

**First draft**

**Formal and informal training versus learning-by-doing at labour  
market entrance of Dutch graduates**

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## **1. Introduction**

The transition from school to work has been an important issue for both researchers and policy makers over the last decade. Most studies on this issue concentrate on unemployment among school-leavers and on job mismatches with regard to field of study (see for example Ryan 2001; Müller and Gangl 2003; Wolbers 2003). Little is, however, known of the process of settling in the first job after graduation. It is generally acknowledged that initial education can never provide all the skills needed on the job as some skills can only be learned in the context of a specific job in a specific firm. There, nevertheless, is little information on the actual gap between skills required and acquired in the first job and how this skill gap is remedied. Our study focuses on two questions:

1. How large is the skill gap in the first job for different field of studies?
2. What strategies are used to reduce this skill gap?

We use data of a survey carried out in 2004 among Dutch graduates from higher education one and a half year after graduation and an additional survey among a subsample of the respondents, which was held in 2005. The first survey contains extensive information on the graduates' educational backgrounds and current labour market positions. In the additional survey, we included a number of questions on skill development in the job.

The skill gap is measured by asking graduates what percentage of tasks they could adequately perform at the start of their job. It is to be expected that this skill gap will

depend on both educational and job characteristics. For example, it will matter whether the education followed had a generic or a vocational focus, and whether it integrated any work experience tracks. Furthermore, it will matter whether the job matches the type of study, and whether the job consists of mainly routine tasks or of more complex non-routine tasks as well. We will explain the skill gap by these educational and job characteristics, while controlling for individual characteristics like gender and age.

With respect to the strategies used to reduce the skill gap, there are several ways to learn new skills at work, e.g. instruction by a supervisor or a co-worker, self-study, formal on- or off-the-job training, or learning-by-doing. In fact, these forms of skill acquisition will very often be complements. For example, new workers are first instructed by co-workers how to perform certain tasks and subsequently learn to perform these tasks by repeating it by themselves. We, therefore, asked graduates what percentages of their newly learned skills were acquired by formal and informal training versus learning-by-doing, and analyse how these strategies are related to the skill gap.

The remainder of the paper is organized as follows. In section 2 we discuss the data set. In section 3 we discuss our measure for the skill gap. Next, in section 4, we will explain the gap between the required and acquired skills of graduates. In section 5 we analyse the strategies to reduce the gap between the required and acquired skills. Section 6 concludes.

## **2. The survey**

The empirical analyses in this paper are based on a large scale survey among Dutch college graduates of higher professional education and university education, 1.5 years after graduation, which took place at the end of 2004. About 62.000 graduates were approached of whom 38% responded. This written survey contains many questions about the educational background and the current labour market position of graduates. A sub sample of about 18,000 respondents of the 2004 survey was approached by e-mail in the spring of 2005 for an additional internet survey of whom about 4,400 responded (24%). This additional internet survey dealt mainly with educational choices.<sup>1</sup> Furthermore, it contained a number of questions regarding skill acquisition at work. Table 6 in the appendix provides some descriptive statistics.

## **3. Measuring the skill gap**

The skill gap is measured by asking graduates what percentage of tasks they could adequately perform at the start of their current job. The skill gap is calculated as 100% minus this percentage and thus gives the percentage of the tasks that could not be fulfilled at the start of job. On average, graduates could not adequately perform 33% of their tasks. Figure 1 gives the distribution of the skills gap. The figure shows that 25% of the graduates could not perform 25% or more of their tasks and 10% could not perform 90% or more of their tasks.

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<sup>1</sup> To stimulate participation and deliberate answers, the respondent were promised a personal profile regarding several psychological factors upon completion of the questionnaire. In the mail it was not explained which personal factors were included in the profile. The respondents got a profile and an explanation of the terms in the profile regarding their individual discount rate, the quality of the image of the future, cognitive ability, locus of control, anxiety, self-confidence, self-image and risk-aversion.

<< Insert figure 1 about here>>

A big skill gap at the start of the job, as it is measured here, does not necessarily imply that there is a skills mismatch. For, example, there may be jobs, which demand complex skills which cannot be learned in education but should be acquired in practice. A graduate starting in such a job will not be able to perform many of his tasks adequately yet, but if he possess a high learning potential to acquire these new skills than he actually fits very well in that job. Therefore a big skill gap at the start of the job is not necessarily negative.

In the survey there were two additional questions that address the match between the required and the acquired skills; “To what extent are your knowledge and skills utilized your current work?” and “To what extent does your current work demand more knowledge and skills than you can actually offer?”. There were 5 response categories, ranging from “not at all” to “to a very great extent” These questions take the graduate’s skills level as the as the reference and measure the degree of skill mismatches. The first question is a measure for the utilisation of skills; the second is a measure for skills shortages. Both questions do not refer to the start of the job but to the survey date. Table 1 shows that underutilisation of skills is more of a problem than skills shortages.

<< Insert table 1 about here>>

To see whether there is a relation between the two measures for skills mismatches and our measure for the skill gap we calculated the mean skill gap for each response

category for both questions. From table 3 it becomes clear that the skill gap increases as the graduate faces a higher skills shortage. It also increases, but to a lesser extent, with the underutilization of skills. So, although there is relation between the three measures, a skill gap is certainly not equivalent to a skill mismatch. For our purpose, the analysis of the settling process in the first job after graduation, the measures for the skill mismatch are less appropriate than the measure for the skill gap. Even if all skills and knowledge are utilised and the work does not demand more skills and knowledge than the graduate can offer the graduate will have to settle into the job.

<< Insert table 2 about here >>

#### **4. Explaining the skill gap**

The skill gap has been explained by educational and job characteristics, while controlling for individual characteristics like gender, age and ethnicity. Table 3 shows the estimation results. Observable individual characteristics seem to explain only little of the variance in the wage gap. The wage gap is smaller for women and for members of an ethnic minority. Furthermore the skill gap seems to increase slightly with age.

<< Insert table 3 about here >>

Including educational characteristics, triples the explained variance to 6% which is still very low. Graduates with a master degree face a bigger skill gap at the start of the job than graduates with a bachelor grade. Furthermore the skill gap increases with the graduate's average degree. These results suggest that more able individuals hold more

complicated jobs and therefore have to acquire more new skills at the start of their jobs than less able individuals. Management experience, for example in a students' union, or studying abroad has no impact on the skill gap. Surprisingly graduates who did an internship during their study face a bigger skills gap. Apparently those graduates are selected for more complicated jobs. Graduates who worked during their study face a smaller skill gap. The field of study also has some impact on the skill gap. Graduates of law studies on average have a bigger skill gap while graduates of teacher courses have a lower skill gap.

To analyse the impact of job characteristics we included some variables referring to the formal job requirements. The survey included questions on the field of study and the educational level required for the job by the employer. The field of study required for the job has no significant impact on the skill gap at the start of the job. Graduates working in job which required their own field of study or a related field of study do not face a different skill gap than graduates working in a job that requires a different field of study or no specific field of study. The required level does have an impact on the skill gap. Graduates working in a job that required a lower level of study than their own field of study have a lower skill gap at the start of the job than graduates working in a job that matches their educational level. However, graduates working in a job that requires a higher level of education than their own level do not face a higher skill gap. Apparently, the required level of the job does not adequately proxy for the complexity of the job. The fact that more able graduates face a higher skill gap suggests that the complexity of the job is one of the most important factors explaining the skill gap.



## 5. Remediating the gap: training versus learning-by-doing

How do graduates remedy the skill gap at the start of their jobs? There are several ways to learn new skills at work, e.g. instruction by a supervisor or a co-worker, self-study, formal on- or off-the-job training, or learning-by-doing. In fact, it is to be expected that different forms of skill acquisition will play a role at the same time. For example, new workers are first instructed by co-workers how to perform certain tasks and subsequently learn to perform these tasks by repeating it by themselves. We asked graduates what percentages of the skills they learned since they started the job were acquired by formal training courses, instruction by co-workers, contacts outside work, self tuition and learning by doing.

<< Insert table 4 about here >>

Table 4 shows that most new skills are acquired through learning-by-doing (42%) and instruction by co-workers (31%). Self tuition makes up for 13% of new skills. Formal training courses only play a minor role. About 10% of the new skills are acquired through formal training courses. Finally, contacts outside work contribute very little to skills acquisition. Note that these figures do not tell us anything about the time spent on different strategies of skill acquisition. The table provides the output distribution of different strategies of skills acquisition and not the input distribution. It is not straightforward to measure the input in all types of skills acquisition strategies on the same scale. For example, graduates learn a lot at work through learning by doing but how much of the working time should be assigned to learning by doing?



To explain the importance of different forms of skill acquisition in the first job we employ a polychotomous extension of the fractional logit model (Papke and Wooldridge 1996; Wooldridge 2002; Bhat et al. 2003). The variable of interest, the importance of different forms of skills acquisitions, is in the forms of fractions. The sum of the fractions across all forms of skills acquisition is equal to one, and each fraction is bounded between zero and one. The econometric specification is as follows:

$$E(y_i | x) = G_i(\beta, x), 0 < G_i(\cdot) < 1, \sum_{j=1}^q G_j(\cdot) = 1, \beta = (\beta'_2, \beta'_3, \dots, \beta'_q)$$

$$G_1(\beta, x) = \frac{1}{1 + \sum_{j=2}^q e^{\beta'_j x}}$$

$$G_i(\beta, x) = \frac{e^{\beta'_i x}}{1 + \sum_{j=2}^q e^{\beta'_j x}}, i = 2, \dots, q$$

The coefficients of the model ( $\beta$ ) give the impact of a certain variable on the fraction in a certain category relative to the baseline category (category 1). Table 5 gives the estimation results. The baseline category is “learning-by-doing”.

Women acquire fewer skills through training courses, self-tuition and contacts outside work compared to learning-by-doing than men. Older graduates acquire fewer skills through learning-by-doing and through instruction by co-workers. Immigrants acquire fewer skills through contacts outside work and more skills through self-tuition.

The field of study is an important factor in explaining the skill acquisition strategies used. Graduates from teacher training courses acquire more skills through learning by doing and fewer skills through formal training courses, instruction by co-workers and

self-tuition than graduates of other fields of study. Graduates of language & culture studies also learn fewer skills through training courses and self-tuition compared to learning by-doing but they learn more new skills through instruction by co-workers. Graduates with a master degree acquire less new skills through formal training courses and instruction by co-workers compared to learning-by-doing than graduates with a bachelor degree but they acquire more new skills through self-tuition. Graduates with a higher average grade learn less through instruction by co-workers and more through self-tuition. Graduates with management experience in student's unions and graduates who gained work experience during their studies learn more through contacts outside work. Graduates who did an internship during their studies acquire fewer new skills through formal training courses than graduates who did no internship.

<< Insert table 5 about here >>

The formal match between education and work also has some impact on skills acquisition strategies. Graduates who work in a job that required their own field of study or a related field of study acquire more skills through self-tuition than graduates that are working in a job that requires a different field of study or no specific field of study. Graduates who are working in a job that requires a lower level of study acquire more new skills through instruction by co-workers and graduates working in a job that requires a higher level of education learn more new skills via contacts outside work.

There are clear differences between large firms with more than 100 employees on the one hand and small and medium firms on the other hand. Graduates working in large

firms acquire more new skills through training courses and fewer new skills through contacts outside work.

The size of the skill gap at the start of the job indeed has an impact on the skill acquisition. The higher the skill gap the more important formal training courses, instruction by co-workers and self-tuition are for skills acquisition and the less important is learning by-doing. So graduates that face a big skills gap at the start of their job are less capable to remedy this gap through learning by-doing than graduates with a small skill gap. Apparently graduates need a certain base level of skills needed for the job before they are able to acquire new skills through learning-by-doing.

## **6. Conclusions**

In this study we analysed the settling process in the first job after graduation. We measured the skill gap by the percentage of the tasks graduates could not perform at the start of the job and next analysed how this skill gap is remedied. We found some evidence that more able graduates are selected into more demanding jobs and therefore face a bigger skill gap at the start of the job. The most important form of skill acquisition in the first job is learning by-doing. However, the importance of learning-by-doing for the skill acquisition decreases with the size of the skill gap.

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## Tables and figures

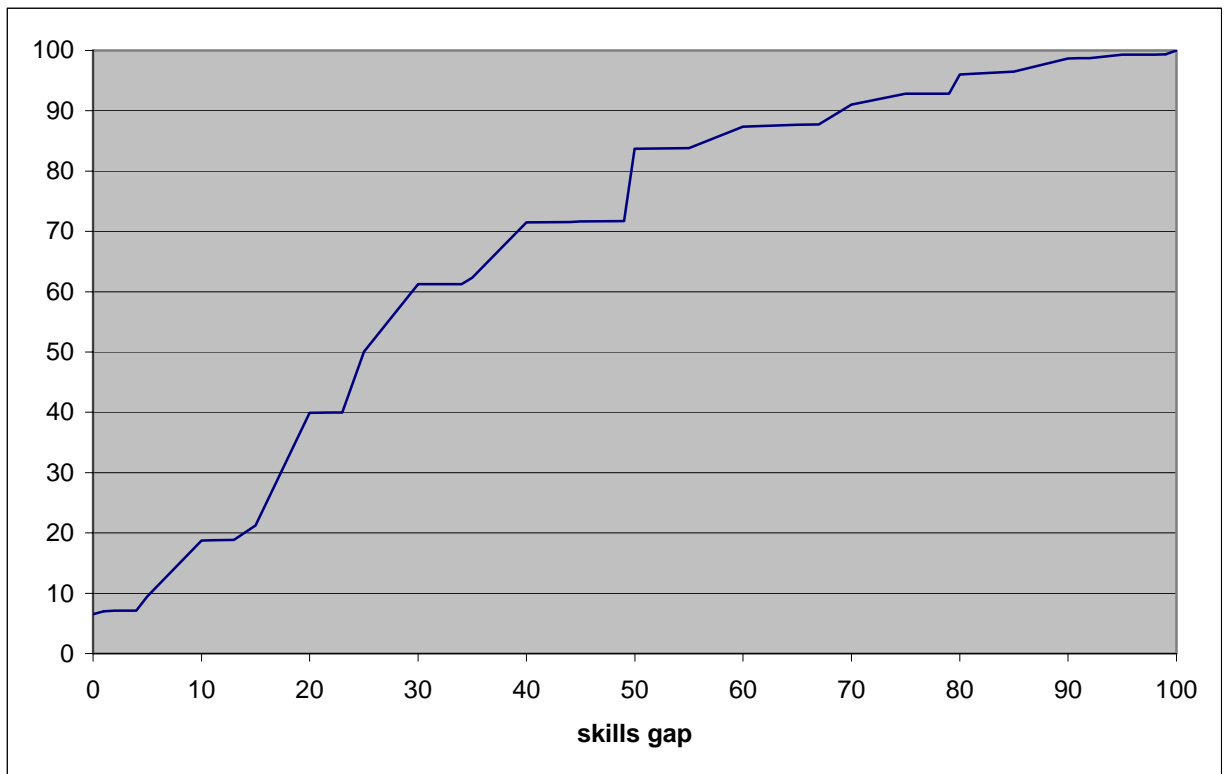


Figure 1: Cumulative distribution of the skills gap

Table 1  
 Degree of utilization<sup>a</sup> and shortage<sup>b</sup> of skills in the current job

	utilization of skills	shortage of skills
	%	%
not at all	5	36
↕	12	41
	21	17
	42	5
	to a very great extent	21
total	100	100

<sup>a</sup> “To what extent are your knowledge and skills utilized your current work?”

<sup>b</sup> “To what extent does your current work demand more knowledge and skills than you can actually offer?”

Table 2  
 Mean skills gap by degree of utilization and degree of skill shortage

	utilization of skills	shortage of skills
	mean	mean
not at all	25	29
↕	31	35
	34	40
	35	38
	to a very great extent	32
total	34	34

Table 3  
Explaining the skills gap (OLS)

	-1	-2	-3
	gap	gap	gap
woman	-5.730 (6.81)***	-2.830 (2.95)***	-2.689 (2.81)***
age	0.976 (1.69)*	0.722 (1.21)	0.588 (0.99)
age squared	-0.019 (2.18)**	-0.012 (1.37)	-0.01 (1.19)
ethnic minority	-3.006 (1.85)*	-4.032 (2.51)**	-4.039 (2.52)**
management experience		-0.436 (0.44)	-0.757 (0.77)
experience abroad		-0.440 (0.43)	-0.485 (0.47)
work experience		-3.221 (3.92)***	-3.427 (4.17)***
internship		3.020 (2.59)***	2.928 (2.51)**
average grade		-0.749 (2.12)**	-0.939 (2.65)***
<i>master degree</i> <sup>1</sup>		2.875 (2.70)***	3.266 (3.05)***
<i>field of study</i> <sup>2</sup>			
teacher courses		-7.857 (2.62)***	-8.152 (2.72)***
technology		3.472 (1.26)	3.998 (1.46)
health		-0.832 (0.29)	-0.555 (0.20)
economics		3.693 (1.35)	4.243 (1.55)
law		9.311 (2.70)***	9.281 (2.70)***
behaviour & society		-2.725 (0.99)	-2.029 (0.74)
language & Culture		-4.330 (1.26)	-2.677 (0.78)
<i>formal match between education and job</i>			
own field or related field of of study required			0.199 (0.20)
higher level required			4.216 (1.49)
lower level required			-3.850 (4.01)***
<i>firm size</i> <sup>3</sup>			
10-99 employees			1.816 (1.09)
100 or more employees			3.453 (2.28)**
Constant	25.688 (2.76)***	26.682 (2.61)***	27.492 (2.65)***
Observations	3210	3210	3210
R-squared	0.02	0.06	0.07

Absolute value of t-statistics in parentheses

\* significant at 10% level; \*\*significant at 5% level; \*\*\*significant at 1% level

<sup>1</sup> reference is bachelor degree, <sup>2</sup> reference is natural science, <sup>3</sup> reference is less than 10 employees

Table 4  
Strategies to reduce the skill gap

	%
formal training courses	10
instruction by co-workers	31
contacts outside work	5
self tuition	13
learning by-doing	42

Table 5  
Explaining the strategies to reduce the skill gap (fractional multinomial logit, reference is learning-by-doing)

	training courses		instruction by coworkers		via contacts outside work		self-tuition	
	Coef.	wald test	Coef.	wald test	Coef.	wald test	Coef.	wald test
woman	-0.15	-2.44 **	-0.01	-0.37	-0.13	-2.01 **	-0.27	-5.86 ***
age	-0.06	-1.63 *	-0.06	-2.53 ***	0.06	1.42	-0.01	-0.47
age squared	0.00	1.95 **	0.00	1.67 *	0.00	-1.40	0.00	0.91
ethnic minority	0.06	0.60 *	0.04	0.66	-0.21	-1.75 *	0.14	1.77 *
<i>field of study</i> <sup>2</sup>								
teacher training courses	-0.68	-3.50 ***	-0.30	-2.47 ***	0.01	0.04	-0.63	-4.43 ***
technology	-0.33	-1.84 *	0.14	1.25	-0.14	-0.66	-0.08	-0.60
economics	-0.37	-2.08 **	0.11	1.04	-0.22	-1.04	-0.29	-2.27 **
health	-0.02	-0.14	0.07	0.65	0.01	0.07	-0.04	-0.31
behaviour & Society	-0.46	-2.58 ***	0.01	0.05	-0.01	-0.07	-0.43	-3.32 ***
language & Culture	-0.63	-2.62 ***	0.28	2.02 **	-0.15	-0.56	-0.40	-2.29 **
law	-0.22	-1.05	0.27	1.88 *	-0.40	-1.50	-0.39	-2.34 **
<i>master degree</i> <sup>1</sup>	-0.14	-2.25 **	-0.09	-2.10 **	0.10	1.38	0.11	2.14 **
average grade	0.02	0.74	-0.03	-2.26 **	0.00	-0.16	0.04	2.47 ***
internship	-0.12	-1.83 *	0.02	0.43	-0.01	-0.08	-0.03	-0.62
work experience	0.00	0.03	-0.08	-2.53 ***	0.21	3.90 ***	0.07	1.69 *
management experience	0.09	1.45	0.01	0.24	0.15	2.35 **	-0.02	-0.48
experience abroad	-0.12	-1.76 *	-0.07	-1.73 *	0.06	0.96	-0.04	-0.78
<i>formal match between education and job</i>								
own field or related field of of study require	0.00	0.01	0.01	0.21	0.05	0.77	0.20	3.75 ***
lower level required	-0.08	-1.21	0.11	2.83 ***	-0.06	-0.90	-0.14	-2.75 *
higher level required	0.01	0.08	0.04	0.34	0.42	2.07 **	0.18	1.23
<i>firm size</i> <sup>3</sup>								
10-99 employees	-0.04	-0.37	0.05	0.70	-0.07	-0.60	-0.06	-0.68
100 or more employees	0.27	2.40 **	0.01	0.09	-0.32	-2.89 ***	-0.06	-0.79
weekly hours	0.01	2.66 ***	0.00	0.29	0.00	-1.29	0.00	-0.75
gap*10	0.03	2.81 ***	0.04	5.93 ***	-0.01	-0.70	0.02	1.86 *
tenure*10	0.03	3.24 ***	-0.01	-1.30	0.01	0.77	0.01	0.74
constant	-0.65	-0.96	0.78	1.92 **	-2.83	-3.98 ***	-0.96	-2.06 **

Absolute value of t-statistics in parentheses

\* significant at 10% level; \*\*significant at 5% level; \*\*\*significant at 1% level

<sup>1</sup> reference is bachelor degree, <sup>2</sup> reference is natural science, <sup>3</sup> reference is less than 10 employees

Table 6  
Descriptive statistics

	mean	standard deviation	n
woman	0.62	0.49	4951
age	26.75	5.81	4945
ethnic minority	0.07	0.26	4732
education	0.11	0.31	4955
technology	0.18	0.39	4955
economics	0.25	0.43	4955
health	0.14	0.35	4955
behaviour & Society	0.21	0.41	4955
language & Culture	0.04	0.20	4955
law	0.03	0.18	4955
master degree	0.32	0.47	4955
average grade	7.31	0.58	4795
internship	0.81	0.39	4943
work experience	0.48	0.50	4904
management experience	0.25	0.44	4892
experience abroad	0.24	0.42	4906
own field or related field of of study required	0.74	0.44	4202
lower level required	0.31	0.46	4199
higher level required	0.02	0.15	4199
10-99 employees	0.23	0.42	3729
100 or more employees	0.69	0.46	3729
weekly hours	32.74	9.45	4158
tenure in months	19.87	29.51	4234