4, column (1)).

Appendix A: Percentage of workplace learning programs by field of study and track

	Short Programs	Long Programs at College	Long Programs at University
Linguistics, history and philosophy	-	7.5%	11.3%
Economics, business and law	42.1%	26.4%	15.2%
Behavioral sciences	97.8%	-	56.6%
Health and (para)medicine	94.4%	100.0%	81.9%
Natural sciences and engineering	51.3%	28.6%	12.0%
Arts	20.0%	26.3%	-
Education	90.6%	15.4%	19.4%
Overall sample	69.7%	27.3%	29.3%

Notes. Data source: SONAR, own calculations; N = 3663.

Appendix B: Descriptive statistics alternative criteria and measures

	Program without Workplace Learning		Program with Workplace Learning		Log rank test
	Median	Mean	Median	Mean	Chi²
Benchmark criterion (3 months of work placement)					
Months until first job	3	4.4	2	3.7	16.9 ***
Months until first good match					
Objective educational mismatch (benchmark)	50	72.0	5	44.3	127.3 ***
Subjective educational mismatch	10	57.9	3	22.0	204.5 ***
Full mismatch	3	25.0	3	14.9	43.2 ***
Occupational wage mismatch	77	76.6	4	38.0	258.1 ***
Months since entry into bad match until first good match					
Objective educational mismatch (benchmark)	-	108.5	-	92.9	8.4 ***
Subjective educational mismatch	-	105.4	-	66.9	15.1 ***
Full mismatch	-	84.9	-	65.6	8.6 ***
Occupational wage mismatch	-	110.3	-	90.1	14.8 ***
Alternative criterion 1 (1 month of work placement)					
Months until first job	3	4.9	2	3.8	21.6 ***
Months until first good match (objective educational mismatch)	54	72.0	9	50.9	38.7 ***
Months since entry into bad match until first good match (objective educational mismatch)	-	115.2	-	96.0	12.5 ***
Benchmark criterion (4 months of work placement)					
Months until first job	3	4.4	2	3.7	16.1 ***
Months until first good match (objective educational mismatch)	40	67.9	4	34.4	119.2 ***
Months since entry into bad match until first good match (objective educational mismatch)	-	106.9	-	74.4	7.0 ***

Notes. Data source: SONAR, own calculations. The log rank test tests the equality of the survival distributions. ***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level.

Appendix C: Descriptive statistics on the control variables

	Program without Workplace Learning		Program with Workplace Learning		Significance of difference
	Mean	SD	Mean	SD	t value
Foreign	0.022	0.146	0.020	0.141	0.287
Male	0.514	0.500	0.331	0.471	11.243 ***
Father's educational level	7.215	3.326	6.684	3.194	4.847 ***
Province: Antwerp	0.279	0.448	0.252	0.434	1.798 *
Province: Flemish Brabant	0.199	0.399	0.185	0.388	1.096
Province: West-Flanders	0.174	0.379	0.181	0.385	0.544
Province: East-Flanders	0.214	0.410	0.240	0.427	1.841 *
Province: Limburg	0.135	0.342	0.143	0.350	0.706
Degree of urbanisation: high	0.081	0.273	0.070	0.256	1.212
Degree of urbanisation: middle-high	0.140	0.347	0.132	0.339	0.680
Degree of urbanisation: middle-low	0.476	0.500	0.455	0.498	1.235
Degree of urbanisation: low	0.303	0.460	0.342	0.475	2.501 **
School orientation at age of 16: General track	0.789	0.408	0.682	0.466	7.211 ***
School orientation at age of 16: Technical track	0.188	0.391	0.295	0.456	7.389 ***
School orientation at age of 16: Arts track	0.017	0.129	0.008	0.089	2.396 **
School orientation at age of 16: Vocational track	0.006	0.077	0.015	0.123	2.690 ***
Higher education: Master	0.621	0.485	0.224	0.417	26.190 ***
Higher education: With (great/highest) honours	0.499	0.500	0.482	0.500	1.006
Subject higher education: Linguistics, history and philosophy	0.093	0.290	0.009	0.095	11.786 ***
Subject higher education: Economics, business and law	0.394	0.489	0.174	0.380	14.966 ***
Subject higher education: Behavioural sciences	0.048	0.214	0.166	0.373	11.388 ***
Subject higher education: Health and (para)medicine	0.025	0.155	0.227	0.419	18.609 ***
Subject higher education: Natural sciences and engineering	0.340	0.474	0.161	0.367	12.650 ***
Subject higher education: Arts	0.035	0.184	0.011	0.103	4.910 ***
Subject higher education: Education	0.066	0.249	0.251	0.434	15.308 ***
Higher education: minimal duration of study	3.781	0.704	3.346	0.758	17.601 ***
Student work	0.889	0.315	0.894	0.307	0.540
Leaving school in June	0.523	0.500	0.589	0.492	3.899 ***
Relative supply of workplace learning programs	0.413	0.039	0.418	0.042	3.729 ***
Unemployment rate at start spell	17.357	3.210	17.135	3.179	2.060 **
N	1662		1874		

Notes. Data source: SONAR, own calculations. ***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level.

Appendix D: Balancing test results[a] – linear regression estimates

	(1A) Difference by workplace learning program		(1B) Difference by supply of workplace learning programs		(2A) Difference by workplace learning program		(2B) Difference by supply of workplace learning programs	
	Coeff.	SE	Coeff.	SE	Coeff.	SE	Coeff.	SE
Level Education father	-0.493***	(0.109)	0.089	(0.147)	-0.008	(0.134)	0.132	(0.143)
Male	-0.184***	(0.016)	-0.007	(0.023)	-0.034*	(0.019)	-0.019	(0.021)
Foreign	-0.000	(0.005)	-0.007	(0.006)	-0.001	(0.006)	-0.007	(0.006)
Level Track in secondary education[b]	-0.113***	(0.016)	-0.037*	(0.022)	0.017	(0.018)	-0.020	(0.020)
Track secondary education: General	-0.104***	(0.015)	-0.045**	(0.021)	0.014	(0.017)	-0.029	(0.019)
Track secondary education: Technical	0.103***	(0.014)	0.068***	(0.020)	-0.001	(0.017)	0.053***	(0.019)
Track secondary education: Art	-0.009**	(0.004)	-0.014**	(0.006)	-0.010**	(0.004)	-0.015***	(0.005)
Track secondary education: Vocational	0.009***	(0.003)	-0.009*	(0.005)	-0.003	(0.003)	-0.009*	(0.005)
Reason to participate: To earn a higher wage	-0.140***	(0.031)	0.001	(0.042)	-0.019	(0.037)	0.005	(0.041)
Reason to participate: My former classmates also participated	-0.117***	(0.029)	-0.036	(0.040)	-0.029	(0.036)	-0.032	(0.039)
Reason to participate: I did not yet want to work	-0.091**	(0.039)	-0.009	(0.053)	0.010	(0.048)	-0.003	(0.053)
Reason to participate: To have good job prospects	-0.024	(0.023)	-0.045	(0.031)	-0.021	(0.026)	-0.037	(0.031)
Reason to participate: To be able to conduct the profession I prefer	0.212***	(0.025)	-0.019	(0.035)	0.119***	(0.032)	-0.018	(0.035)
Reason to participate: My parents expected me to participate	-0.157***	(0.033)	-0.022	(0.046)	-0.117***	(0.041)	-0.019	(0.046)
Reason to participate: It was self-evident that I would participate	-0.174***	(0.032)	-0.044	(0.044)	-0.059	(0.040)	-0.031	(0.043)
Reason to participate: I was interested in the topic of my program	0.077***	(0.019)	-0.035	(0.027)	0.031	(0.025)	-0.038	(0.027)
Reason to participate: To work on my self-development	0.020	(0.021)	-0.106***	(0.029)	0.029	(0.026)	-0.098***	(0.029)
Reason to participate: I enjoy studying	-0.092**	(0.041)	-0.138***	(0.030)	-0.074**	(0.037)	-0.069*	(0.040)
Control variables								
Province of Residence and Urbanisation	Yes		Yes		Yes		Yes	
Other control variables[c]	No		No		Yes		Yes	

Notes: ***(**)((*)) indicates significance at the 1% (5%) ((10%)) level.

[a] Results based on regressions with each variable in the first column being regressed on either a workplace learning program dummy (regression A) or a workplace learning program supply dummy (regressions B), together with a number of control variables; robust standard errors.

[b] Variable codes one in case of vocational track; two in case of technical or art track and three in case of general track.

[c] Level of education, field of study, minimal duration of study, graduating with great/highest honours, student work, leaving school in June, unemployment rate at start spell.

Appendix E: Full estimation results – Benchmark model

	Hazard rate into good match			Hazard rate into bad match			Probability to participate in program with workplace learning		
	Coeff.	SE	p-value	Coeff.	SE	p-value	Coeff.	SE	p-value
Treatment effect									
Delta_0	-7.341***	0,272	0,000						
Delta_1	2.573***	0,298	0,000						
Delta_2	-0.224*	0,133	0,092						
Delta_3	0.109	0,141	0,439						
Explanatory variables									
Constant	-1.993***	0.387	0.000	1.180***	0.431	0.006	-29.650***	6.150	0.000
Foreign	-0.575**	0.233	0.014	-0.901***	0.228	0.000	-0.164	0.789	0.836
Male	0.135*	0.075	0.071	-0.024	0.078	0.763	-0.234	0.233	0.314
Father's educational level	-0.004	0.011	0.743	-0.026**	0.011	0.020	0.062*	0.034	0.069
Province: Flemish Brabant	0.026	0.105	0.804	0.039	0.110	0.719	0.749**	0.317	0.018
Province: West-Flanders	0.073	0.112	0.512	-0.109	0.120	0.364	-1.162**	0.459	0.011
Province: East-Flanders	0.082	0.098	0.400	-0.096	0.101	0.345	0.813***	0.300	0.007
Province: Limburg	-0.109	0.117	0.354	-0.117	0.126	0.353	-0.361	0.388	0.353
Degree of urbanisation: high	-0.088	0.141	0.531	0.001	0.138	0.995	-0.332	0.465	0.475
Degree of urbanisation: middle-high	-0.083	0.108	0.445	-0.043	0.112	0.700	0.022	0.336	0.949
Degree of urbanisation: low	0.023	0.081	0.781	0.008	0.088	0.930	0.175	0.250	0.485
School orientation at age of 16: General secondary education	0.197**	0.088	0.025	-0.383***	0.093	0.000	0.259	0.239	0.279
School orientation at age of 16: Arts secondary education	-0.339	0.423	0.424	-0.250	0.307	0.415	-2.015	1.775	0.256
School orientation at age of 16: Vocational secondary education	0.162	0.358	0.650	0.326	0.354	0.357	-0.824	1.414	0.560
Higher education: Master	-1.939***	0.164	0.000	0.096	0.175	0.583	-22.047***	4.356	0.000
Higher education: With (great/highest) honours	0.497***	0.071	0.000	0.166**	0.073	0.023	0.601***	0.213	0.005

Subject higher education: Linguistics, history and philosophy	0.350 *	0.188	0.063	-0.376 **	0.163	0.021	-5.379 *	2.741	0.050
Subject higher education: Behavioural sciences	-0.006	0.122	0.960	-0.614 ***	0.126	0.000	11.539 ***	2.713	0.000
Subject higher education: Health and (para)medicine	1.661 ***	0.132	0.000	0.491 ***	0.144	0.001	16.466 ***	2.894	0.000
Subject higher education: Natural sciences and engineering	0.140	0.097	0.149	-0.430 ***	0.101	0.000	0.741 ***	0.264	0.005
Subject higher education: Arts	-1.507 ***	0.466	0.001	-0.285	0.207	0.169	-1.415	2.812	0.615
Subject higher education: Education	0.509 ***	0.120	0.000	-1.499 ***	0.143	0.000	4.967 ***	1.273	0.000
Higher education: minimal duration of study	0.667 ***	0.100	0.000	-0.277 **	0.117	0.018	7.951 ***	1.911	0.000
Student work	0.014	0.107	0.893	0.194 *	0.111	0.081	-0.146	0.324	0.653
Leaving school in June	-1.886 ***	0.090	0.000	-1.674 ***	0.093	0.000	0.031	0.215	0.885
Workplace learning program	-0.043	0.091	0.637	-0.042	0.086	0.626			
Relative supply of workplace learning programs							11.872 ***	3.926	0.002
Unemployment rate	-0.023 **	0.010	0.019	0.011	0.011	0.315	-0.039	0.033	0.245
Duration dependence									
t = [1,2]									
t = [3,4]	1.491 ***	0.088	0.000	1.086 ***	0.093	0.000			
t = [5,9]	2.058 ***	0.159	0.000	1.835 ***	0.159	0.000			
t > 10	1.905 ***	0.202	0.000	2.499 ***	0.262	0.000			
Unobserved heterogeneity: estimates									
v2	-2.064 ***	0.148	0.000	-1.529 ***	0.158	0.000	20		
v3	-5.220 ***	0.840	0.000	-6.322 ***	1.218	0.000	-20		
v4	3.772 ***	0.224	0.000	6.043 ***	1.277	0.000	-20		
v5	-20			-20			50		
v6	-20			-4.939 ***	1.657	0.003	50		
v7	-4.285 ***	0.319	0.000	-3.685 ***	0.298	0.000	-3.551	2.313	0.125
q2				-1.199 ***	0.077	0.000			
q3				-3.554 ***	0.531	0.000			
q4				-2.880 ***	0.204	0.000			

q5	-6.133***	1.503	0.000
q6	-4.395***	0.828	0.000
q7	-2.200***	0.172	0.000
Unobserved heterogeneity: resulting probabilities			
p1	0.662		
p2	0.199		
p3	0.019		
p4	0.037		
p5	0.001		
p6	0.008		
p7	0.073		
Log-likelihood	-11877.066		
Akaike Information Criterion	23982.132		
Hannan-Quinn Information Criterion	25617.063		
Bayesian Information Criterion	24685.598		
Parameters	114		
N	3536		

Notes. ***(**)((*)) indicates significance at the 1%(5%)((10%)) significance level. Standard errors are in parentheses. Some heterogeneity parameters are estimated as a very large negative (positive) number causing a 0 (1) probability with respect to the related hazard rate or chance on vocational higher education for a subset of individuals. This is numerically problematic. When we face this problem, in the spirit of Gaure et al. (2007), we stick it to -20 (20), or -50 (50) if needed, and keep it out of further estimation.