Skill Matters: Curriculum updates and Labor Market Outcomes

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## ABSTRACT

Trends like digitalization and the energy transition are major drivers of changes in the skill demands in the labor market. Ideally, education institutions should anticipate the labor market requirements for skills and provide students with appropriate skill sets. Vocational Education Training (VET) plays a crucial role in training students for practical roles and preparing them for these changes. This study targets Dutch middle-skilled VET graduates and investigates the labor market consequences of curriculum updates. From text descriptions of the curricula, we construct a measurement for the skills and identify the emerging patterns of skill supply in the Netherlands, differentiated by education programs. Adopting Staggered Difference in Difference and combining the skill indices with graduates' survey and administrative microdata, we find that the updates mitigate the self-reported skill mismatches and positively correlate with the probability of employment and self-reported wages. This research sheds light on the contents and frequency of the curriculum updates in the Netherlands.

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Skills2Capabilities, a Horizon Europe study, is about understanding how skills systems need to develop if they are to assist people to make labour market transitions – i.e. between jobs, employers or sectors – and thereby reduce the level of skill mismatch which might otherwise arise.

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## Introduction

Labor markets have been changing dramatically in recent years, driven by technological advancements and global policy shifts. For example, the digitalization of industries and the energy transition are key priorities for the European Union (EU) (European Commission, 2020). These shifts are reshaping economies, with an increasing demand for specific skills. In the transition toward sustainable economies, engineering skills for developing green technology and managerial skills for implementing environmental organizational practices are increasingly being demanded in the labor market (Vona et al., 2018). In response to the implementation of digital innovations, the demand for digital skills, such as the ability to use digital devices, communication applications, big data analytics, and networks to access and manage information, is increasing (Shakina et al., 2021). At the same time, the growing complexity of work means that Social, Emotional, and Behavioral (SEB) skills are becoming just as important. These include teamwork, cooperation, innovation, and social engagement (Weinberger, 2014; Deming, 2017; Soto et al., 2024). Furthermore, external shocks such as the COVID-19 pandemic and the Ukraine war have increased labor market mobility (Casarico and Lattanzio, 2022; Caselli et al., 2022; Borjas and Monras, 2017), further emphasizing the growing need for robust communication and collaboration skills (Budr ´ıa and Martínez-de Ibarreta, 2021; Hall and Farkas, 2008), as well as the appropriate upskilling and reskilling (Kahn, 2004; Borjas, 2005). In this context, characterizing labor market dynamics is essential for understanding their implications for both the macroeconomic environment and individual career development.

The changes in skill demand call for corresponding adjustments in the supply of skills. Ideally, education programs should respond to changing skill demands by updating their curricula to better prepare students for the labor market (Oliver et al., 2019). However, education institutions may not always respond swiftly, as adapting curricula takes time, and today's job market require- ments may not necessarily reflect future needs (Desha et al., 2009). If the supply fails to meet the demand, this could result in skill mismatches. For example, skill-biased technological change, where technological advancements favor high-skilled workers over middle-skilled ones, has led to job polarization. This means that middle-skilled workers are replaced by new technologies (Autor et al., 2003), leading to growth in high- and low-skilled jobs while middle-skilled employment declines (Goos and Manning, 2007; Autor and Dorn, 2013; Autor, 2015). While evidence of job polarization and skill mismatches in the Netherlands has been assessed by previous research (Terzidis and Ortega-Argilés, 2021; Cabus and Somers, 2018), we focus on the current situation for VET graduates who are generally trained for one specific occupation. In their case, not being trained in skills that are in demand is likely to result in a mismatch in the labor market.

This study addresses the pressing need to study changes in skill demands and supplies in the labor market, particularly to prepare middle-skilled VET graduates who have experienced deteriorating labor market outcomes over the past decades. This group of graduates represents the largest share of the working population (Statistics Netherlands, 2022). This project aims to investigate whether updates in VET curricula affect individual labor market outcomes and whether these effects take place through the channel of reduced skill mismatches. By matching VET curricula skill content to administrative data, we also examine the long-term effects of the skills learned at school on labor market outcomes.

The analysis entails multiple data sources, including curricula data, graduate surveys, and administrative microdata. Extracting and structuring publicly available text descriptions from the nationally standardized Dutch VET curricula provided by the Samenwerkingsorganisatie Beroepsonderwijs Bedrijfsleven (SBB), we constructed a novel panel data set that records the contents of skills in VET education from 2012 to 2023. This data set contains information on how each VET education program has adapted to changing skill demands in the labor market. This standardization ensures that there is no location variance in the teaching agenda and that the students should receive uniform skill training in this system. By linking this program-level skill informa- tion with individual-level data from the Dutch School Leavers Survey for VET graduates (BVE-Monitor/Schoolverlatersonderzoek (SVO)) and administrative microdata from Statistics Netherlands (CBS), we can examine the impact of curriculum updates on various labor market outcomes for VET graduates in the Netherlands. Identifying the causal effect of curriculum updates on students' labor market outcomes is challenging, as it requires isolating exogenous variation of education reforms from other endogenous and potentially correlated factors, such as capabilities, and the advancement of technology and industries. We use the staggered Difference in Difference to identify if the curricula updates have a causal effect on labor market outcomes, such as further education, employment, self-reported skill mismatch, self-reported wages, and turnovers. The school leavers survey records short-term labor market outcomes after 1.5 years from graduation, while we can observe the whole career path in the administrative data.

We identified the emerging patterns of the skill supply in the Netherlands. Furthermore, we showed that the curriculum updates have positive effects on the probability of being employed, longer working hours, and higher monthly wage and hourly wage. More precisely, as compared to acquiring basic skills, acquiring social skills, technical skills, complex problem solving skills, systems skills, and resource management skills all has positive effects on longer working hours. Learning systems skills and technical skills yield higher return in terms of monthly wage. Additionally, male benefits more in terms of monthly wage, driven by longer working hours, while female would have higher hourly wage if she acquires more social skills and resource management skills. We further analyzed the heterogeneous results of study tracks: school based track has higher effects on longer working hours while work based track has higher effects on hourly wage.

This study provides the first empirical evidence of how VET institutions in the Netherlands, that train half of the Dutch student population, respond to changing skill demands. Previous research shows that reforms in educational programs can lead to better labor market outcomes such as being more likely to be employed, longer hours worked, and higher wages (Bravo et al., 2010; Alzúa et al., 2015). Reforms in higher education have also been shown to help narrow the gap between the demand and supply of high-skilled labor and reduce earnings inequality (Bravo et al., 2010; Boccanfuso et al., 2015). Despite these findings, much less attention has been paid to how vocational training reforms affect labor market outcomes. Bühler et al. (2023) find that updates in Swiss VET curricula can lead to an increase in graduates' wages, especially when old skills are replaced with new skills. Böckerman et al. (2009) find that transforming former vocational colleges into polytechnics positively affected earnings and employment. However, there is still a lack of evidence about how changes within the vocational training system affect labor market outcomes and its mechanisms. As such, this study contributes to the growing body of literature by exploring how VET institutions adapt to changing skill demands and how curriculum updates impact the labor market success of graduates.

Additionally, this paper contributes to the emerging body of economic studies that use text data. Labor economists are increasingly applying natural language processing to analyze large vol- umes of unstructured text data, such as job ads and resumes, to quantify skill demand (Banfi and Villena-Roldan, 2019; Kuhn and Shen, 2023; Kessler et al., 2019). Surprisingly, few studies have focused on quantifying the supply of skills from curriculum descriptions. This project advances the literature by extracting skill supply information from VET curriculum descriptions. This is novel as only a few working papers are challenging the measurement of skill supply, namely, Lipowski et al. (2024); Langer and Wiederhold (2023) for Germany, and Bühler et al. (2023) for Switzerland. Cnossen et al. (2023) document the returns to skills developed in Dutch VET. The present study extends that work by constructing a panel dataset of skills across study programs and years, enabling the identification of causal relationships between curriculum updates and labor market outcomes. By incorporating the education and long-term employment records from CBS administrative microdata, we can identify the enrolment of VET education programs and analyze the evolution of labor market outcomes over time.

As a policy evaluation research, this project sheds light on the appropriate frequency and di- rection for curriculum updates. This investigation is of great importance for institutes that are responsible for VET education in the Netherlands, namely SBB. Additionally, the evidence can serve as a reference to other countries where VET plays an important role, such as Germany and Switzerland. Most importantly, the patterns and evidence described in the project are also of interest to VET students, parents, and schools. Study and occupational choices are two high-stakes lifetime choices. Students must be fully informed about what follows in their studies and their potential labor outcomes later in the job market.

The remainder of this paper is structured as follows: section 2 describes the institutional background of the Dutch VET system; section 3 explains how we construct our skill measures from the curricula; section 4 introduce the data sets and the empirical methods; section 5 reports the main results which includes the return to the program reform and its short-term and long-term effects, heterogeneous analysis, and robustness check. Section 6 provides a short discussion and section 7 concludes.

## Institutional setting

### Dutch education system

In this section, we discuss the features of the Dutch education system. As illustrated in Figure 1, in the Netherlands, children usually start compulsory education at age 4 and stay in primary school for 8 years. Children will take the Cito test at the end of primary education and receive advice on which secondary education track they should choose. [1] Followed by lower secondary education, students may choose to continue their upper secondary vocational education (MBO) or tertiary education (University of Applied Science (HBO) and Research University (WO)). After this phase of education, most students would enter the job market.

Our study focuses on the curricula for MBO and the labor market outcomes of MBO graduates. MBO graduates account for a large proportion of the Dutch labor market. According to CBS, young people under 25 are more likely to choose MBO over HBO and WO. During the 2021/22 academic year, 40% of young people participating in further education were enrolled in MBO, while the proportions for HBO and WO were 35 and 25% respectively (Statistics Netherlands, 2022). The majority of HBO students are students who have progressed from the VMBO track. In the 2020/21 academic year, 88.1% of students with a VMBO diploma progressed to MBO, while the numbers for HAVO and VWO diploma holders who went for MBO education are 3.3% and 0.1% respectively (Statistics Netherlands, 2022). With these statistics, we conclude that the entry barrier to the Dutch VET system is not high, and the students generally have a similar education level beforehand. Hence, labor market returns should be

[1] Cito is the standardized final primary education test held in group 8. The score ranges from 501 to 550 and the test result is the basis for the advice the school gives concerning the follow-up track in secondary education. The recommendation also depends on students' achievements throughout primary education and their motivation. There are three tracks in secondary education: the vocational track (VMBO), the lower academic track (HAVO), and the higher academic track (VWO).

less attributed to previously acquired knowledge but rather reflect the returns to skills in vocational training. A more detailed identification strategy will be discussed later.

MBO has nine occupation-specific sectors[2], which are clusters of education programs that offer courses focused on similar topics, knowledge, tasks, and skills. Each education program has a unique curriculum (in Dutch: kwalificatiedossiers) directly linked to a specific occupation. For example, under the sector “Technology”, the curriculum “Automotive Technology” contains three education programs: “Auto Technician”, “First Auto Technician”, and “Technical Specialist Passenger Cars”. These profiles are directly linked to the occupation of an auto technician. As revealed in the names of the education programs, some are more challenging than others. Related to International Standard Classification of Education (ISCED) levels 3 to 5,[3] there are 4 levels in MBO: Level 1 entails entry-level training and is usually treated as a starting point for further vocational training; level 2 is basic vocational training that lasts for 2 to 3 years; level 3 is the standard vocational training lasting for 3 to 4 years; and level 4 includes middle management training and specialist training that also lasts for 3 to 4 years. Take our “Automotive Technology” as an example: “Auto Technician” is a level 2 education program, while “Technical Specialist Passenger Cars” is level 4. After completing their studies, students can choose to either continue a higher-level program or enter the labor market. To qualify for a job in the labor market, students must obtain at least level 2. In our analysis, we focus on the cohort that enters the labor market after the highest MBO training, no matter which level they attained, and students who continue to study at university are excluded.

Additionally, MBO students can combine classroom learning with practical training and choose between the School-based Track (BOL) or the Work-based Track (BBL). The BOL involves 20% to 60% of practical training in the program, while more than 60% of the course is practical training in the BBL track. According to the Education Implementation Service (DUO), the majority of students have followed BOL over the years. In 2023, 68.74% of MBO students chose the BOL track, and over 70% of students in our study sample chose the BOL track. Both tracks in the same programs lead to the same qualifications and certificates, and thus we assume they acquired the same skills. Due to the heterogeneity of the form of training, we will perform a heterogeneous analysis.

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[2] The nine sectors include the Information and Communications Technology (ICT) and Creative Industry; Mobility, Transport, Logistics & Maritime; Specialist Craftsmanship; Technology and Construction; Food, Green, and Hospitality; Business Services and Security; Care, Welfare, and Sports; Entrance (entry-level); and Trade.

[3] 32011 ISCED integration of Dutch education: https://www.cbs.nl/nl-nl/onze-diensten/methoden/classificaties/onderwijs-en-beroepen/isced/niveau-isced-2011; Detailed information on levels of the programs: https://www.rijksoverheid.nl/onderwerpen/middelbaar-beroepsonderwijs/vraag-en-antwoord/uit-welke-mbo-opleidingen-kan-ik-kiezen.

### Curriculum (in Dutch: kwalificatiedossiers)

The standardization and unification of the curricula in the Dutch VET system have gone through several phases. In 2000, Regional Knowledge Centers (KBBs) were responsible for designing curricula, and there were no uniform files across the Netherlands. In 2012, KBBs started to make nationally standardized curricula. There are also the earliest publicly available curricula that indicate what skills should be trained. In 2015, KBBs' role was taken over by the SBB. SBB is responsible for developing and updating MBO curricula and ensuring that the knowledge and skills taught at MBO are consistent with developments in industries. Local schools should provide education and skill training to adhere to the curricula, and all the skills are tested, with quality checks by the inspectorate. We consider the curricula as unified frameworks for MBO education in the Netherlands and they have been standardized across the country since 2012.

As shown in Figure 2, Dutch VET curricula are updated through a regular, well-defined, and legally mandated updating process. All curricula should be evaluated every 5 years and updated if necessary, and 20% of the curricula are maintained annually. The timeline and process of updating files are fixed. First, SBB will draft the multi-year maintenance plan for curricula and internally identify the labor market trends and bottlenecks of educational implementation. The discussion and evaluation of the curricula involve three parties: the research team at each educational sector at SBB, representatives from schools, and representatives from branch organizations. This evaluation process ensures up-to-date updates of skills in the MBO curricula. The decision of whether the program needs to be updated is made during the evaluation in December, the contents of updates are discussed from January to September, and the proposal for the updates is sent to the ministry on October 1st. Thereby the schools are informed of the updates and they have around 9 months to incorporate the updates into their education agenda. The new cohorts that enroll in the education programs next year will be affected by the new curricula. Therefore, it takes around two and a half years from drafting the maintenance to the students actually affected by the change. The old cohorts that have already enrolled in the program can follow the previous version of training and are unaffected by the updates. Since MBO students seldom monitor the changes in curricula and choose their program based on the updates, nor does the standard of the intake change across the years, we can see these updates as quasi-random experiments.

Table 1 presents detailed information on how many programs are updated each year.[4] 4 We can see that there is no clear pattern of how many programs or which level of the programs should be updated each year. Since 2012 was the first year that KBBs provided the unified framework, the 685 programs in 2012 were all the education programs at that time. In the following years, some of the

[4] These numbers also include newly added programs. When estimating the effects of updating programs, we do not include new programs.

programs are updated accordingly. In 2015 and 2016, SBB modified the structure of all the curricula, and hence there were 704 new records in these two years. Figure 3 presents the cumulative number of updates across the years for all education programs. It is worth noticing that the majority of the programs have not been updated, and even if the programs are updated, they are usually updated once. More specifically, there are 365 programs that have been updated once, and 31 programs have been updated twice. We will take a closer look at the contents of the curricula and describe how to extract and quantify skills trained in the Dutch VET system in the next section.

## Skill measurement

All the MBO curricula in the Netherlands are publicly available on the website of SBB.[5] For the structure of the curricula, please refer to Appendix Figure A3 and Appendix Figure A4 for the information we have and the structure of the curriculum data from 2012 to 2015 and from 2015 to 2023, respectively. Although the structure of the curricula was changed in 2015, we harmonized the data frame by identifying the education program and the skills. Each education program is given a unique identifier, CREBO code, and the skills to learn are described in the Core Tasks sections.[6] Using Natural Language Processing, we retrieved the information on the skill content of curricula for all upper-secondary VET education programs in the Netherlands.

Similar to Cnossen et al. (2023), we further classified these skills according to the O*NET content model (worker requirement) into 6 categories, basic skills, social skills, technical skills, complex problem-solving skills, systems skills, and resource management skills. The skills domain and keywords are presented in Appendix Table B1.[7] The classification was done by cross-checking the English translation of the skill descriptions in the curricula and the description of the content model in O*Net. Distinct from Cnossen et al. (2023), we make use of pre-determined skill cate- gories provided in the curricula data. There are 25 different kinds of skills classified by SBB. We intend to map them into six O*Net categories. The exact mapping is presented in Appendix Table B2. Notice that these are exhaustive classifications, meaning each SBB skill is classified into one of the six O*Net taxonomy, and all the SBB skills in the curricula data are classified.

After classifying skills in the curricula, we then construct a numerical index to measure the intensity of skills in the programs. Since there are no required teaching hours indicated in the curricula either at the program or the skill level, we treat teaching hours as fixed within the same level of the

[5] After data preprocessing, there are 11 education programs that do not contain any information on skills and are hence excluded from our analysis.

[6] In 2012, education programs with CREBO codes 95060 and 95070 duplicates twice, 95520 and 95530 duplicates four times, while they have different names. They are considered the same programs since they have the same identifier (CREBO code).

[7] Data Retrieved from National Center for O*NET Development: https://www.onetonline.org/.

education programs. This means that we assume within the same level, the difficulty of the program is the same, hence skill vectors are comparable within the level. Since we don't have absolute measurements for the complexity or difficulty, we construct the relative importance of skills within each education program. Hereby we define the skill vector for program i {skill_1, skill_2, ... skill_j}, where J denotes the total number of skills. Then we measure how important these skills are (how many times they are mentioned in the curricula):

$$Skill_{ij} = \frac{N_{Skills_{ij}}}{N_{TotalSkills_i}},$$

where $Skill_{ij}$ denotes the intensity of skill j in program i; $NSkills_j$ denotes the total number of that specific skill within this program; $NTotalSkills_i$ denotes the total number of skills within program i.

Figure 4 shows the frequency of skills in 2012. As we can see, the most mentioned skill is "apply expertise", followed by " following instructions and procedures", "collaborate and consult", and "deploy material and resources", showing emphasis on both technical skills and social skills. The average frequency of skills in 2012 by sector can be seen in Appendix C. We can observe in the figures that social skills such as "collaborate and consult" ranked higher in social-oriented sectors such as care and welfare, commerce, hospitality, and business services; while technical skills such as "deploying materials and resources" ranked higher in technical-oriental sectors such as technology and construction, ICT, and craftsmanship.

Table 2 and Table 3 show the descriptive statistics for MBO education programs and the pairwise correlation coefficients between skills, respectively. Out of the population of 8,304 education programs, 8,224 programs have the information of skill contents. On average, technical skills, social skills, and basic skills are the most mentioned skills among the programs. Additionally, notice that not all the skills are mentioned for each education program, and the minimum value for skill indices is 0. Since the skill indices are the relative importance of skills, there are trade- offs between skills by construction. We can see in the correlation table that complex problem solving skills, social skills, and systems skills are all negatively correlated with technical skills, presenting a clear trade-off pattern in vocational training. If we look at the evolution of social skills and technical skills across years in Figure 5,[8] we can see that there are trends of less social skill-intensive programs and slightly more technical skill-incentive programs. The trends reflect the changes in the number of social and technical skills, and we may conclude that there are no dramatic changes from 2012 to 2023. Figure 6 shows the changes in social and technical skills at the program level. The figure illustrates the evolution of education programs that have at least gone through two updates from 2012 to 2015. We can see that for some of the programs, the updates go in the same direction. Take the program at the

[8] If the relative importance of the social skills in one program is higher than median of the relative importance of the social skills among all the programs, this education program is classified as the social skill-intensive program. The identification of technical skill-intensive program is conducted in a similar way.

top left for example. This is a technical skill-intensive program, and the number of social skills is growing over the years. While for some of the programs, the increase in social skills can be changed back in the following years.

The validity of the index is proved by the skill patterns by sectors. As we can see in Figure 7, programs that are in more social skill-intensive sectors (care and welfare, commerce, hospitality, and business service) are clustered to the left at the top, showing less importance in technical skills and more importance in social skills; while more technical sectors (technology and construction, and craftsmanship) are clustered to the right at the bottom, showing more importance in technical skills and less importance in social skills.

## Data and methodology

### School leaver survey

The school leaver survey provides us with both objective and subject labor market outcomes after 1.5 years from graduation at the individual level. In addition to employment status and wages that can be observed in the administrative microdata, the school leaver survey complements the story by providing a self-reported skill mismatch measurement. We also retrieved demographic information like age, gender, and race. By linking the unique program identifiers (CREBO code) recorded in the survey and the starting date of their studies in the CBS MBO registry, we are able to identify each graduate in the school leaver survey to the education program they followed and the skills they obtained. Graduates who continue with education on the academic track are excluded from our study sample. Our sample is restricted to graduates who directly entered the labor market after MBO studies. Since the curriculum data dates from 2012 to 2023, we constrain the timeframe in the school leaver survey to 2013 to 2022 (responses in 2022 are the latest data we can get). The final sample consists of 147,473 MBO graduates, with 85,915 employed graduates.

### Empirical strategy

Using the exogenous variation of curriculum updates, we use the instrumental variable approach and staggered difference in difference to (1) identify the causal effects of curriculum updates on labor market outcomes; and (2) investigate the return to skills.

*Using curriculum updates as exogenous shocks*

By exploiting the curriculum updates implemented by SBB, we treat it as an external shock or- thogonal to the ability of the students. We compare the students who went through the cur- riculum updates with the ones who followed the former curriculum. If the students finish the program before the curriculum updates, then these students are not exposed to the changes; if the curriculum updates happened in the middle of the schooling years and the students have enrolled in the program, then they are requested to follow the former curriculum and also not exposed to the changes; if the curriculum updates happened before the student's entrance year, then they are identified by full exposure to the changes. The specification can be seen in Equation 1.

$$Exposure_i = \begin{cases} 1 & \text{if student } i \text{ followed an updated program} \\ 0 & \text{otherwise} \end{cases} \quad (1)$$

More specifically, we estimate the following equation to investigate the effect of curriculum updates on various labor market outcomes:

$$Y_{ijt} = \alpha + \beta \cdot Exposure_i + \boldsymbol{\gamma} \cdot \boldsymbol{X}_{it} + \boldsymbol{\xi} \cdot \boldsymbol{R}_j + \tau_t + \varepsilon_{ijt}, \quad (2)$$

where $Y_{it}$ are the outcomes of interest for an individual i measured in year t. The outcomes include employment status, self-reported skill mismatch, working hours, monthly wage, and hourly wage. $Exporsure_i$ corresponds to whether this individual followed an updated program. $X_i$ is the sector for individual characteristics such as age, gender, and race. $R_j$ is the vector or education program characteristics such as level, work-based or school-based indicator, and MBO domain. $\tau_t$ is the year fixed effects. $\varepsilon_{ijt}$ is the corresponding error term.

One identification threat is the self-selection problem. However, students normally do not self-select into one education program by checking whether this program will have a new curriculum next year. For example, students who want to become hairdressers wouldn't change their minds about becoming engineers by expecting or observing the curriculum updates. Additionally, the changes in curricula are not evident on the school's website, and hence the students probably wouldn't know there will be an update for some programs. The same argument also applies to distinguish whether it is the signaling effect or the curriculum updating effect. Since there is no change in the program names and the curriculum updates are also unobserved for employers, we would argue that we capture the effects of curriculum updates. Another concern could be that the updates could focus on poor programs that had been underperforming. If this is the case, the information should be captured by our skill indices, and these effects are exactly what we intend to identify.

More importantly, we further identify the effects of additional skills learned through curriculum updates. We assume that individuals should acquire the skills listed in the curricula, and if there are changes in curricula, the graduates also update their skills as requested, regardless of the school's quality of teaching these skills.[9] Hence, we have objective skill measurements at the individual level, and the variations are across individuals. Then the skill premiums gained from curriculum updates are identified to estimate the return to skills. Hereby, we adopt the two-stage

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[9] The teaching quality of MBO schools are uniform in the Netherlands.

least square estimations, whereas the first stage corresponds to the skill premiums gained from the updates, and the second stage estimates the returns to the skill premiums. The labor market outcomes are the same as before. The equations are as follows:

$$\boldsymbol{Skills}_{it} = \eta + \iota \cdot Exposure_i + \boldsymbol{\kappa} \cdot \boldsymbol{X}_{it} + \boldsymbol{\Lambda} \cdot \boldsymbol{R}_j + \tau_t + \epsilon_{ijt}, \qquad (3)$$

$$Y_{it} = \alpha + \beta \cdot \boldsymbol{Skills}_{it} + \boldsymbol{\gamma} \cdot \boldsymbol{X}_{it} + \boldsymbol{\xi} \cdot \boldsymbol{R}_j + \tau_t + \upsilon_{ijt}, \qquad (4)$$

where the specifications are the same as in Equation 1, and $\text{Skills}_{it}$ is the vector of skill premiums gained from curriculum updates for individuals i at time t.

## Results

### Descriptive evidence

The descriptive statistics are presented in Table 4. The mean of program level is above 3, indicating that the majority of the graduates followed a higher level of MBO programs. Even though the oldest student is aged 67 while the youngest is aged 16, the mean age is around 24, indicating that the majority of graduates followed the age ladder in Figure 1, and our results would not be driven by extreme values. The gender ratio is roughly balanced in our sample, and the majority of students are Dutch. As for labor market outcomes, 98% of the graduates are employed, while 21% of the graduates report that they experienced skill mismatch in their employment. The working hours ranged from 0 to 60 with a mean of 29, indicating some graduates are taking part-time jobs and some graduates even have a second job. The monthly wage and hourly wage present heterogeneities, and we have trimmed 5% of extreme values in the sample. With regard to the skill indices, basic skills, social skills, and technical skills are the most important skills among all the programs, with their means all above 0.20. It is worth noticing that complex problem-solving skills consist of a small portion of the skill population. The results of the reduced form of estimations are presented in Table 5.

### Effects of updates

As seen in Table 6: individuals who followed an updated program are statistically significantly more likely to be employed, have longer working hours, a higher monthly wage, and a higher hourly wage. The curriculum updates on average have no effect on self-reported skill mismatches.

As seen in Table 7: the skill premiums (take the basic skills as the reference skills) gained from curriculum updates do not have statistically significant effects on employment. Individuals with more resource management skills as compared to the basic skills are less likely to report skill mismatch. Although there are no significant effects on an hourly wage, learning more complex skills as compared to basic skills will significantly increase the working hours, yielding a higher monthly wage. Among all the skills, systems skills and technical skills give higher returns.

### Heterogeneous Analysis

*Who benefits more?*

As we can see in Table 8, as compared to the basic skills, acquiring more complex problem solving skills would increase males' probability of being employed; while acquiring more resource management skills would be beneficial to female to be employed. It it worth noticing that if male gains more social skills and female gains more technical skills, they are more likely to report skill mismatches, indicating potential gender sorting into occupations. Additionally, acquiring any kind of skills has positive effects on working hours and monthly wage. Male benefits more from additional technical skills and social skills, while female benefits more from additional systems skills and resource management skills. The higher monthly wage effects for males are driven by longer working hours. If we look at hourly wage, then female benefits more from learning social skills.

*Where is the best place to learn?*

Based on Table 9, different tracks present heterogeneous results. It is better to learn social skills and resource management skills at school; technical skills and complex problem-solving skills, and systems skills at work. These results are hard to interpret, we should consider only including school-based track graduates in the main analysis. The table might be removed at a later stage.

## Conclusion

In this paper, we use the text data from MBO curricula in the Netherlands. Leveraging this panel data across 11 years, we identified the patterns of curriculum updates and the skill up- dates recorded in the curricula. By comparing the students exposed to the updates with those who did not, we found positive effects in probability of being employed and wages for those fol- lowed the updated programs. We further identify the return to skills by looking at the margin, and we found heterogeneous effects for different skills, gender, and school track.

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Figure 1: Overview of the Dutch education system

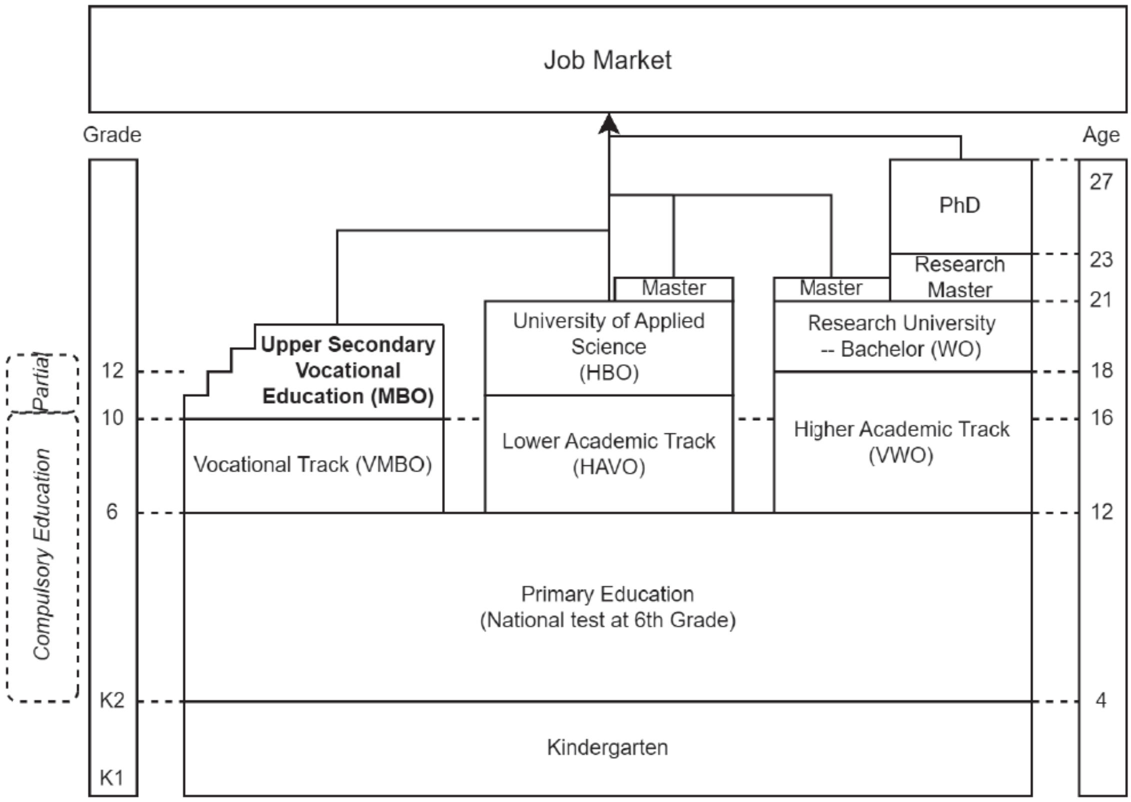



Figure 2: Overview of the curricula (qualification files) evaluated and updated process

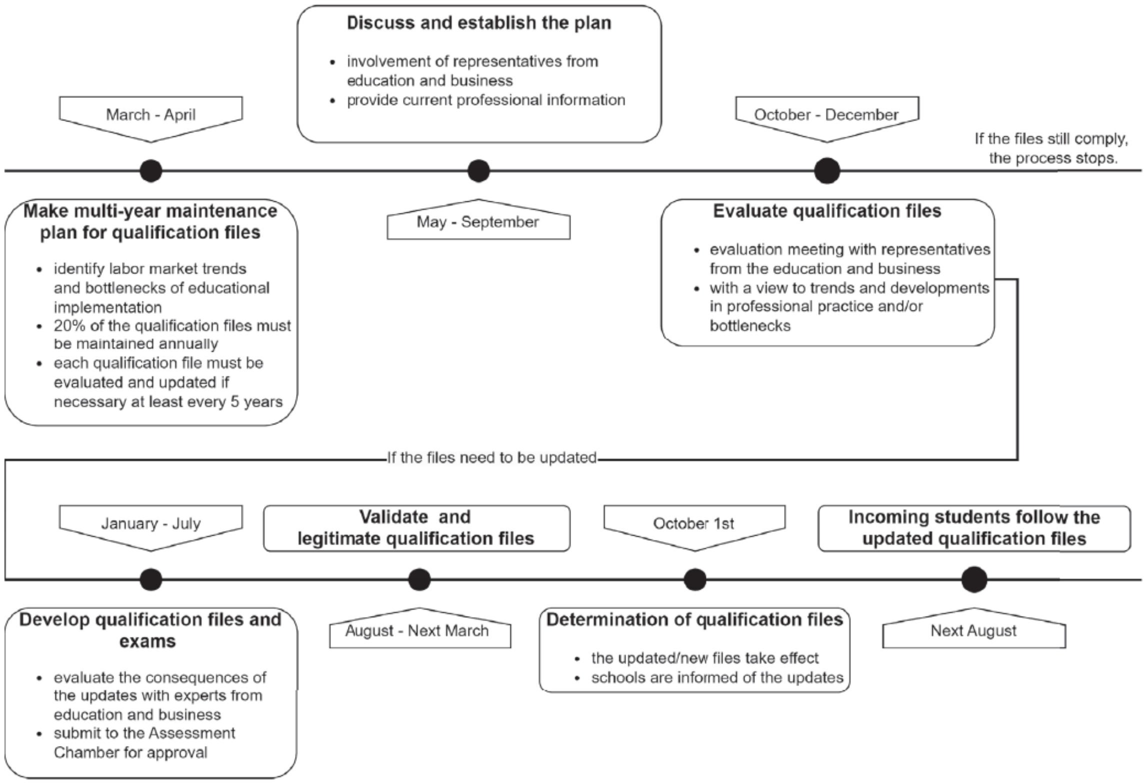


Figure 3: Cumulative number of updates across the years

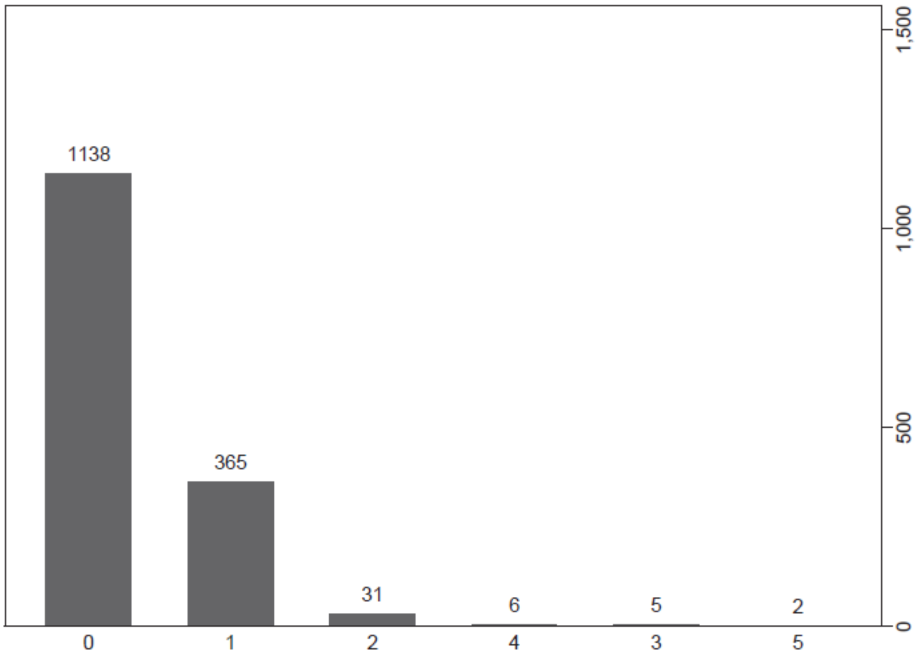



Figure 4: Frequency of skills in the base year, 2012

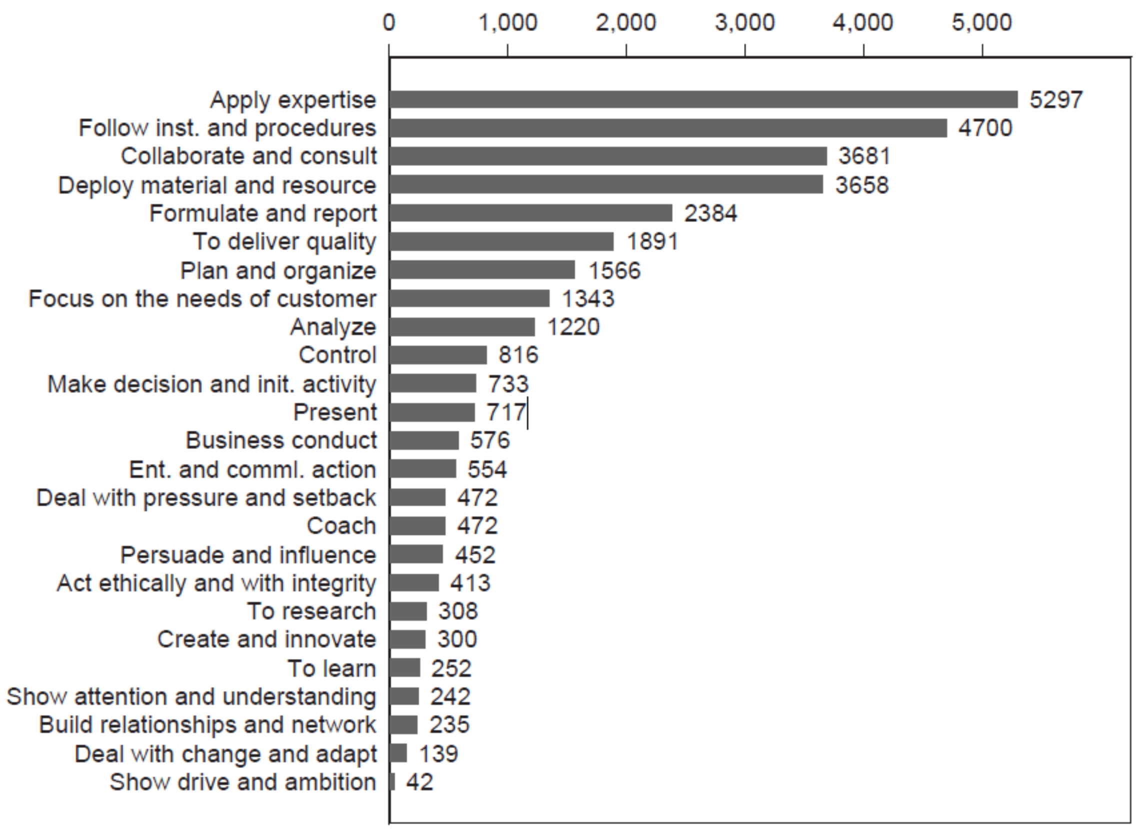


Figure 5: Share of the programs that are social (technical) skill intensive

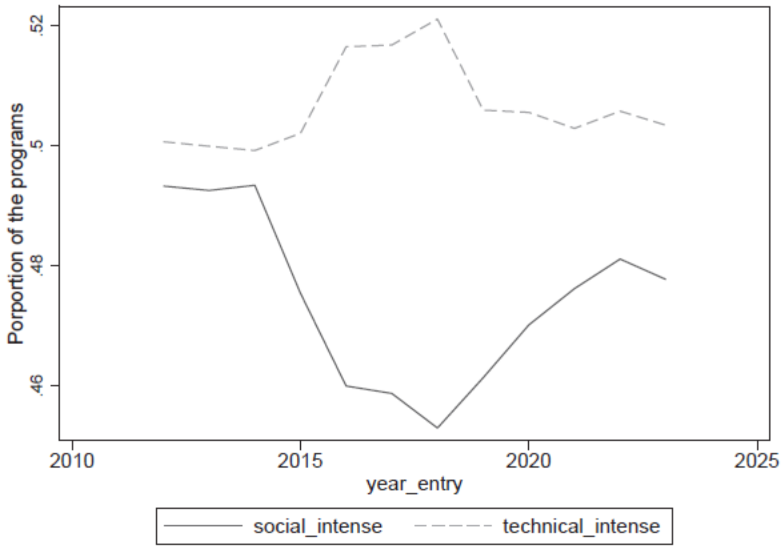
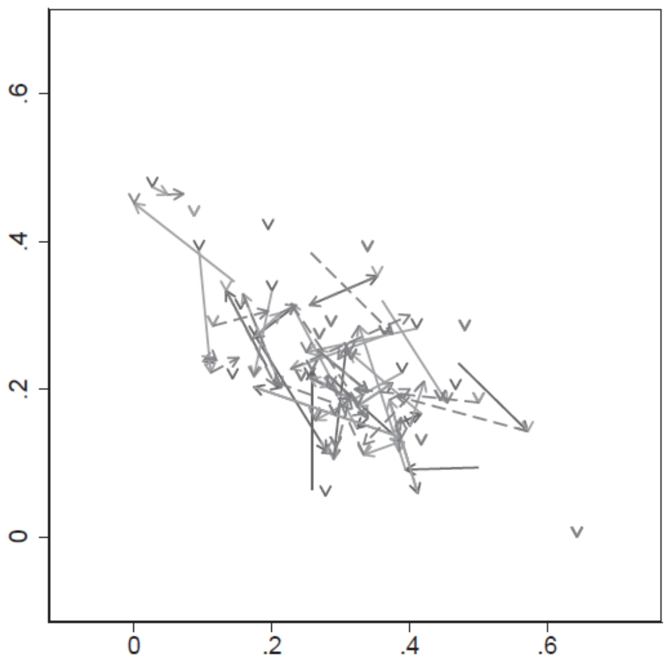



Figure 6: The evolution of social skills versus technical skill, 2012-2015




*Notes:* The x-axis is the relative frequency of social skills, while the y-axis is the relative frequency of technical skills. The time frame is from 2012 to 2015. Dark solid lines indicate the updates from 2012 to 2013; grey solid lines indicate the updates from 2013 to 2014; and dashes indicate the updates from 2014 to 2015.

Figure 7: Skill patterns by occupation-specific sectors

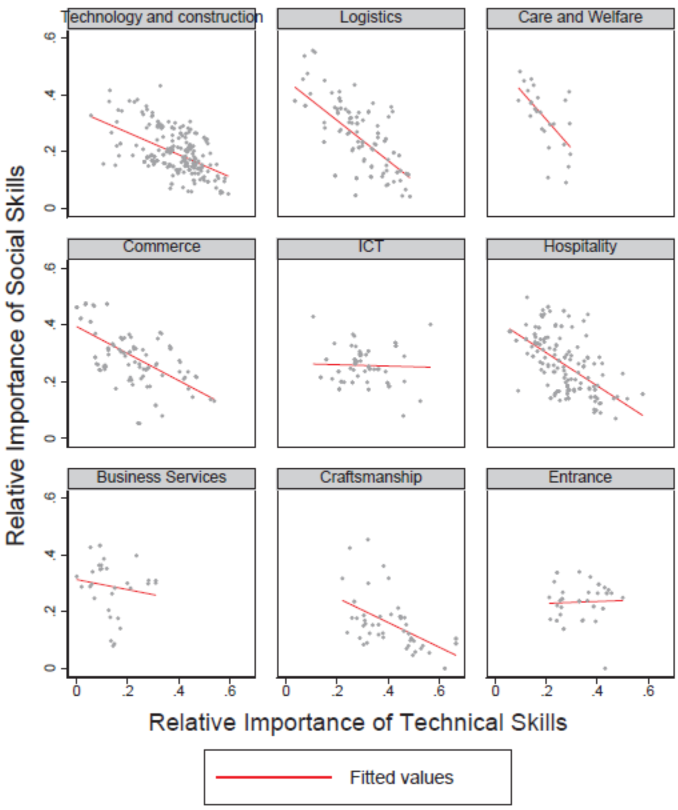


Table 1: MBO education program updated records

| Year | Programs | Level 1 | Level 2 | Level 3 | Level 4 |
|---|---|---|---|---|---|
| Panel A: time period 2012-2015 | | | | | |
| 2012 | 685 (all) | 29 | 167 | 221 | 268 |
| 2013 | 43 | 0 | 5 | 14 | 24 |
| 2014 | 25 | 12 | 3 | 5 | 5 |
| 2015 | 73 | 0 | 20 | 27 | 26 |
| Panel B: time period 2015-2023 | | | | | |
| 2015 | 478 (all) | 12 | 125 | 156 | 185 |
| 2016 | 226 (cont.) | 12 | 51 | 76 | 87 |
| 2017 | 50 | 0 | 17 | 20 | 13 |
| 2018 | 29 | 0 | 7 | 10 | 12 |
| 2019 | 50 | 0 | 16 | 19 | 15 |
| 2020 | 56 | 9 | 9 | 17 | 21 |
| 2021 | 53 | 0 | 12 | 18 | 23 |
| 2022 | 105 | 9 | 27 | 35 | 34 |
| 2023 | 87 | 0 | 14 | 31 | 42 |

*Notes:* SBB re-structured the qualification files in 2015, and the restructuring was finished in 2016. The updated records in this table also include new programs.

Table 2: MBO education program descriptive statistics

| Variable | Obs | Mean | Std.dev. | Min | Max |
|---|---|---|---|---|---|
| Program effective year | 8,304 | 2014.67 | 2.53 | 2012 | 2023 |
| Program updates | 8,304 | 0.09 | 0.29 | 0 | 1 |
| Program level | 8,304 | 3.08 | 0.88 | 1 | 4 |
| Basic skills | 8,224 | 0.19 | 0.09 | 0 | 0.625 |
| Complex problem-solving skills | 8,224 | 0.03 | 0.06 | 0 | 0.444 |
| Resource management skills | 8,224 | 0.11 | 0.07 | 0 | 0.388 |
| Social skills | 8,224 | 0.24 | 0.11 | 0 | 0.636 |
| Systems skills | 8,224 | 0.11 | 0.09 | 0 | 0.447 |
| Technical skills | 8,224 | 0.31 | 0.15 | 0 | 0.938 |

Table 3: Pairwise correlation coefficients between skills

| Variable | Basic skills | Complex problem-solving skills | Resource management skills | Social skills | Systems skills | Technical skills |
|---|---|---|---|---|---|---|
| Basic skills | 1 | | | | | |
| Complex problem-solving skills | -0.3582 | 1 | | | | |
| Resource management skills | -0.4678 | 0.1043 | 1 | | | |
| Social skills | -0.2197 | 0.1126 | -0.1543 | 1 | | |
| Systems skills | -0.3434 | 0.2219 | 0.0760 | 0.1466 | 1 | |
| Technical skills | 0.1110 | -0.4413 | -0.1769 | -0.6348 | -0.6008 | 1 |

Table 4: School leaver survey descriptive statistics

| Variable | Obs | Mean | Std.dev. | Min | Max |
|---|---|---|---|---|---|
| Program level | 147,473 | 3.06 | 0.96 | 1 | 4 |
| Graduation year | 147,473 | 2017.09 | 1.54 | 2013 | 2019 |
| Age | 147,456 | 24.16 | 8.23 | 16 | 67 |
| Gender | 147,473 | 0.54 | 0.50 | 0 | 1 |
| Race | 147,473 | 0.04 | 0.19 | 0 | 1 |
| Employment | 85,915 | 0.98 | 0.14 | 0 | 1 |
| Skill mismatch | 85,915 | 0.21 | 0.41 | 0 | 1 |
| Working hours | 98,019 | 29.33 | 11.24 | 0 | 60 |
| Monthly wage | 107,368 | 1620.31 | 904.91 | 236.11 | 3327.88 |
| Hourly wage | 81,040 | 14.39 | 5.93 | 4.81 | 26.83 |
| Basic skills | 147,452 | 0.21 | 0.10 | 0 | 0.63 |
| Social skills | 147,452 | 0.27 | 0.10 | 0 | 0.64 |
| Technical skills | 147,452 | 0.23 | 0.11 | 0 | 0.91 |
| Complex problem-solving skills | 147,452 | 0.04 | 0.05 | 0 | 0.44 |
| Systems skills | 147,452 | 0.13 | 0.09 | 0 | 0.43 |
| Resource management skills | 147,452 | 0.10 | 0.07 | 0 | 0.39 |

Table 5: Correlation between skills and labor market outcomes

| | Employment | Skill Mismatch | Working Hours | Monthly Wage | Hourly Wage |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Social Skills | 0.030*** | 0.052** | 4.505*** | 627.323*** | 2.663*** |
| | (0.0082) | (0.0256) | (0.5021) | (42.3952) | (0.2925) |
| Technical Skills | 0.010 | 0.058* | 9.402*** | 713.515*** | 1.415*** |
| | (0.0095) | (0.0297) | (0.5817) | (49.0347) | (0.3389) |
| Complex Problem Solving Skills | -0.037*** | 0.463*** | -5.821*** | -1447.337*** | -7.441*** |
| | (0.0127) | (0.0394) | (0.7713) | (65.1657) | (0.4497) |
| Systems Skills | 0.031*** | 0.083*** | 8.474*** | 1291.421*** | 6.560*** |
| | (0.0094) | (0.0293) | (0.5732) | (48.2563) | (0.3334) |
| Resource Management Skills | -0.031*** | 0.160*** | 2.006*** | -286.626*** | -3.527*** |
| | (0.0090) | (0.0280) | (0.5478) | (46.280) | (0.3191) |
| Covariates Controlled | YES | YES | YES | YES | YES |
| Level FE | YES | YES | YES | YES | YES |
| School track FE | YES | YES | YES | YES | YES |
| Graduation Year FE | YES | YES | YES | YES | YES |
| MBO Domein FE | YES | YES | YES | YES | YES |
| N | 84,953 | 83,354 | 82,843 | 72,162 | 72,138 |

*Notes:* Age, gender, and race are controlled. The estimation sample only includes those who are employed for columns (2) - (5).

Table 6: Effects of curriculum updates on labor market outcomes

| | Employed | Skill Mismatch | Working Hours | Monthly Wage | Hourly Wage |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Updates | 0.006*** | -0.009 | 0.307** | 46.798*** | 0.274*** |
| | (0.0020) | (0.0062) | (0.1216) | (10.3133) | (0.0708) |
| Covariates Controlled | YES | YES | YES | YES | YES |
| Level FE | YES | YES | YES | YES | YES |
| School track FE | YES | YES | YES | YES | YES |
| Graduation Year FE | YES | YES | YES | YES | YES |
| MBO Domein FE | YES | YES | YES | YES | YES |
| N | 84,967 | 83,368 | 82,854 | 72,168 | 72,150 |

Table 7: 2SLS Estimates of skill premiums and labor market outcomes

| | Employment | Skill Mismatch | Working Hours | Monthly Wage | Hourly Wage |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| Social Skills | 0.005 | -0.066 | 14.588*** | 987.984*** | 1.665 |
| | (0.0413) | (0.1287) | (2.5651) | (222.5294) | (1.5294) |
| Technical Skills | -0.0122 | 0.156 | 21.885*** | 1739.929*** | 1.462 |
| | (0.0538) | (0.1676) | (3.3268) | (287.6272) | (1.9817) |
| Complex Problem Solving Skills | 0.009 | 0.172 | 7.080** | 205.899 | -1.736 |
| | (0.0462) | (0.1452) | (2.8963) | (254.5214) | (1.7487) |
| Systems Skills | 0.074 | 0.080 | 33.979*** | 2259.591*** | 1.660 |
| | (0.0542) | (0.1687) | (3.3374) | (282.4479) | (1.9533) |
| Resource Management Skills | -0.066 | -0.279** | 8.048*** | 301.579 | 1.424 |
| | (0.0417) | (0.1322) | (2.6441) | (221.1167) | (1.5231) |
| Covariates Controlled | YES | YES | YES | YES | YES |
| Level FE | YES | YES | YES | YES | YES |
| School track FE | YES | YES | YES | YES | YES |
| Graduation Year FE | YES | YES | YES | YES | YES |
| MBO Domein FE | YES | YES | YES | YES | YES |
| N | 84,953 | 83,354 | 82,843 | 72,162 | 72,138 |

*Notes:* Each skill is instrumented by $Updates$ and its interaction with $Updates$.

Table 8: 2SLS Estimates of skill premiums and labor market outcomes, by gender

| | Employment | Skill Mismatch | Working Hours | Monthly Wage | Hourly Wage |
|---|---|---|---|---|---|
| | (1) | (2) | (3) | (4) | (5) |
| **Social Skills:** Male | 0.069 | 0.268** | 20.504*** | 668.256*** | -3.084* |
| | (0.0434) | (0.1351) | (2.6971) | (236.4148) | (1.6054) |
| Female | -0.017 | -0.175 | 11.678*** | 821.606*** | 3.140** |
| | (0.0417) | (0.1303) | (2.5836) | (229.2731) | (1.5649) |
| **Technical Skills:** Male | -0.033 | 0.066 | 28.004*** | 1984.073*** | 2.165 |
| | (0.0517) | (0.1614) | (3.1958) | (277.7182) | (1.8982) |
| Female | 0.050 | 0.721*** | 17.142*** | 445.477 | -4.666** |
| | (0.0587) | (0.1830) | (3.6297) | (318.4678) | (2.1751) |
| **Complex Problem Solving Skills:** Male | 0.174* | 0.117 | -4.685 | 758.715 | 4.149 |
| | (0.0904) | (0.2804) | (5.6994) | (480.0688) | (3.2556) |
| Female | 0.044 | 0.324** | 5.4432* | -277.092 | -2.882 |
| | (0.0526) | (0.1655) | (3.2726) | (293.7928) | (2.0086) |
| **Systems Skills:** Male | 0.084 | 0.291 | 31.251*** | 1669.244*** | 0.837 |
| | (0.0578) | (0.1802) | (3.5697) | (309.9627) | (2.1197) |
| Female | -0.077 | 0.492** | 31.955*** | 1207.337*** | -5.138** |
| | (0.0631) | (0.1962) | (3.8856) | (326.4627) | (2.2375) |
| **Resource Management Skills:** Male | -0.096** | -0.140 | 8.456*** | 185.616 | 2.066 |
| | (0.0436) | (0.1388) | (2.773) | (236.841) | (1.6180) |
| Female | 0.135** | -0.741*** | 10.835*** | 1222.004*** | 5.236** |
| | (0.0612) | (0.1912) | (3.7923) | (328.1261) | (2.2435) |
| Covariates Controlled | YES | YES | YES | YES | YES |
| Level FE | YES | YES | YES | YES | YES |
| School track FE | YES | YES | YES | YES | YES |
| Graduation Year FE | YES | YES | YES | YES | YES |
| MBO Domein FE | YES | YES | YES | YES | YES |
| N | 84,953 | 83,354 | 82,843 | 72,162 | 72,138 |

Table 9: 2SLS Estimates of skill premiums and labor market outcomes, by education track

| | Employment (1) | Skill Mismatch (2) | Working Hours (3) | Monthly Wage (4) | Hourly Wage (5) |
|---|---|---|---|---|---|
| Panel A. School-based Track | | | | | |
| Social Skills | 0.50 | 0.106 | 17.524*** | 433.766* | -3.279* |
| | (0.0498) | (0.1593) | (3.3374) | (263.3038) | (1.8530) |
| Technical Skills | 0.287*** | 0.700*** | 15.690*** | -225.109 | -9.4561*** |
| | (0.0717) | (0.2296) | (4.7771) | (380.5667) | (2.6875) |
| Complex Problem Solving Skills | 0.211*** | 0.503*** | 1.803 | -1207.16*** | -9.422*** |
| | (0.0561) | (0.1810) | (3.7654) | (304.1927) | (2.1466) |
| Systems Skills | 0.096 | 0.321 | 36.445*** | 958.612*** | -7.736*** |
| | (0.0678) | (0.2170) | (4.5038) | (350.7447) | (2.4851) |
| Resource Management Skills | -0.068 | -0.336* | 14.975*** | 170.464 | -2.017 |
| | (0.0563) | (0.1852) | (3.8884) | (299.9445) | (2.1172) |
| N | 49,661 | 48,595 | 48,301 | 41,609 | 41,616 |
| Panel B. Work-based track | | | | | |
| Social Skills | 0.066 | -0.175 | -5.460 | 233.008 | 6.548** |
| | (0.0814) | (0.2411) | (4.234) | (427.6684) | (2.9158) |
| Technical Skills | -0.109 | -0.198 | 4.713 | 1151.81** | 7.659** |
| | (0.1103) | (0.3266) | (5.7515) | (554.1314) | (3.7695) |
| Complex Problem Solving Skills | 0.255 | -0.431 | -10.946 | 1088.036 | 10.317** |
| | (0.1655) | (0.4818) | (8.6929) | (766.709) | (5.2298) |
| Systems Skills | 0.157 | -0.032 | 15.521*** | 2479.666*** | 11.800*** |
| | (0.1047) | (0.3066) | (5.3854) | (506.2491) | (3.4521) |
| Resource Management Skills | 0.043 | -0.093 | -10.493*** | -570.247* | 3.749* |
| | (0.0635) | (0.1876) | (3.3075) | (328.7987) | (2.2366) |
| N | 35,292 | 34,759 | 34,542 | 30,553 | 30,522 |
| Covariates Controlled | YES | YES | YES | YES | YES |
| Level FE | YES | YES | YES | YES | YES |
| Graduation Year FE | YES | YES | YES | YES | YES |
| MBO Domein FE | YES | YES | YES | YES | YES |

# Appendix A: Illustrative Examples of the Education Plan

Figure A1: Excerpts 2013 updates XML file, program “Auto Technician”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  Autotechniek (Autotechnicus)
<sbu>
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<taalbeheersingseisen>
<rekenbeheersingseisen>
<kerntaken>
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    <werkprocessen>
      <werkproces volgnummer="1" titel="Bereidt onderhoudsopdracht aan personenauto voor" referentie="841145">
        <beschrijving>
        <resultaat>
        <competenties>
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            <indicator>
            <vaardigheden>
              <vaardigheid referentie="841175" titel="Heeft kennis van (personenauto)systemen en onderdelen" />
              <vaardigheid referentie="841179" titel="Heeft kennis van arbo-regels en bedrijfsprocedures m.b.t. veiligheid en milieu " />
              <vaardigheid referentie="841190" titel="Heeft kennis van materialen" />
              <vaardigheid referentie="841191" titel="Heeft kennis van meet-, controle-, hulp- en handgereedschappen" />
              <vaardigheid referentie="841198" titel="Kan zoekstrategieën toepassen" />
              <vaardigheid referentie="841202" titel="Kan relevante informatiebronnen raadplegen" />
            <componenten>
          <competentie titel="Vakdeskundigheid toepassen" code="K" referentie="3413">
          <competentie titel="Materialen en middelen inzetten" code="L" referentie="3414">
          <competentie titel="Onderzoeken" code="N" referentie="3416">
          <competentie titel="Instructies en procedures opvolgen" code="T" referentie="3422">
      <werkproces volgnummer="2" titel="Voert inspectie uit aan personenauto" referentie="841146">
      <werkproces volgnummer="3" titel="Voert onderhoudsbeurt uit aan personenauto" referentie="841147">
      <werkproces volgnummer="4" titel="Monteert accessoires aan personenauto" referentie="841148">
      <werkproces volgnummer="5" titel="Controleert zijn onderhoudswerkzaamheden en rondt opdracht af" referentie="841149">
  <kerntaak volgnummer="2" titel="Voert reparaties uit aan personenauto's" referentie="841152">
```


Figure A2: Excerpts 2021 updates PDF file, program “Auto Technician”

| P1-K1-W3 Voert modificatie- en/of reparatie- en/of assemblagewerkzaamheden uit aan componenten en/of systemen die werken op basis van elektrische, elektronische of digitale principes |
|---|
| *Omschrijving* |
| De beginnend beroepsbeoefenaar leest elektrische, elektronische of digitale componenten uit met behulp van testapparatuur. Hij verbindt elektrotechnische onderdelen en componenten en past daarbij voorkomende standaard verbindings- en aansluittechnieken toe. Hij controleert tijdens en na afloop van het aansluiten of de verbindingen correct zijn uitgevoerd, of de onderdelen en aansluitingen voldoen aan gestelde eisen van functionaliteit, kwaliteit en veiligheid en regelt zo nodig systemen in. Hij reset (vervangings)onderdelen en houdt zich aan de veiligheidsvoorschriften. Hij registreert zijn uitgevoerde werkzaamheden en de gewerkte tijd, rond zijn werkzaamheden af en vermeldt eventuele opmerkingen die van belang zijn. |
| *Resultaat* |
| De modificatie- en/of reparatie- en/of assemblagewerkzaamheden zijn uitgevoerd conform opdracht, geldende procedures en bedrijfsregels, kwaliteitseisen en –normen. |
| *Gedrag* |
| De beginnend beroepsbeoefenaar:<br>- werkt nauwkeurig en systematisch;<br>- maakt effectief, efficiënt en veilig gebruik van materialen en (technische) middelen;<br>- zet actief zijn kennis en vaardigheden in bij het bedienen van de machines en het werken met verschillende installaties, systemen, technieken en materialen;<br>- overlegt bij de uitvoering van de gemeenschappelijke taak tijdig en regelmatig met zijn collega's en stelt zich zo op dat de samenwerking met de anderen goed verloopt;<br>- raadpleegt tijdig de leidinggevende bij vragen en onduidelijkheden;<br>- aanvaardt veranderingen en reageert hier goed op;<br>- volgt nauwgezet de werkinstructies, de kwaliteitseisen bedrijfsregels bij het uitvoeren van de werkzaamheden;<br>- de werkplek is zorgvuldig opgeruimd.<br><br>De onderliggende competenties zijn: Samenwerken en overleggen, Vakdeskundigheid toepassen, Materialen en middelen inzetten, Instructies en procedures opvolgen, Omgaan met verandering en aanpassen |

Figure A3: MBO education plan structure (2012-2015)

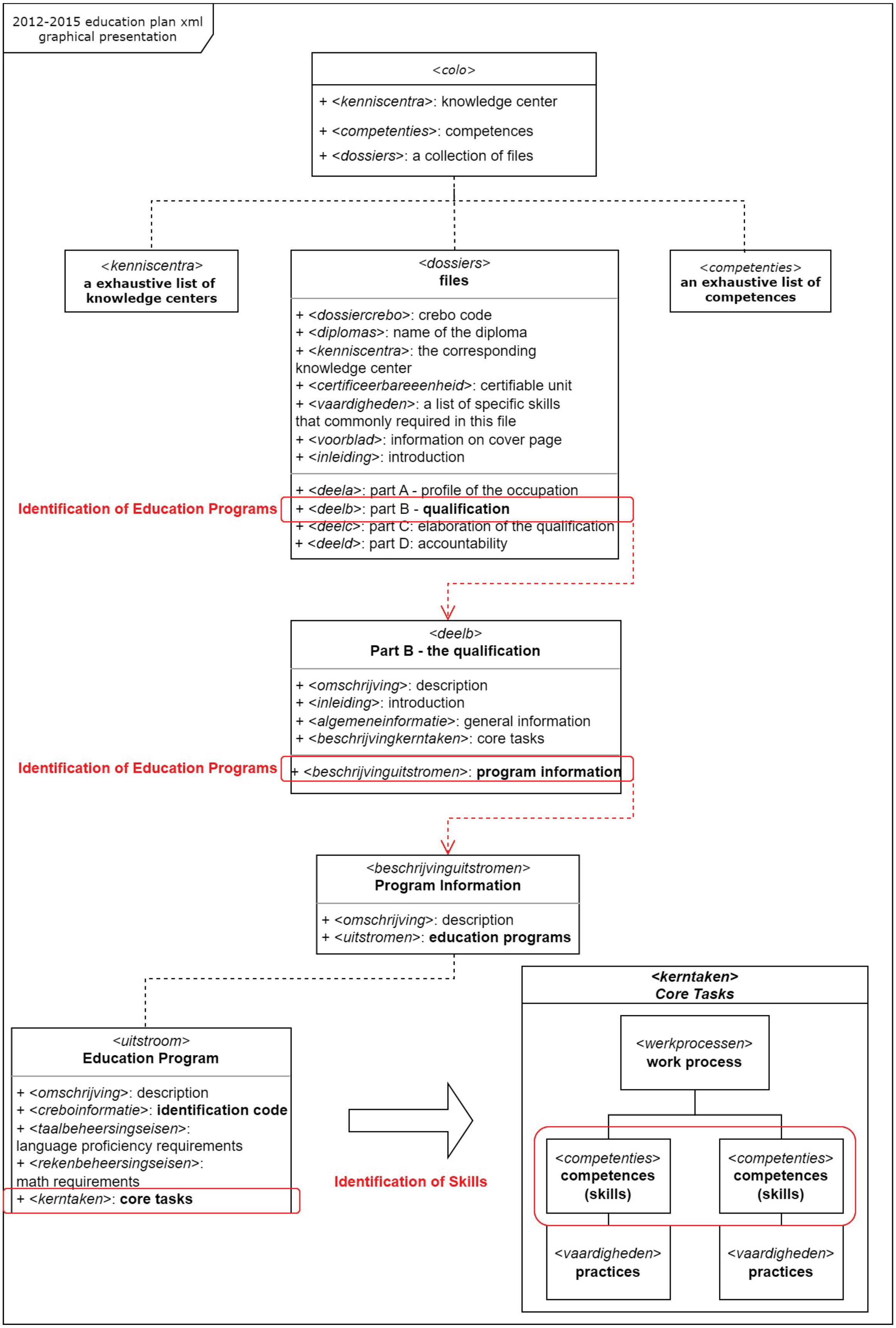
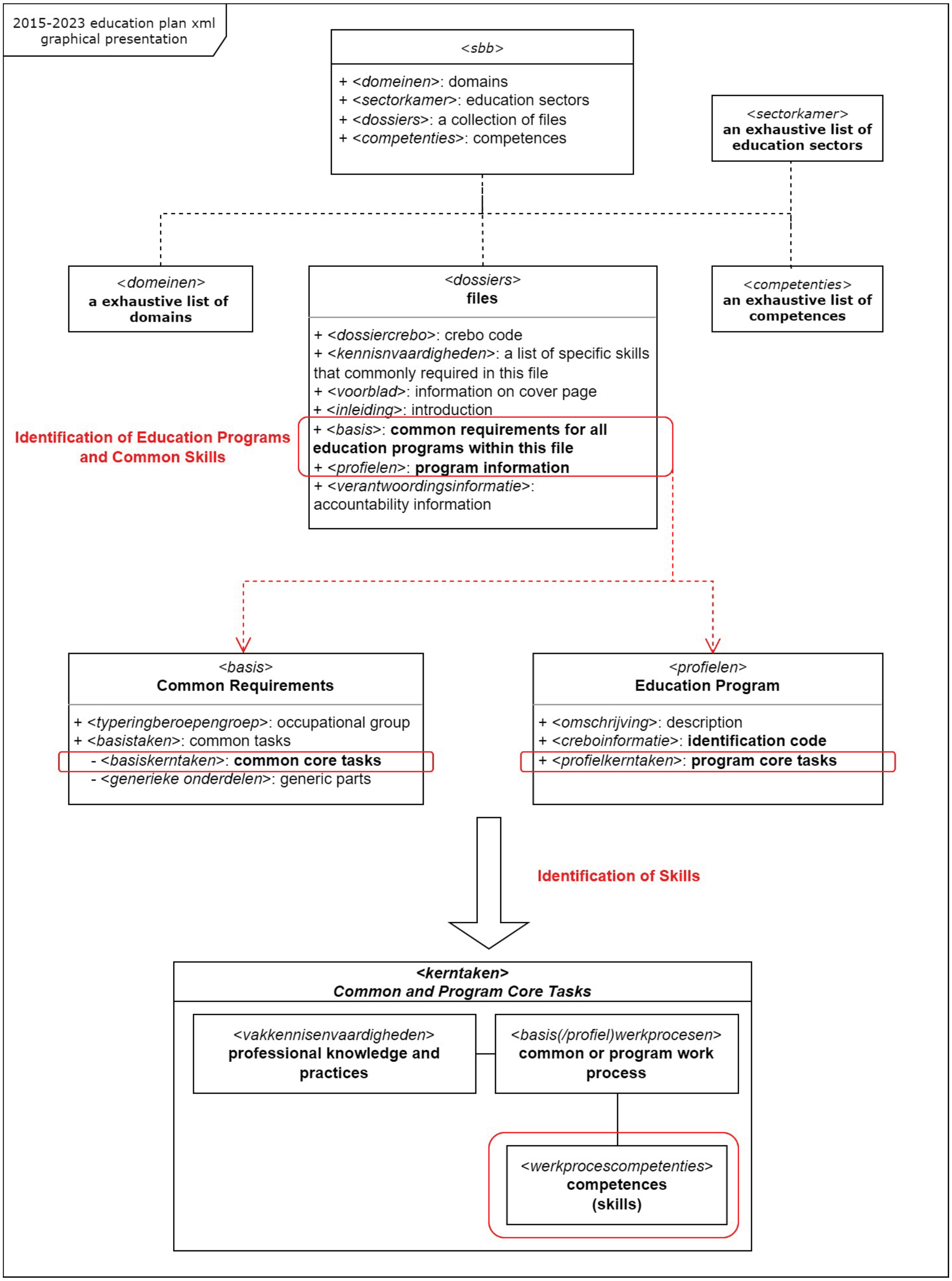


Figure A4: MBO education plan structure (2015-2023)



# Appendix B:

Table B1: The O*NET content model (worker requirement)

| Skills Domain | Keywords (Contents) |
|---|---|
| Basic Skills | Reading comprehension, active listening, writing, speaking, Mathematics, science, critical thinking (logic and reasoning), active learning, learning strategies, monitoring |
| Social Skills | Social perceptiveness, coordination, persuasion, negotiation, instructing, service orientation |
| Complex Problem-Solving Skills | Complex problem-solving |
| Technical Skills | Operations analysis, technology design, equipment selection, installation, programming, operations monitoring, operation and control, equipment maintenance, troubleshooting, repairing, quality control analysis |
| Systems Skills | judgment and decision-making, systems analysis, systems evaluation |
| Resource Management Skills | time management, management of financial resources, management of material resources, management of personnel resources |

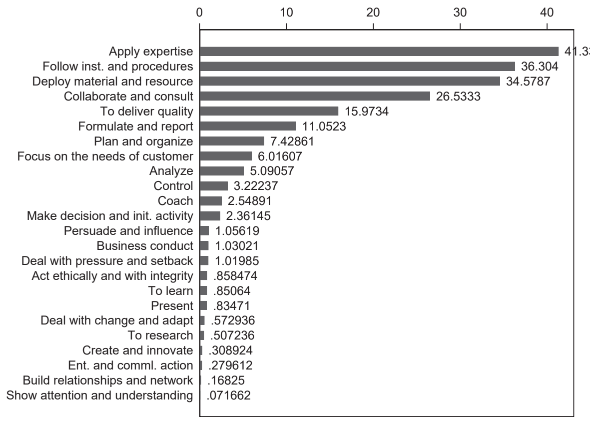
*Notes:* Data Retrieved from National Center for O*NET Development. O*NET OnLine. April 29, 2024, from https://www.onetonline.org/

Table B2: Mapping SBB categories into O*Net taxonomy

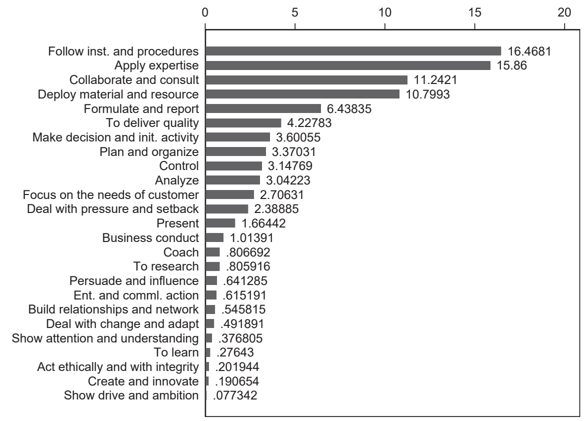
| SBB Categories | O*Net Taxonomy |
|---|---|
| Show attention and understanding | Basic Skills |
| Act ethically and with integrity | Basic Skills |
| To learn | Basic Skills |
| Follow instructions and procedures | Basic Skills |
| To research | Complex Problem Solving Skills |
| Create and innovate | Complex Problem Solving Skills |
| Dealing with change and adapting | Complex Problem Solving Skills |
| Enterprising and commercial action | Complex Problem Solving Skills |
| Planning and organizing | Resource Management |
| To deliver quality | Resource Management |
| Business conduct | Resource Management |
| Control | Interpersonal Skills |
| Coach | Interpersonal Skills |
| Collaborate and consult | Interpersonal Skills |
| Building relationships and networking | Interpersonal Skills |
| Persuade and influence | Interpersonal Skills |
| Present | Interpersonal Skills |
| Focus on the needs and expectations of the ”customer” | Interpersonal Skills |
| Dealing with pressure and setbacks | Interpersonal Skills |
| Show drive and ambition | Interpersonal Skills |
| Making decisions and initiating activities | Systems Analysis |
| Formulating and reporting | Systems Analysis |
| Analyze | Systems Analysis |
| Applying expertise | Technical Skills |
| Deploying materials and resources | Technical Skills |

# Appendix C: The contents of skills

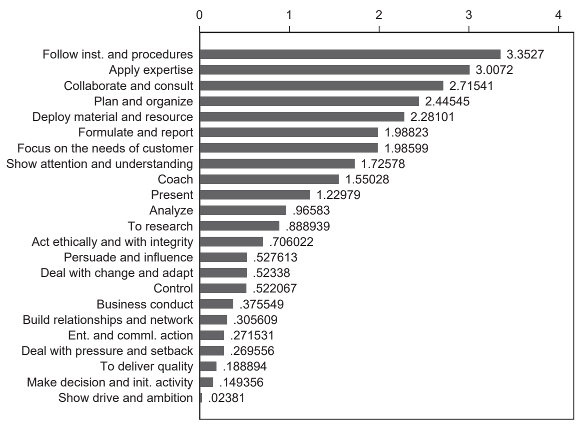
Figure A5-1: Average number of skills by sectors



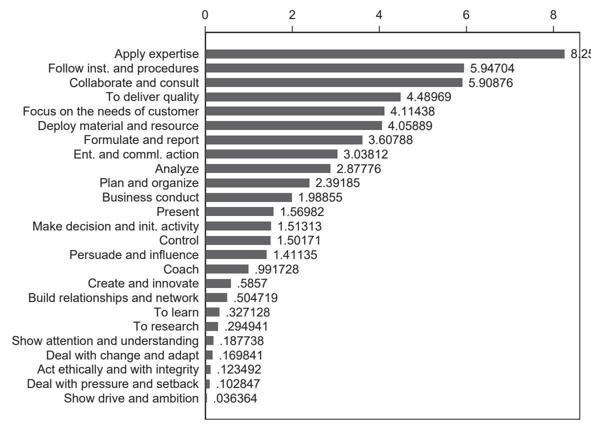

(a) Technology and construction




(b) Logistics

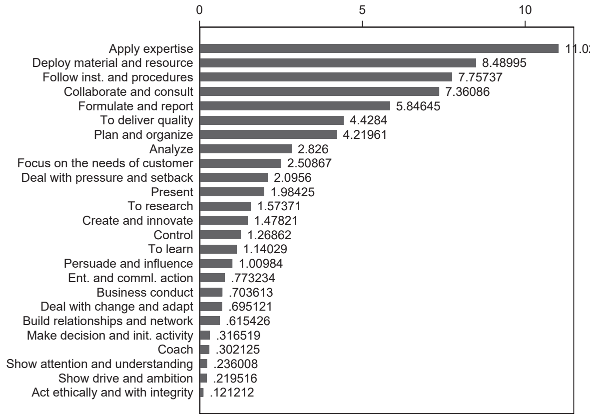



(c) Care and Welfare

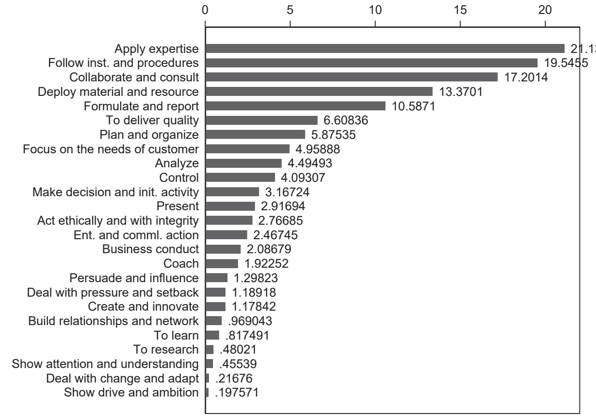



(d) Commerce

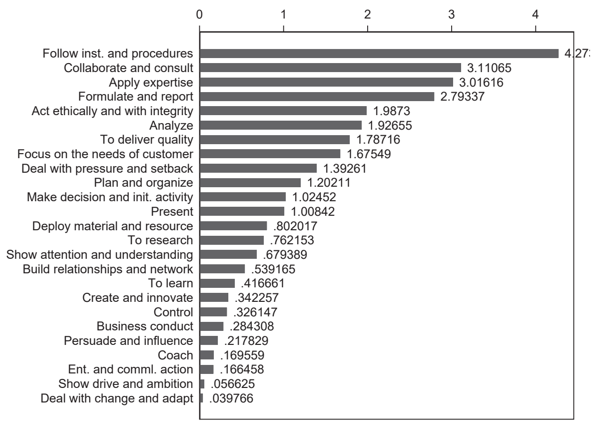
Figure A5-2: Average number of skills by sectors



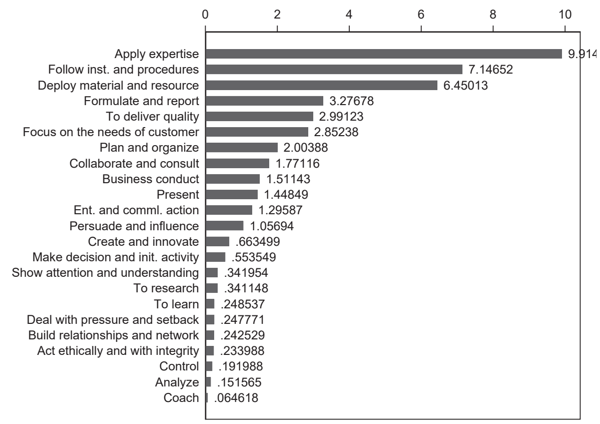

(a) ICT



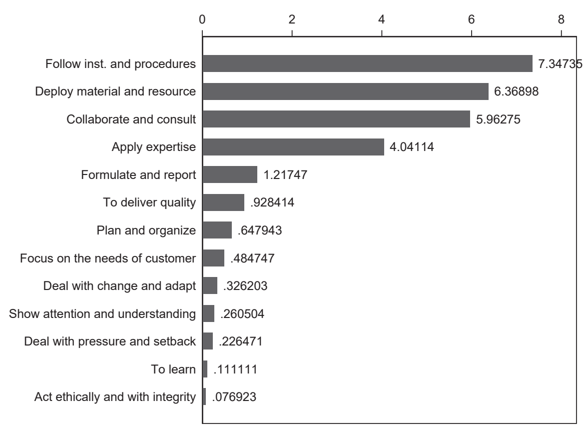

(b) Hospitality




(c) Business Services




(d) Craftsmanship




(e) Entrance

This working paper was authored for Skills2Capabilities by Ziyue Zhu, Didier Fouarge, Barbara Belfi, Melline Somers (all ROA). This paper is a deliverable from the work package entitled 'The supply of skills and lifelong learning among VET graduates over the life course', led by ROA.



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