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Does vocational education pay off?

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KEY MESSAGES

- In Estonia, individuals with vocational education earn on average less than those with general upper secondary education.
- In certain occupations, particularly in blue-collar trades, wages exceed those of individuals with general upper secondary education.
- Political pressure to steer more pupils into vocational education is misplaced if the labour market does not sufficiently reward vocational school graduates.

INTRODUCTION

This article compares the wages of individuals with vocational education and those who have completed general upper secondary education. In Estonia, vocational graduates tend to earn less than their peers with general upper secondary education. We seek to account for the influence of personal characteristics such as ethnicity, gender, place of residence and family background in order to assess whether these factors explain the lower earnings of vocational graduates. To this end, we estimate the relationship between income and a set of explanatory variables and then assess the effect of vocational education on income. Although we control for the mother's level of education, we cannot fully account for unobserved characteristics such as communication skills or individual academic ability. As a result, part of the wage gap may reflect educational self-selection. Income data are drawn from 2023 income tax declarations, and the explanatory variables are obtained from administrative registers.

A meta-analysis published in 2023¹ found that vocational education increases earnings by an average of 2.1% compared with general upper secondary education, based on a synthesis of multiple studies, and that this effect declines over time. An analysis of Danish data showed that vocational education had a positive effect on earnings at age 28, but that this effect diminished over time.² The Danish study concluded that for marginal cases choosing between vocational and general education, the decision had no significant impact on wages for women or for men with weak mathematics skills, whereas men with strong mathematics skills experienced a wage loss by opting for vocational education. In contrast, research from Finland found that vocational education increases wages by 6%, and that this effect does not diminish over time.³ International studies also suggest that participation in further training later in working life may influence the

subsequent career prospects of vocational graduates.⁴

Graduates of vocational education often enter the labour market with strong job-specific skills. However, if participation in further training is limited, these skills may become outdated, increasing the risk that they lose value as technology advances.⁵ Adequate in-service training would help mitigate such skill obsolescence. At the same time, general upper secondary education may provide stronger general skills that better support lifelong learning and further professional development than vocational education.

GRADUATES OF VOCATIONAL SCHOOLS DO NOT EARN MORE ON AVERAGE THAN GRADUATES OF GENERAL EDUCATION SCHOOLS

Figure 3.2.1 presents the median annual incomes of individuals with general upper secondary and those with vocational education by birth cohort. The figure shows that, in the observed cohorts, the wage effect of vocational education is modest compared with general upper secondary education. Characteristics such as gender and mother tongue account for larger

wage differences. Men with ISCED 3 vocational education – that is, below the level of vocational upper secondary education – earn significantly less than men with general upper secondary education or higher-level vocational education. It is also evident that among Russian-speaking individuals, ISCED 5 vocational education (post-secondary vocational education) is associated with a significant income premium.

EMPLOYEES WITH VOCATIONAL EDUCATION EARN MORE IN BLUE-COLLAR OCCUPATIONS

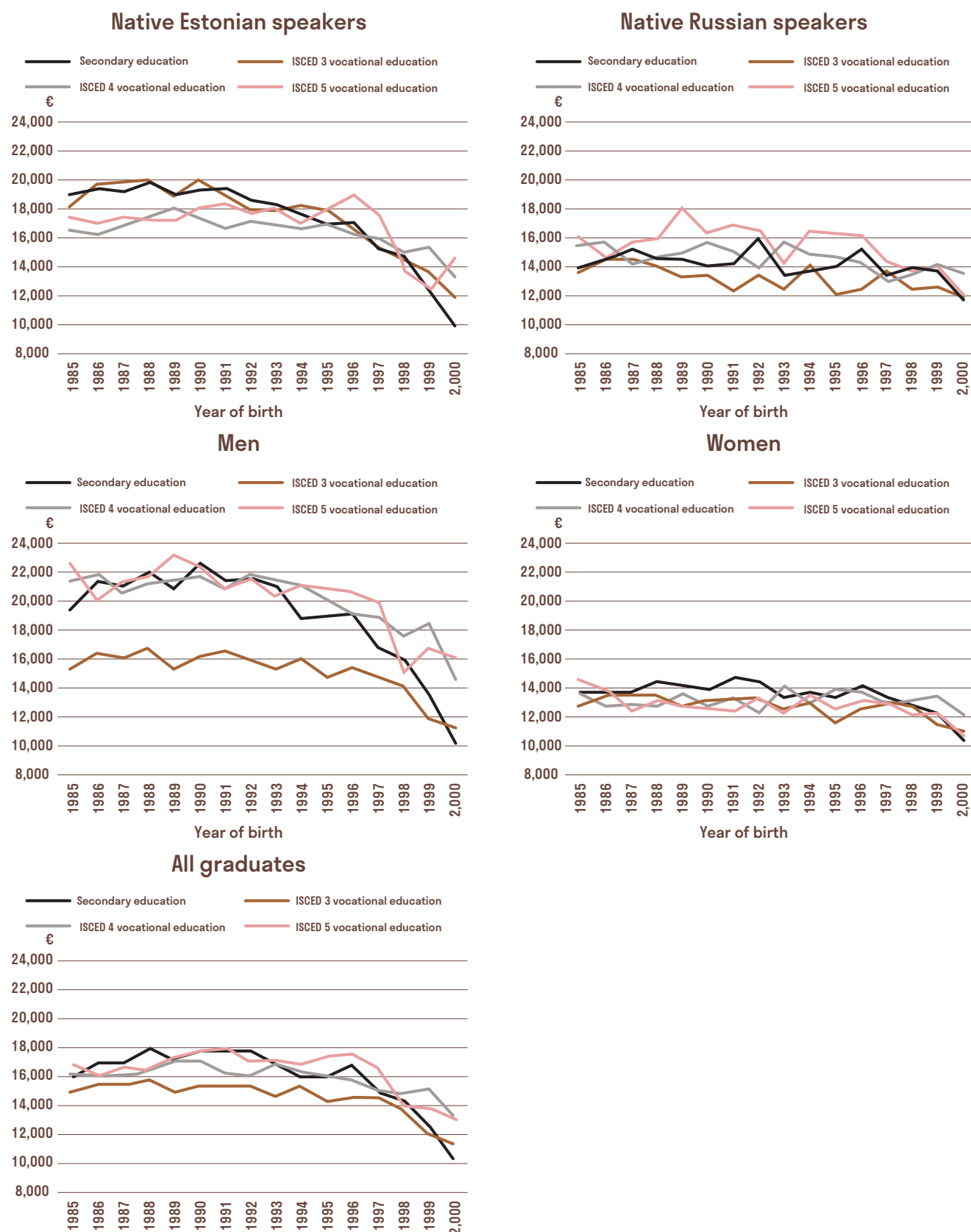
The wages of employees with vocational education are strongly shaped by occupation. In higher-paid white-collar roles, young people with only general upper secondary education often earn more than those with vocational qualifications. By contrast, in blue-collar occupations – for which vocational schools typically provide training – vocational graduates earn more than their peers with general upper secondary education. However, these wages remain below those of vocational graduates employed in higher-paid white-collar positions.

Vocational education thus offers a wage advantage mainly within relatively lower-paid

Data and methodology. We analyse income by level of education using 2023 income tax declaration data. Information on educational attainment refers to 2023 and is drawn from the Population Register, which also provides data on language proficiency, gender, cohort, place of residence and the individual's and mother's educational attainment according to the ISCED classification. Data on completion of vocational education are obtained from the Estonian Education Information System (EHIS). Income data are based on individual income tax declarations and include labour income, excluding capital gains, rental income and similar sources. The regression analysis also uses data from the Employment Register on occupation, defined as the first occupation recorded for the individual in 2023.

The sample includes individuals born from 1985 onwards. It is restricted by year of birth to capture those who completed their education within the past 20 years, allowing a clearer assessment of the impact of the current education system on wages. Graduates of general upper secondary education are defined as individuals whose highest level of education in the Population Register corresponds to ISCED 3 and who have not completed vocational education. Graduates of vocational education are defined as individuals with ISCED 3, ISCED 4 or ISCED 5 education who, according to EHIS data, have completed a vocational programme. The analysis is based on the most recently completed vocational qualification.

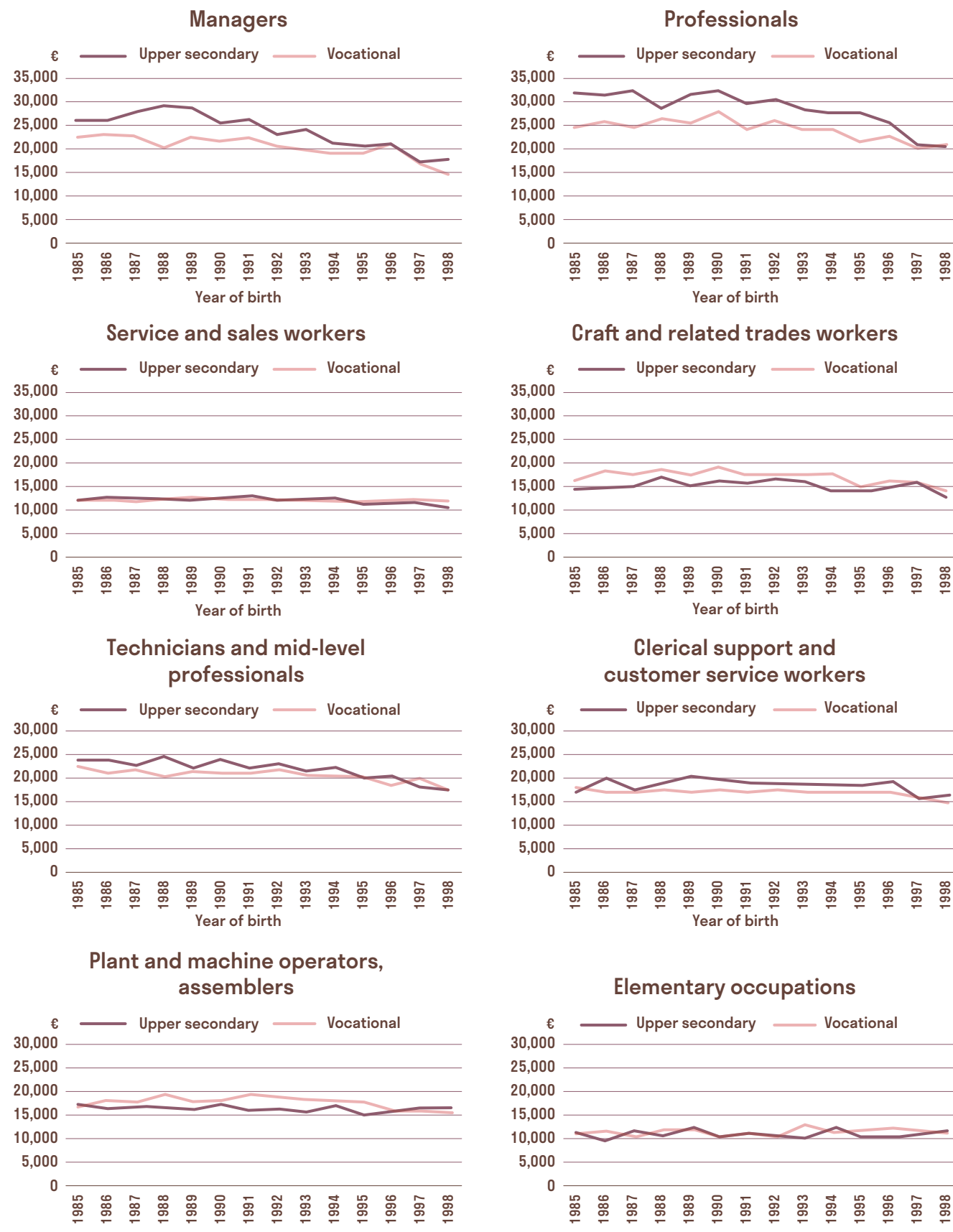
Figure 3.2.1 Median annual income by year of birth and level of education



SOURCE: figure by the author

NOTE. ISCED 3 – vocational upper secondary education based on lower secondary education; ISCED 4 – vocational upper secondary education based on upper secondary education; ISCED 5 – post-secondary vocational education entered after upper secondary education.

Figure 3.2.2 Median annual income by occupation and level of education



SOURCE: figure by the author

occupations (see Figure 3.2.2). The largest share of individuals with vocational or general upper secondary education is employed in service and sales occupations, where wages are significantly below the overall average. According to the 2022 structure of earnings survey, wages in this field in Estonia amounted to 47% of those of professionals, compared with an EU average of 55%.⁶ At the same time, the relative wages of craft and related trades workers and plant and machine operators, compared with professionals, were higher in Estonia than the EU average.

The figure also shows that older workers tend to earn more in white-collar occupations, and that among older workers the income gap between those with general upper secondary and vocational education is wider than among younger workers. This is consistent with international evidence suggesting less frequent participation in further training among vocational graduates and a decline in their relative wage advantage over time. It is also evident that younger service and sales workers with general upper secondary education earn less than their vocationally educated counterparts, whereas among older workers this difference is no longer apparent.

In more specialised occupations that require specific skills, such as craft and related trades, the income gap between vocational and general upper secondary graduates appears to persist across age groups.

CONTROLLING FOR PERSONAL CHARACTERISTICS REDUCES THE NEGATIVE EFFECT OF VOCATIONAL EDUCATION ON INCOME

For the regression analysis, we excluded individuals born after 1999, as their time in the labour market has been relatively short. The model includes 67,121 observations. When data on mother's education and occupation are added, the number of individuals available for analysis decreases. Some information is likely missing from the registers because it has been further suppressed to prevent identification of individuals. By occupation, there appears to be a notable absence of individuals employed in security-related fields. As the data cover the full

population, the regression coefficients reflect actual population differences. In other words, there is no need to rely on statistical significance to generalise the results to the population.

Based on 2023 income tax declaration data, graduates of vocational schools do not earn substantially more on average than graduates of general upper secondary schools. This suggests either that the skills acquired in vocational education add little value in the labour market compared with general upper secondary education without specialisation, or that the choice of vocational education is associated with characteristics that make labour market success more difficult. Controlling for gender, year of birth, county of residence, mother tongue and socio-economic background (proxied by mother's education) does not materially alter the estimated income differences between graduates of general upper secondary and vocational education.

Table 3.2.1 shows that individuals with ISCED 3 vocational education earn less in the labour market than those with general upper secondary education; those with ISCED 4 education earn approximately the same as general upper secondary graduates; and ISCED 5 education is associated with a modest income premium. Controlling for gender, mother tongue and cohort does not materially alter these estimates.

When county of residence is included, the coefficient for vocational upper secondary education based on general upper secondary education (ISCED 4) becomes positive but statistically insignificant. This likely reflects regional differences in opportunities and wage levels. In other words, individuals with ISCED 4 vocational education earn less than general upper secondary graduates because they are more likely to reside in lower-wage regions.

Including mother's level of education does not materially affect the coefficients associated with vocational education. In the observed data, the relationship between mother's education and children's income is not linear. The effect increases with higher maternal education but declines when mothers have tertiary education. This may reflect the fact that highly educated mothers are more likely to steer their children

towards higher education, and those who do not pursue it may have lower academic ability.

Controlling for occupation makes the coefficient for ISCED 4 vocational education statistically significant and renders the coefficient for ISCED 3 vocational education statistically insignificant. This suggests that the choice between general upper secondary and vocational education is also, in part, a choice between different occupations.

Vocational education is associated with higher average wages within occupations that have relatively low overall wage levels.

With regard to occupation, it should be noted that employees without recorded occupational data are excluded from the model. These are likely to include workers in higher wage-potential fields within the security sector. This may partly explain why the coefficient for ISCED 5 vocational

education in model M7 is smaller than in the other models.

Although many characteristics are controlled for, the estimated models explain only a limited share of wage dispersion. This reflects two key factors. First, the models focus on a relatively narrow segment of the workforce, meaning that much of the income variation associated with education across the labour market as a whole is not captured. Second, the low explanatory power suggests that unobserved characteristics, such as communication skills or general cognitive ability, play an important role in wage formation. If such characteristics influence field-of-study choices or available opportunities, vocational education is likely to be most beneficial for those intending to enter blue-collar occupations.

The importance of field of study is also reflected in wage differences among vocational school

Table 3.2.1 Income regression models (dependent variable: logarithm of income)

	M1	M2	M3	M4	M5	M6	M7
ISCED 3 vocational education	-0.139***	-0.119***	-0.124***	-0.128***	-0.094***	-0.085***	-0.021
ISCED 4 vocational education	-0.022	-0.006	-0.011	-0.036**	0.022	0.011	0.047***
ISCED 5 vocational education	0.065***	0.039*	0.043*	0.015	0.048**	0.051**	0.029*
Sex		+	+	+	+	+	+
Estonian as native language			+	+	+	+	+
Cohort				+	+	+	+
County					+	+	+
Mother's education level						+	+
Occupation							+
Number of observations	67,121	67,121	67,121	67,121	67,121	55,476	50,170

SOURCE: table by the author

NOTE. Stars indicate significance levels: *** 0.001; ** 0.05; * 0.1. ISCED 3 – vocational upper secondary education based on lower secondary education; ISCED 4 – vocational upper secondary education based on upper secondary education; ISCED 5 – post-secondary vocational education entered after upper secondary education. A plus sign indicates that the corresponding variables are included in the model.

Figure 3.2.3 Median income of vocational school graduates compared with the median income of general upper secondary graduates, 2023



SOURCE: figure by the author

NOTE. ISCED 3 – vocational upper secondary education based on lower secondary education; ISCED 4 – vocational upper secondary education based on upper secondary education; ISCED 5 – post-secondary vocational education entered after upper secondary education. The zero line in the figure represents the wage level of employees with general upper secondary education.



graduates. The incomes of graduates from some vocational schools exceed those of general upper secondary graduates, indicating that the skills provided by those institutions are more highly valued in the labour market. For example, young people with vocational qualifications in internal security and national defence earn more than general upper secondary graduates, as do some graduates of technically oriented vocational schools.

Administrative registers also allow us to examine the wages of vocational school graduates by institution. However, confidentiality requirements apply. Accordingly, only examples are presented in which each data point is based on at least 20 observations.

By institution, the Estonian Military Academy and the Estonian Academy of Security Sciences stand out (see Figure 3.2.3), as their graduates earn significantly more than individuals with general upper secondary education. These institutions train for public sector professions in which wages are not determined by market forces, making direct comparisons with regular vocational schools difficult. Nevertheless, the incomes of graduates from many vocational schools remain below those of individuals with only general upper secondary education, regardless of whether ISCED 3, ISCED 4 or ISCED 5 education is considered. Positive exceptions include the Tallinn School of Economics, Tallinn Polytechnic School and the Tallinn Industrial Education Centre, whose graduates earn more than general upper secondary graduates of the same age.

SUMMARY

The limited wage effect of vocational education compared with general upper secondary education gives rise to several hypotheses that require further analysis.

First, labour market outcomes may reflect selection into vocational education. The regression analysis sought to account for these effects. At the same time, the results show that controlling for county of residence and occupation alters the estimated impact of vocational education on income. This suggests that vocational education has a more positive effect in lower-

paid occupations and regions. However, choosing a different position in the labour market would enable individuals to earn higher wages.

Second, in Estonia's relatively flexible labour market, where employment relationships are short by international standards, general skills such as language proficiency, learning habits and communication skills – developed in general upper secondary education but to which vocational education may add less – may be more highly valued. At the same time, vocational skills may also be acquired in the workplace or through further training.

Third, the issue may lie in weak alignment between vocational education and labour market needs. This is particularly evident in the results by institution. While graduates of most vocational schools earn less than individuals with general upper secondary education without specialisation, graduates of some vocational schools earn significantly more than general upper secondary graduates of the same age. This indicates that the skills provided in those institutions are better aligned with labour market demand.

In the case of vocational education, it is important to examine how to improve alignment between what is taught and what is valued in the labour market. Although weaker labour market outcomes among vocational graduates may partly reflect personal characteristics that also limited their access to general upper secondary education, this should not be used to justify modest outcomes among vocational school graduates. If vocational schools do not provide the skills required in the labour market, directing less academically able young people into them creates a double disadvantage. First, they may lack characteristics needed to succeed both in the education system and in the labour market. Second, they may receive an education that does not sufficiently support their future prospects.

International studies also indicate that the relative wage level of individuals with vocational education may decline over time as skills become outdated and are not renewed. Alongside the provision of vocational education, it is therefore essential to ensure that employers continue to invest in further training and the updating of employees' skills.

REFLECTION

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Vocational education generally does not provide significant labour market advantages compared with general upper secondary education. In principle, vocational graduates' skills tailored to labour market needs should lead to higher earnings than those of general upper secondary graduates. In practice, however, the wage premium is small and tends to diminish over time. Two main factors are likely at play: selection and instructional quality.

Estonia's culture of prioritising higher education channels most of the more able young people into general upper secondary school and from there to university. Vocational schools often enrol those for whom upper secondary or university studies are less attainable. It is therefore reasonable to assume that general upper secondary graduates are, on average, somewhat more academically capable, which may offset the lack of vocationally acquired skills in the labour market. In other words, above-average pupils tend to select into general upper secondary education, while somewhat less academically strong pupils enter vocational schools.

Paradoxically, vocational pupils are expected to complete both general upper secondary education and vocational training within roughly the same timeframe as general upper secondary pupils complete their studies. This is demanding even for motivated and capable pupils, let alone for those who struggle with general education. Inevitably, vocational curricula involve compromises, and requirements are likely to be aligned more closely with the abilities of less academically strong learners. This implies that more capable vocational pupils could probably acquire more knowledge if vocational schools were able to expand the general education component of their curricula. However, this is difficult, as dropout rates are already high.

If the aim is to improve both the substance and the reputation of vocational education, selection must be taken more fully into account

in curriculum design and in evaluating the performance of vocational schools.

- The effectiveness of vocational schools should be assessed regularly, taking into account pupils' initial levels of knowledge and skills, the extent to which these improve by graduation and their subsequent labour market outcomes. This would provide a clearer picture of the value added by vocational schools and indicate which pupils benefit more and which less. For many young people, general upper secondary education is not a realistic option, and vocational schools likely perform valuable work in preparing them for the labour market. However, comparing the average outcomes of general upper secondary and vocational graduates without accounting for differences in pupil ability obscures this contribution.
- Vocational education must become more diverse. It faces both substantive and reputational challenges. Addressing these requires making vocational education attractive also to academically stronger pupils, which in turn means offering programmes that do not appear to lead to a dead end. One option would be to consolidate institutions providing vocational upper secondary and applied higher education into integrated education centres offering both pathways. The duration of study should also be reconsidered – if pupils are to receive high-quality general upper secondary education, vocational upper secondary programmes should extend beyond three years. Providing secondary and higher education within the same institution would make it possible to design general education modules that better support further study and potentially increase their appeal. Strong general education is essential for adaptability. Vocational education must find ways to provide it at a high standard to as many pupils as possible. Achieving this would also help mitigate the selection problem.

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