Journal of Education and Work
Vol. 20, No. 1, February 2007, pp. 1–16

Polytechnic graduate placement in Finnish manufacturing

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This paper analyses polytechnic graduate placement in Finnish manufacturing. The paper uses a register-based data source covering white-collar manufacturing workers over the period 1995–2004. Taken together, the results show that wages and job classification are higher for polytechnic graduates, once other covariates are controlled for. Despite this, almost 20% of graduates from polytechnics have been forced to take a position in manufacturing in which they can be considered to be overeducated. Interestingly, Bachelors of Business Administration are not as well placed as Bachelors of Engineering.

Introduction

This paper considers the labour market value of a polytechnic degree in Finland. The polytechnic education reform took place in Finland in the early 1990s. It was a reform of great importance that involved the transformation of the whole secondary education system. Hence, it was the largest single education reform in Finland since the reform of the comprehensive school system in the early 1970s. The polytechnic education reform provides valuable information about the way in which labour markets are able to cope with a large influx of entrants with new qualifications.

The very first students from the newly established polytechnics (*ammattikorkeakoulut* in Finnish) graduated in 1994. Despite the apparent importance of the reform, there have been no empirical evaluations that look at the placement of these new entrants in the labour market by using register-based data sources. This paper aims to fill a part of that gap by focusing on the situation in the Finnish manufacturing sector, which is an important employer sector for students that have graduated from polytechnics.

The Finnish case is of interest from a broader perspective, because it is able to address wider debates about changing skill needs (e.g. Acemoglu, 2002),

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ISSN 1363-9080 (print)/ISSN 1469-9435 (online)/07/010001–16

DOI: 10.1080/13639080601137577

overeducation (e.g. McGuinness, 2006) and, indirectly, binary versus unitary systems of higher education (e.g. Meek, 1991). Because of technological change and globalization, skill needs are changing fast across the industrialized countries. In particular, the demand for highly skilled employees has increased (e.g. Green, 2006, pp. 29–35). Accordingly, polytechnic degrees were introduced in Finland during the early 1990s to meet the new demands of employers for higher skills. The general education level of Finns has improved rapidly. The gap in the education level between the youngest and oldest generations in Finland is nowadays among the highest within the countries of the Organisation for Economic Co-operation and Development (OECD, 2004a). Polytechnic graduates have contributed to this dramatic change in the labour market. It is possible that some employees that have graduated from polytechnics end up in jobs where the tasks do not require their level of skills. This issue has recently been a subject of public debate in Finland. Hence, it is interesting to look at the level of salaries and job quality in positions in which polytechnic graduates end up, compared with employees that have traditionally been in such jobs in the manufacturing sector. In addition, there has been high unemployment in Finland since the great recession of the early 1990s. This may have hampered the placement of graduates from polytechnics, because the number of available vacancies has been limited. These are important policy questions that are able to reveal something about the success of the reform in which Finland transformed itself from a unitary to a binary system of higher education.[1]

In this paper, we discover that wages and job classification are higher for polytechnic graduates, once other covariates are controlled for. Despite this, almost 20% of graduates from polytechnics have been forced to take a position in manufacturing in which they can be considered to be overeducated. Interestingly, Bachelors of Business Administration are not as well placed as Bachelors of Engineering.

The paper proceeds as follows. The next section provides a brief description of the Finnish polytechnic education reform. Then we introduce the data-set that is used to address the issues at hand. The following section reports the results on the placement of graduates from polytechnics in terms of salaries and job quality in manufacturing. This is followed by a concluding section.

Polytechnic education reform

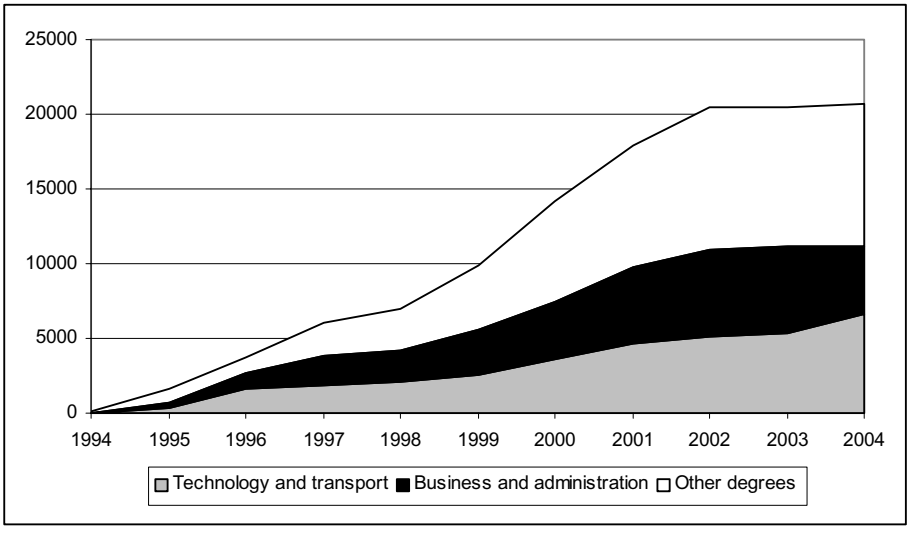
The education system in Finland consists of pre-school education, comprehensive school, post-comprehensive general and vocational education, higher education and adult education (Organisation for Economic Co-operation and Development, 2003). As a result of the polytechnic education reform, the higher education system comprises two parallel sectors, which are traditional universities and polytechnics.[2] Hence, as an outcome of the reform, a completely new network of schools was established. The aim of polytechnic reform was to raise the general educational standard of Finns, to diversify higher education and to respond to new demands of vocational skills that were seen to arise in the labour market.[3]

The reform process started in 1991 with 22 temporary polytechnics introduced in order to gain experience about the system. The first permanent polytechnics went into operation in August 1996. Since August 2000 all polytechnics have been permanent.

The total number of polytechnics is currently 31. Most of them are multidisciplinary and the network of polytechnics covers the whole country. Polytechnic degrees are Bachelor-level higher education degrees with a professional emphasis.[4] These degrees take around 3.5 to 4 years to complete.[5] There were around 33,000 new study places in polytechnics in 2004, for which around 110,000 young people applied.

Graduates from polytechnics have increased their number rapidly. Cumulatively, around 120,000 degrees were taken at the polytechnics by the end of 2004. The composition of graduates from polytechnics is shown in Figure 1. The study fields of technology and transport, and business and administration cover a major part of all degrees.[6]

The most important feature of the reform from the point of view of this paper is that new polytechnic degrees partly replaced some of the older vocational degrees, because they were designed to meet the increasing demand for more highly skilled workers in the very same segments of the labour market. Indeed, vocational schools were a rather diverse group in the early 1990s. Some of them took most students directly from comprehensive schools while others took students from upper secondary schools. Hence, there were differences in the length of education. Broadly speaking,



Note: The graph shows the total number and the composition of degrees taken from polytechnics. The figure is based on the information from the AMKOTA database provided by the Ministry of Education.

Figure 1. Polytechnic degrees in Finland

corresponding vocational degrees and polytechnic degrees were designed by the Ministry of Education to meet the same occupational demands. This is clearly reflected in the fact that the share of employees that graduate with corresponding vocational degrees has declined sharply since the introduction of polytechnics. Indeed, this structural transformation has been the policy that the Ministry of Education has followed. Hence, the comparison that is adopted in this paper is appropriate and relevant from the perspective of education policy. A major difference is that polytechnics belong to the higher education system and corresponding vocational degrees take about two or three years to complete, which means that polytechnic degrees are around a year longer in length.

Therefore, it is interesting to measure the inherent 'value added' that graduates from polytechnics may obtain from their degrees in comparison with workers with corresponding vocational degrees. For the manufacturing sector, these corresponding vocational education degrees are diplomas in business and administration (vocational college) (*merkonomit* in Finnish) and engineering qualifications from a vocational college (*opistoinsinöörit* in Finnish). It is reasonable to expect that graduates from polytechnics are able to obtain some amount of positive 'value added' from their degrees, because these degrees take more time to complete than the corresponding vocational degrees. This comparison can be made in terms of salaries and job quality in manufacturing.[7]

Surprisingly, there have not been that many evaluations of polytechnic graduate placement beyond the ones summarized by OECD (2003). Importantly, those studies do not contain an analysis of the placement of graduates from polytechnics based on register-based data sources. In contrast, the studies summarized and discussed by OECD (2003) are almost exclusively based on various surveys conducted among graduates from polytechnics that reflect the graduates' own subjective views about the content of their jobs and overall placement in the labour market.[8] Hence, it is important to complement these subjective measures with objective measures that are based on register-based data sources. In particular, the empirical studies that use subjective measures typically do not include salary, which is an important attribute of the employment contract.

Data

The data for this paper come from the wage survey of the Finnish employers' association. The survey is from TT (*Teollisuus ja työnantajat* in Finnish) covering non-manual workers in the manufacturing sector.[9] There are separate wage surveys for manual (hourly paid) workers and non-manual (salaried) workers by TT. This paper uses the data for non-manual workers, because it is the sector that hires students from polytechnics. The wage information in this survey originates directly from the payroll records of companies, so it can be characterized as administrative or register-based data. Therefore, the data are usually considered to be very accurate by their very nature, and the sources of measurement error in surveys of individual workers are not expected to be a great problem.

The data are not identical to the whole of manufacturing. They cover the members of TT, but the coverage of TT members in manufacturing is high, because manufacturing firms are large and well organised. It is compulsory for the member firms of TT to provide information on the salaries and the characteristics of workers employed, for collective bargaining purposes. The number of salaried workers in the data is around 190,000 for the year 2004.[10]

The data provide information about salaries and working time, and some information about employees' individual characteristics (such as age and gender) that are relevant covariates for our purposes. Importantly, the data include an education code by using classification by Statistics Finland. This enables us to identify employees that have a polytechnic degree or a corresponding vocational degree.[11] The data cover one month of each year for non-manual (salaried) manufacturing workers (September before 1993 and December in and after 1993). This paper uses the data for the years 1995–2004.

The wage measure that is used in this paper is the monthly rate (salary) for non-manual workers. The monthly rate for non-manual workers in manufacturing is defined as 'the fixed basic monthly salary paid for regular working time'. This fixed salary is based on the 'demands' of jobs or tasks performed that are stipulated by employers and employees by means of collective bargaining and the contract-based wages determined for these 'demand classes' of jobs, and on a person-specific component which is based on personal competence.[12]

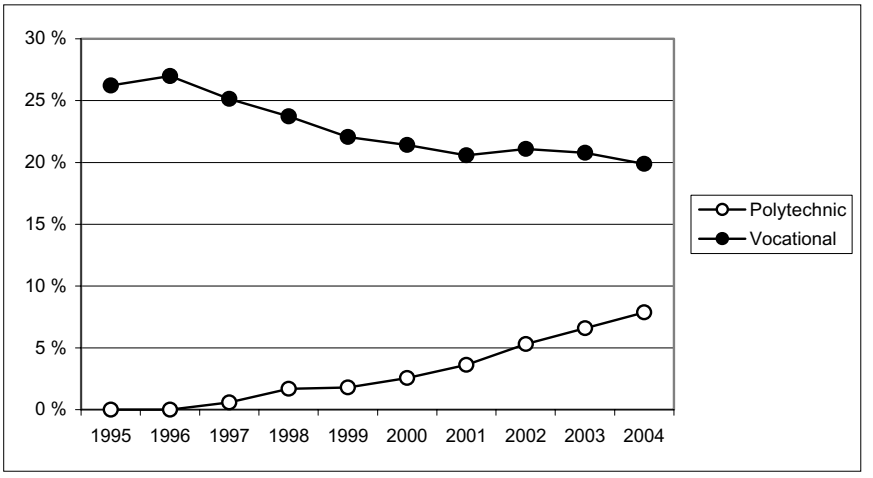
Placement of graduates from polytechnics

Basic facts

The first non-manual manufacturing workers that have graduated from polytechnic schools appeared in the data for 1997. Hence, it took only three years for manufacturing firms to start hiring graduates from polytechnics. Surpassing other degrees by a wide margin, the two most important degrees from polytechnics that appear in the data are Bachelors of Business Administration (*tradenomit* in Finnish) and Bachelors of Engineering (*AMK-insinöörit* in Finnish).[13] These two degrees cover around 90% of all degrees from polytechnics that appear in the data. This ratio has been almost constant over time.

Therefore the role of other degrees is minor. For this reason, it is convenient and relatively straightforward to compare graduates from polytechnic schools with workers with corresponding vocational degrees. As noted earlier, these corresponding vocational degrees are diplomas in business and administration (vocational college) and engineering qualifications from a vocational college.

The total number of employees with Bachelor of Business Administration and Bachelor of Engineering degrees is around 15,000 in the data in 2004. This figure represents about 25% of all graduates from polytechnics with these particular degrees over the period 1994–2004.[14] This confirms that manufacturing has been an important employer sector for graduates from polytechnics.[15]



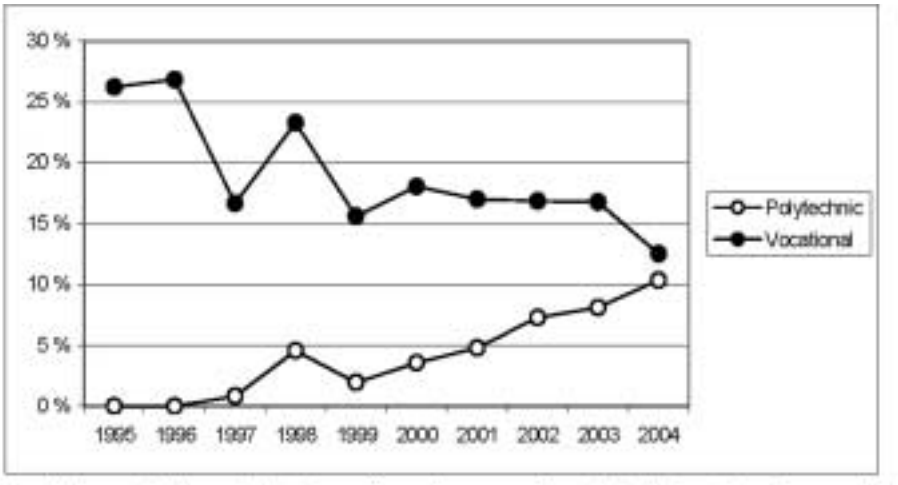
Note: The graph shows the share of employees with polytechnic education and the share of employees that have corresponding vocational education of the total non-manual workforce in manufacturing.

Figure 2. Composition of non-manual workforce in manufacturing

The proportion of workers with polytechnic education of the total salaried non-manual workforce in the sector shows a rapid increase over the period (Figure 2). The share of graduates from polytechnics was almost 8% in 2004. At the same time, the share of employees with corresponding vocational degrees that were partly replaced by polytechnic degrees shows a steady decline up to 2001. However, their share has been almost constant for the years 2001–2004. The share of the corresponding vocational degrees was 20% in 2004. Interestingly, it seems that there has been an almost opposite change in these shares.

The number of salaried workers with a polytechnic education among new entrants to companies in manufacturing shows a similar increase (Figure 3).[16] This share was almost 11% in 2004. The share of employees with vocational degrees that were partly replaced by the degrees from polytechnics shows a substantial decline at the same time. The share of employees with corresponding vocational degrees was around 13% in 2004. It is interesting to note that there has also been an almost opposite change in these shares.

Based on these figures, it seems that the demand for labour has shifted from employees with corresponding vocational degrees to employees that have graduated from polytechnic schools after the introduction of polytechnic education. This is in line with the thinking that employees with these degrees have been relatively close substitutes for each other for manufacturing companies. In a sense, this pattern is what should be expected, given that polytechnic degrees were introduced to meet the demand for more skilled workers in the same segments of the labour market that have traditionally been occupied by employees with corresponding vocational education. Of course, the rising number of employees holding polytechnic degrees could equally



Note: The graph shows the share of employees with polytechnic education and the share of employees that have corresponding vocational education of the total number of new non-manual recruits in manufacturing.

Figure 3. Composition of new non-manual recruits in manufacturing

simply represent the change in supply, with more individuals obtaining polytechnic degrees and employers hiring whoever is available for the manufacturing sector.

Descriptive evidence

Table 1 documents the placement of graduates from polytechnics in terms of (starting) salaries in comparison with the placement of employees with corresponding vocational degrees for the year 2004. Firm-specific factors matter for the level of salaries. For this reason, it is interesting to analyse the placement of graduates from polytechnics in salary deciles within each firm, because in this way we are able to take firm-specific factors into account.[17] Taken together, the raw data suggest that polytechnic graduates are not as well placed as employees with corresponding vocational degrees.

An attractive feature of the data for the purposes of this paper is that the 'demands' of various jobs or tasks are classified and stipulated by means of collective bargaining in manufacturing. Hence, the classification of jobs and tasks is jointly agreed by the representatives of employees and employers. The very same procedure is executed in all firms that are members of TT. This classification is particularly useful for our purposes, because it is based on the real content of each job, not on occupation, job title or the level of an employee's education in the particular position. Therefore, an employee's high level of education does not necessarily imply a high-level job in this classification. In other words, there are no a priori obstacles whatsoever, for instance, for a case in which a white-collar worker without a degree could not be in the highest job quality category ('manager').

Table 1. Placement in terms of salaries

	1	2	3	4	5	6	7	8	9	10
Overall salary deciles										
Polytechnic	5.41	6.98	10.03	14.1	15.81	15.96	13.8	9.93	5.97	2.02
Vocational	5.39	7.88	8.89	8.94	8.17	9.07	10.7	13.47	14.91	12.59
Salary deciles for new recruits										
Polytechnic	14.06	12.08	13.84	16.7	14.81	9.61	8.37	5.24	3.92	1.37
Vocational	12.25	9.65	8.46	9.26	8.65	6.47	8.65	10.03	13.71	12.86
Overall salary deciles within each firm										
Polytechnic	10.3	15.69	15.73	14.34	11.42	10.28	8.33	6.63	4.74	2.54
Vocational	8.32	8.88	8.82	8.83	8.73	9.73	10.57	11.42	12.5	12.22
Salary deciles within each firm for new recruits										
Polytechnic	22.57	21.2	13.35	13.09	8.33	7.23	5.46	3.75	3.35	1.67
Vocational	15.93	9.49	9.23	8	6.74	8.46	8.84	9.3	11.29	12.71

Notes: The placement of graduates from polytechnics and employees with corresponding vocational degrees in salary deciles in manufacturing in 2004. The figures are based on the raw data. Hence, the relevant covariates have not been taken into account.

There is a five-category classification: 'managers' (meaning overall management of a firm or product line), 'specialists' (demanding development and planning tasks), 'experts' (application of procedures and more standard planning tasks), 'performers' (e.g. standard office work and customer service) and 'manual workers' (e.g. construction and repairing). Graduates from polytechnics are considered to be overeducated in this paper when they are located as 'performers' or 'manual workers', because those particular tasks clearly do not require their education level.[18] The job quality classification is available in the data for white-collar manufacturing workers for the years 2002–2004.

Polytechnic graduates are better placed in terms of job quality than graduates from vocational schools with corresponding degrees, even without taking into account the relevant covariates (Table 2). Hence, the share of graduates from polytechnics that are located in 'performers'' positions is 18%, but this same figure is 23% for employees with corresponding vocational degrees. The number of graduates from polytechnics that are employed as 'manual workers' is almost zero. This points out that the wage survey for (hourly paid) manual manufacturing workers by TT is largely not relevant in the investigation of the placement of graduates from polytechnics.[19] Most of them are positioned as 'experts'. The placement, however, is not perfect, because there is quite a large share (almost 20%) of graduates from polytechnics that are in tasks and jobs that are classified as 'performer' tasks and jobs.[20]

As expected, new recruits are worse placed. Accordingly, of new recruits to companies, the share of graduates from polytechnics that are in 'performer' jobs is nearly 30%. In this sense, there are some signs of the existence of overeducation in the labour market in manufacturing for graduates from polytechnics. Not all degrees from polytechnics are equal in terms of job quality. Interestingly, Bachelors of Business Administration are not as well placed as Bachelors of Engineering in terms of job quality in manufacturing (Table 3). Therefore, around 38% of Bachelors of Business Administration are located in 'performer' jobs. This same figure is merely around 8% for Bachelors of Engineering. Hence, the difference is substantial. Based on the evidence, it seems that polytechnics have been more successful in filling a specific niche, that is, technical experts in manufacturing.

Because this classification is available in the data for three years, we can say something about the transitions of individual graduates from polytechnics between these job quality categories. The amount of mobility is not insignificant. For instance, it

Table 2. Placement in terms of job quality

	Manager ('johtaja')	Specialist ('erityisasiantuntija')	Expert ('asiantuntija')	Performer ('asianhoitaja')	Manual worker ('työntekijä')
Overall					
Polytechnic	1.59	17.68	62.23	18.33	0.17
Vocational	6.13	30	40.43	23.02	0.43

Notes: The placement of graduates from polytechnics and employees with corresponding vocational degrees in various tasks and jobs in terms of job quality in manufacturing in 2004.

Table 3. Placement in terms of job quality

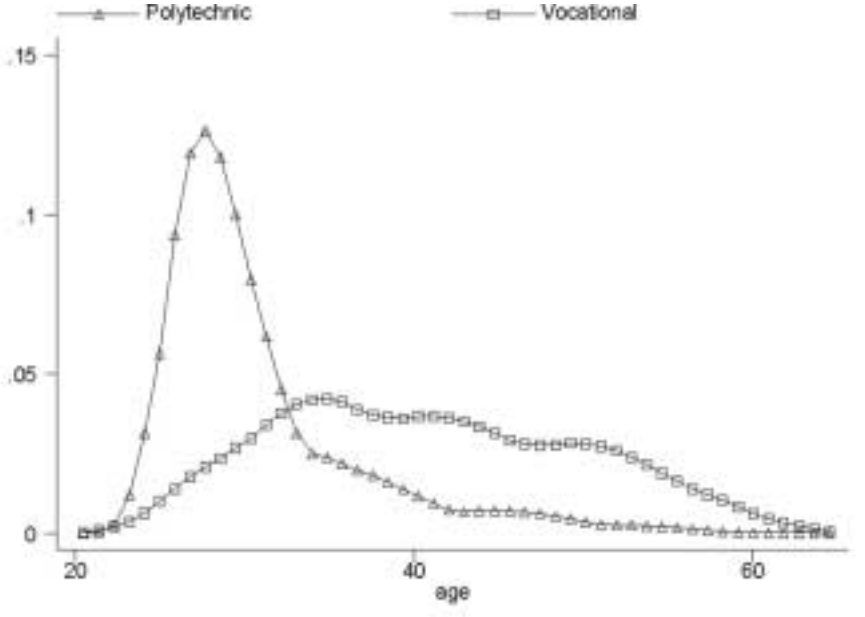
	Manager (‘johtaja’)	Specialist (‘erityisasiantuntija’)	Expert (‘asiantuntija’)	Performer (‘asianhoitaja’)	Manual worker (‘työntekijä’)
Business and administration					
Overall					
Polytechnic	0.91	12.72	48.19	38.17	0
Vocational	2.75	13.54	41.07	41.9	0.74
Engineering					
Overall					
Polytechnic	1.97	20.3	69.76	7.76	0.21
Vocational	9.8	47.92	39.72	2.47	0.08

Notes: The placement of graduates from polytechnics and employees with corresponding vocational degrees in various tasks and jobs in terms of job quality in manufacturing in 2004.

turns out that around 85% of graduates from polytechnics who had 'performer' tasks and jobs in 2002 were at this same level in 2003 and around 5% of them have moved up to 'experts'.[21] The downside is that a large proportion of the graduates from polytechnic schools are stuck in tasks and jobs that do not require their skill level. Most of the remaining 10% of polytechnic graduates have moved out of the manufacturing sector (9%), which confirms that the labour market for young employees is dynamic. A smaller share (1%) have fallen even further down the occupation hierarchy to 'manual workers' and none have managed to obtain higher manager or specialist status.

Analysing differences

Descriptive evidence based on the raw data (Tables 1–3) does not take into account the relevant covariates that have a substantial influence on the placement of employees in terms of salaries and job quality categories. An obvious covariate is the employee's age, owing to the fact that employees with corresponding vocational degrees are, on average, much older than employees that have graduated from polytechnic schools. This originates from the fact that the first students graduated from polytechnics in 1994. Figure 4 provides an illustration of the substantial age



Note: The graph shows the age distribution of employees with polytechnic degrees and corresponding vocational degrees. The figure is drawn for those aged between 20–65 covering the years 1995–2004. The figure is based on the Kernel density estimate that is a non-parametric histogram presentation of the distribution.

Figure 4. Differences in age profiles of graduates

differences between graduates from polytechnics and employees with corresponding vocational degrees. These age differences are important for placement, because salaries rise very fast during the early years in the labour market.

We restrict the analysis of differences to those new recruits to manufacturing companies that are aged between 20–30, in order to facilitate a better comparability of workers with different degrees. In addition, the salary comparisons are performed for the year 2000 in order to ensure that there are enough new graduates with engineering qualifications from a vocational college. The simplest way to take into account the large prevailing age differences between these groups of the labour force is to compare the wages of employees with the two qualifications in the same age group. For instance, when we calculate the average (starting) wage level of new recruits aged between 20–30 for the year 2000, we discover that the average wage level is 1973 euros per month for employees with a polytechnic degree. In contrast, the average wage level is 1857 euros per month for employees with a corresponding vocational degree. Hence, our first estimate is that polytechnic graduate starting salaries are higher by 116 euros per month (or around 6%).

To further quantify the wage effects of having a polytechnic degree, we estimated the Mincerian wage equation, which is one of the most estimated relationships in applied economics (e.g. Willis, 1986). The relevant covariates that are available in the data are gender, age, hours of work (an indicator for those that work fewer than 35 hours weekly to capture part-time workers), size of firm (five categories), province of residence (seven categories) and an indicator for urban areas.[22] The factors that are included as explanatory variables are the 'usual suspects' from the literature that should have a bearing on the determination of wages. In particular, we explained the logarithm of the monthly wage for new recruits aged between 20–30 in the year 2000 with the indicators for the education level (including the relevant covariates as unreported control variables). The results from the OLS regression reveal that polytechnic graduates obtain about 3% higher starting wages than employees with corresponding vocational degrees, other things being equal (Table 4, Column 1). Interestingly, it turns out that the wage gain is almost 6% for Bachelors of Engineering and less than 1% for Bachelors of Business Administration (Table 4, Columns 2–3). This finding is in line with the fact that Bachelors of Engineering are better placed in terms of job quality categories than Bachelors of Business Administration (Table 3). The estimated effects are very short-term gains measured in terms of starting salaries. For this reason, it is difficult to say whether the wage gain is a sufficient pay-off to justify the extra year in education involved when one acquires a polytechnic degree. It is not yet possible to estimate the long-term gains from having a polytechnic degree. Nevertheless, it is highly likely that this relatively small wage gain from having a polytechnic degree accumulates a lot over time, for instance, because employees with polytechnic degrees may obtain promotions more quickly than those employees with older vocational degrees. After all, polytechnic degrees were designed by the Ministry of Education to meet the new demands of employers for higher skills.

To check the robustness of the conclusions regarding the placement in terms of job quality, we have estimated ordered Probit models for job quality categories for new

Table 4. The OLS results for wage equations

	All	Engineering	Business and administration
Polytechnic degree	0.031** (3.82)	0.057*** (5.96)	0.006 (0.40)
R^2	0.558	0.558	0.557

Notes: The models are estimated for new recruits aged 20–30 in the year 2000. Robust t statistics in parentheses. * significant at 10%; ** significant at 5%; *** significant at 1%. The models include the unreported control variables, as listed in the text.

recruits aged between 20–30 in the year 2004. By estimating ordered Probit models we are able to control for the same relevant covariates as in the analysis of the placement in terms of starting salaries. These results convey the same overall picture of the placement of polytechnic graduates as the descriptive evidence. This is not surprising, given that polytechnic graduates are better placed in terms of job quality, even without taking into account the relevant covariates (Table 2). The disadvantage of ordered Probit models is that it is difficult to interpret the coefficients that are obtained from ordered Probit models. This is in contrast with the Mincerian wage equations, in which it is possible to obtain an estimate for the percentage difference in wages between the polytechnic and vocational degree graduates.

Conclusions

This paper analyses polytechnic graduate placement in Finnish manufacturing by using a register-based data source from employers' wage surveys. Taken together, the results show that wages and job classification are higher for polytechnic graduates, once other covariates are controlled for. In this sense, the polytechnics that were introduced in 1991 in order to diversify higher education and satisfy demands for higher vocational skills have been a success. Despite this, almost 20% of polytechnic graduates have been forced to take a position in which they can be considered to be overeducated. The most likely reason for this is the high unemployment that has persisted since the great recession of the early 1990s, which has limited the number of available vacancies for recently graduated students. Interestingly, Bachelors of Business Administration are not as well placed as Bachelors of Engineering. Based on the evidence, it seems that polytechnics have been more successful in filling a specific niche, that is, as technical experts in manufacturing.

The main limitations of the paper are that the impact of polytechnic degrees on labour market outcomes was estimated on the basis of individuals working in a minority sector of the economy, and the impact in the service sector could tell a very different story. In particular, it is possible that the estimates presented for manufacturing could be subject to selection bias, if the unobserved factors that determine whether polytechnic graduates choose to work in the manufacturing sector rather than the service sector also influence their wages. In addition, all individuals in the data that

we used in this paper were employed in manufacturing. Hence, it was not possible to analyse unemployment among graduates from polytechnics and it is not yet possible to evaluate the long-term gains from the reform. These are important questions for future research.

Acknowledgements

This study has been financed by the Ministry of Education. I am grateful to Mika Haapanen, Ulla Hämäläinen and Roope Uusitalo for comments. In addition, I would like to thank the two anonymous referees for valuable comments and suggestions that have improved the paper. Paul A. Dillingham has kindly checked the language. The usual disclaimer applies.

Notes

1. All individuals in the data that we are using in this paper are employed in manufacturing. Therefore, it is not possible to investigate unemployment among graduates from polytechnics.
2. Unlike traditional universities, polytechnic schools are not engaged in academic research. Interestingly, the OECD (2004b) recommends that there should be research at polytechnics.
3. The Ministry of Education (1990), among others, has stated these objectives. An additional reason for the introduction of polytechnic education was the large number of matriculated students who did not have a student place in higher education (Lampinen, 2000). This was caused by the rapid increase in matriculated students from upper secondary schools.
4. These degrees are equivalent to the Bachelor of Arts (Hons) or Bachelor of Science (Hons) degrees in the UK, the French *Licence*, the German *Diplom Fachhochschule* and the Dutch *HBO Diploma*.
5. The average actual completion time was 3.9 years in 2004. The figures reported in this section of the paper on polytechnics are based on the so-called AMKOTA database maintained by the Ministry of Education to document the performance of polytechnic schools.
6. Most of the 'other degrees' in Figure 1 are in the study fields of health and social services, but those degrees are not relevant for the manufacturing sector. This is shown later.
7. Card (1999) provides a survey of the economic literature on the return on education. Uusitalo (1999) provides estimates for Finland.
8. Stenström *et al.* (2005) provide a recent study based on a postal survey on the issue along these lines. The study covers the study fields of administration and business, technology and transport, and health and social services. The postal survey was conducted among those graduates that had left their polytechnics about three years earlier, in 2000. In addition, there have been some studies that look at the placement of graduates from certain polytechnic schools, but those studies do not provide an overall picture of the placement of graduates from polytechnics in the Finnish labour market.
9. TT (the central organization for manufacturing sector employers) and PT (the central organization for service sector employers) merged in spring 2004. The new employers' association is called the Confederation of Finnish Industries (*Elinkeinoelämän keskusliitto* in Finnish). However, these wage surveys are still conducted separately for each sector. Unfortunately, the wage survey by PT does not include an education code that would be detailed enough to identify graduates from polytechnics. For this reason, it is not possible to study the placement of graduates from polytechnics in the service sector. In addition, the service sector data do not contain information about job quality categories that are unique to manufacturing.

10. This is around 9% of all salaried workers in the Finnish labour market.
11. However, the education code in the data is not detailed enough to identify the individual polytechnic schools from which the workers with polytechnic degrees have graduated. Graduation dates are not fully recorded. For instance, in the data for the year 2004, information on graduation dates is missing for around 20% of all non-manual workers in the data. In addition, the data only contain information on the most recent degree taken.
12. One of the fundamental features of the Finnish wage formation is that the collective labour contracts contain a set of minimum wages for different job-complexity levels. Hence, there is no general minimum wage in the country. It is important to note that collective labour contracts put only an effective floor on wage levels in particular occupations (or jobs). This means that there are no upper limits for wages as such. Pekkarinen and Vartiainen (2006) provide a description of the system.
13. OECD (2004b) notes that the introduction of polytechnic education has led to a higher share of graduates in engineering-related fields in Finland compared with other OECD countries.
14. The total number of degrees for the years 1994–2004 is obtained from the AMKOTA database.
15. OECD (2003) reports that around 74% of employed polytechnic graduates had positions in the private sector.
16. There is a measure of tenure in the data (i.e. time that employees have spent with their current employer). However, the fact that a person is classified as a 'new recruit' by this criterion does not necessarily mean that one is at his/her first job in manufacturing. This is a problem, because by focusing on new recruits, we want to study the placement in terms of starting salaries. Therefore, we define 'new recruits' in this paper as those employees that are in the data for their first year. The results that follow are qualitatively the same when 'new recruits' are defined based on a measure of tenure.
17. The measure is simply calculated by computing the location of each worker in wage deciles of the firm in which the person is currently employed. We dropped manufacturing firms that have fewer than 25 employees. The number of employees in these firms is 9348 over the period 1995–2004. The data that we are using are not a linked employer–employee data-set in the sense that there is not much information about firm characteristics in the data.
18. A comprehensive report by the Ministry of Education (1990) for the Finnish parliament on the reform of the education system clearly states (p. 93) that the aim of polytechnic schools will be to educate 'experts' for the needs of business. We follow this practical definition of overeducation that originates directly from the policy goals set for the introduction of polytechnic education. McGuinness (2006) provides a survey of different ways to define and measure overeducation in the literature. The only previous study on overeducation in Finland (Hämäläinen, 2003) discovered that around 10% of employed university graduates feel that they are overeducated five years after graduation.
19. We have looked at this data source. The number of graduates from polytechnics is 1325 in the wage survey for manual (hourly paid) manufacturing workers for the year 2004. This figure is less than 0.5% of the total manual manufacturing workforce. Around 70% of graduates from polytechnics that appear in the data are Bachelors of Business Administration or Bachelors of Engineering.
20. Stenström *et al.* (2005) report that 22% of graduates from polytechnics have 'performer' tasks or jobs three years after graduation. This figure is based on the respondents' subjective valuation.
21. These figures are almost similar for changes in the years 2003–2004.
22. We include an indicator for urban areas, because the collective agreements typically stipulate slightly higher pay in the urban areas where the costs of living (such as housing) are presumably higher.

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