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# Cross-sector collaboration in upper secondary school vocational education: experiences from two industrial towns in Sweden and Norway

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## ABSTRACT

This study explores industry–education collaboration on vocational education and training (VET) in upper secondary schools in Sweden and Norway, with particular attention to the initiatives, organisation and operational management, and aspects of robustness and lock-in effects. The case studies include two upper secondary schools situated in manufacturing based towns, which are similar in size and industrial structure, and have the dual system of education. Pupils come from these towns and other places in the surrounding region. The research design is based on a mixed-method approach, including interviews and other sources of information from schools and industry. This covered organisational and operational levels, corporate motives and arrangements, industrial composition, labour market conditions, and other regional and national characteristics. The results demonstrated how shared goals of improving the reputation and quality of VET and meeting industries' needs for skills formed in two distinct organisational models. These findings raise concerns about the robustness of these collaborations, since how changes occur in companies' economic situations may affect their ability and motivation to participate in VET training. The authors conclude that the arrangements have had success but may create a lock-in-situation regarding the companies' ability to restructure and develop new skills for new sectors.

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VET; industry–school collaboration; duality; robustness; corporate strategies

## Introduction

In many European countries, vocational education with training (VET) at upper secondary level is separated from theoretical learning. Consequently, VET has been excluded from recent endorsements and expansion of academic education careers and competition for pupils (Brockmann and Laurie 2016). In addition, VET has traditionally not managed to meet the requirements for more advanced occupation-specific practices and broader competences such as teamwork, communication skills and social capabilities, which are relevant for workplaces in general (OECD 2015). In response, VET has been restructured to offer dual theoretical and practical education programmes. This dual approach has three aspects: (1) a combination of theoretical and practical content; (2) a combination of skills that enable the combination of VET with general studies, which can be built on when applying for higher education; and (3) cross-sectoral arrangements with alternation between the classroom and the workplace throughout the school year. The dual approach of practical and theoretical content was initially

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supported by initiatives introduced during the European Union's (EU) Lisbon Conference on Education in 2000, as a strategy to improve the reputation, quality and number of applicants to VET programmes across Europe (Leney and Green 2005; European Commission 2013). The EU later addressed the VET issue on several occasions; for instance, the Riga Conclusions 2015 detailed the European Commission's requirements for the provision of VET in EU states for the period 2015–2020 (European Union 2015; Arribas 2016). This policy context for school–industry collaborations on VET programmes constitutes an important background to the discussion in this article.

According to the EU, strengthening collaboration between school and industry for education programmes is a method for increasing the competitiveness of industries (European Commission 2010). A similar debate has arisen in Sweden and Norway, about how industry stakeholder organisations and the national governments have claimed there are national structural deficits in skilled labour with upper secondary school vocational training (Meld. St. 20. 2012–2013; Industrirådet 2014). These bodies have maintained that such deficits have been particularly evident in specialised technological and blue-collar manufacturing skills. A lack of appropriate labour is a capacity issue that significantly hinders dynamic socio-economic development. This background is also important to the debate on how VET can compete for resources, gain attractiveness, or be combined with educational programmes with a higher theoretical content (Brockman and Laurie 2016).

The particular conditions and needs concerning upper secondary school education with VET in the two case studies are relevant. The development of work processes and products of the engineering-based manufacturing sector in high-cost economies, such as Sweden and Norway, have transformed the qualification structure through increasing demands for technical professions, teamwork skills, quality assurance, and workplace values. Skills supply represents an essential competitive condition for engineering companies in global markets and motivates their involvement in VET collaborations.

The focus of this article is the organisation and operations of industry–school collaborations on VET in the context of dual systems. In the literature, such collaborations have been analysed at the state level down to local operations (e.g. Konkola et al. 2007; Harreveld and Singh 2009; Keep 2012; Brockmann and Laurie 2016; Ehlen, van der Klink, and Boshuizen 2016; Flynn, Pillay, and Watters 2016). Some studies have focused on the development and institutional arrangements of vocational training with reference to Norway or Sweden (e.g. Antikainen 2006; Michelsen, Olsen, and Høst 2014; Olsen, Høst, and Tønder 2014; Dobbins and Busemeyer 2015; Lundh Nilsson and Nilsson 2015). These have mainly concerned the institutional perspective. Other studies have tended to discuss practical training performance (Schøne 2006). However, these studies have rarely explained how the collaborative initiatives are shaped at the operational level by cross-sector collaboration, corporate structure, strategies, or by the geographical context in which training takes place (e.g. Fuller and Unwin 2003).

The industry–school collaboration at the operational and organisational level presented in this article complements the above-mentioned discussions. VET collaborations share critical challenges, including the robustness of the initiatives in terms of organisation and ability to deliver under fluctuating economic market conditions and future demand.

In this article, we explore organisations and operations for cross-sector industry–school collaboration on VET in secondary schools. The empirical cases from Sweden and Norway, includes two towns with strong industrial traditions. Combining literatures across social sciences with a research background in economic and regional geography, we demonstrate the need for sensitivity to nuances of corporate arrangements, industries, regions and processes over time.

The article has six sections. The next section presents the background to the debate on industry–school VET collaboration, which covers a range of topics and perspectives based on existing research literature. Thereafter, we explain our methodology. The empirical evidence from the respective cases is outlined in the fourth and fifth sections. The concluding discussion in the final section addresses theories and perspectives, and we reflect on further ways to investigate the dynamics of school–industry collaboration on VET.

## Theoretical background: drivers, collaborations, and commitments

Industry–school collaborations on VET can facilitate access to advanced technology and costly equipment, and provide important training for pupils (OECD 2015). However, the contrasting logic of private and public activities poses challenges for the development and maintenance of long-term and coherent goal-oriented work (Le Ber and Branzei 2010). VET requires co-ordination capacities across institutions, whereby their pedagogical expertise and technological expertise are combined. Capabilities and challenges relating to these organisational arrangements are discussed below.

We first address the question of what motivates companies to become involved in education. Part of the answer is linked to expectations and commitments and how these inform institutional set-ups. Education programmes in the Nordic countries are designed to ensure equity, inclusion, social mobility, and lifelong learning (Antikainen 2006). In Sweden, VET is fully integrated into the comprehensive secondary school system (Dobbins and Busemeyer 2015), which means that most theoretical and practical education takes place at school. However, this education is often combined with shorter internships in companies. In Norway, the one VET educational model that includes general studies (TAF; *tekniske allmenne fag*, meaning technical general subjects) is based on direct involvement by companies offering workplace-based apprenticeships (Norwegian Ministry of Education and Research 2007). Both the Norwegian and Swedish case models rely on what Leney and Green (2005) define as a social partnership, a collaborative state in which parties from the public sector and private sector join forces (Busemeyer and Trampusch 2012).

Companies' involvement in education and apprenticeship concerns both their priorities and capacity. However, many companies that face a difficult market situation have less capacity to address matters other than those purely concerning business. Furthermore, the choices relating to engagement depend on decision-makers at central headquarters, which may be distant from production sites. This leads to the argument that people make these decisions, not organisations, which indicates a negotiated collective decision process within the organisation (Simon 1991). In some cases, a company's motivation for engagement can even be characterised as a form of corporate citizenship and seen as a social contribution from a local community perspective (Aras and Crowther 2010). Company managers, stakeholder organisations, the local chambers of commerce and other business community networks, and educational and political institutions may all share a vision of doing something that strengthens their efforts to achieve professional targets as well as to make a difference to their local community.

Companies involved in industry–school collaborations have found this a suitable way of identifying, testing, and building relationships with candidates whom they may later wish to recruit (OECD 2015). From a company perspective, apprenticeship involvement not only concerns the company's social conscience and interest to support their community, but also its ability to meet a specific skill or technological need. This contributes to development of practical skills that can be applied in other workplaces. Situations of 'poaching', whereby other companies recruit candidates after graduation, may represent some risk (Euler 2013).

Although industry–school collaboration on VET is considered to contribute important resources, it is also important to reflect on the limitations and vulnerabilities of such arrangements. Although workplace training generally introduces skills that will facilitate pupils' work opportunities, certain company-specific skills may be less transferable for use in other workplaces than broader technological insights. The content defined by the parties represents a lock-in risk though education programmes becoming too dependent on the needs of specific companies or industries. Dependency on company commitments may also lead to vulnerability in times of economic recession, and to deficits in apprenticeship positions or job vacancies.

When considering the motivation for involvement in societal tasks from a company perspective, Porter and Kramer (2011) and Shaw and de Bruin (2013) referred to this as a strategy whereby companies actively engage in environmental, social, cultural, educational, and health care concerns. These actions can be seen as a form of social engagement, but are simultaneously driven by a wish to strengthen the reputation of the company and its brand. This may also be an important component of developing an

attractive workplace and being recognised for these efforts. Together, the above-discussed aspects explain why companies choose to become involved in and contribute resources to VET.

### **Cases, research design, and data collection methods**

Almost all young people in Sweden and Norway enrol in secondary school education programmes. In Sweden, an increasing proportion of secondary school pupils choose vocational training, and in 2013 this proportion was almost one-third. Of this group, about half were in programmes with a variety of technical profiles. In 2013, c.50,000 pupils took VET courses (Skolverket 2014). The corresponding figure for Norway in 2013 was 24,000 (Statistics Norway 2014a), which was the same proportion as in Sweden (i.e. one-third of all secondary school pupils).

The studied industry–school VET collaborations in Sweden and Norway show contrasting as well as complementary characteristics. Comparative aspects refer to the contextual and underlying factors conditioning the cross-sector collaborations in the VET programmes. The findings from our two cases cover the start-up, development, and resilience of industry–school collaboration arrangements for VET programmes in Norway and Sweden. The two collaborations have three main dimensions. First, they were studied in towns with similar industrial profiles and of similar size (20,000–30,000 inhabitants) located in traditional industrial regions. Both towns have branches of large global engineering companies with a strong industrial tradition. Second, both collaborations represent pioneer examples of industry–school collaborations and had dual-model variants of VET. Third, the Swedish case represents a school-based organisational model for the VET training arrangement, whereas the Norwegian case was a combined school and workplace based apprenticeship model. The selected cases were primarily examined using a within-case analysis with some cross-case references. Our data were compiled with a detailed project history using a mixed methods approach.

The Swedish case study was based on 15 interviews conducted in 2013 and 2014 with local politicians, planners, company representatives from the engineering industry, and management at the local secondary school. In 2014, the study results were communicated to local actors, who gave important feedback that gave us a thorough understanding of the processes and challenges faced by the industry–school VET collaboration (Hermelin and Edwardsson 2014). In addition, a visit was made in 2016, when we held follow-up conversations with management and teachers at the studied schools.

For the Norwegian case, the data collection was based on interviews in 2015 and follow-ups with two representatives: a school manager and an industry apprenticeship co-ordinator. These interviews represented important follow-up to a previous regional study conducted by one of the authors in 2006 (Rusten and Eldegard 2006), which focused on the process relating to the start-up and organisational model for the VET programme. We subsequently investigated the process in much greater detail and with a specific focus on the corporate perspective. Our more recent fieldwork in Norway, conducted in 2015, included two half-day visits and on-site interviews with a team of management mentors at the two major engineering companies taking part in this training scheme. During these visits, we also held interviews with two student and made observations of apprenticeship teams at work at the respective company production facilities. Additionally, our fieldwork included interviews and follow-up communication with the education and training representative at the school, and with the school mentors who followed up their pupils in the workplace, and an interview with the person responsible for education at the regional chamber of commerce. In spring 2016, we undertook a follow-up excursion to one of the companies, where we heard presentations by the staff and two apprentices.

Through our research design, we followed operations and processes underpinning the development of industry–school collaborations over a number of years, including recent updates. Additionally, the cases in each country were based on open sources, grey literature, and educational statistics.

## Swedish school-based VET

In the Swedish case, industry–school VET collaboration reflects the Swedish national school system, which involves school-based VET programmes (Dobbins and Bussemeyer 2015). VET programmes are part of the secondary school education system in Sweden, which follows a nine-year compulsory programme. Although secondary education is not compulsory by law, it is compulsory in practice. Almost all elementary school pupils enrol in an upper secondary school education programme. With minor exceptions, secondary school education programmes last three years and the average age of the pupils at enrolment is 16 years. However, an important issue is that the dropout rate is high, with c.25% of all pupils leaving the programmes early.

Major differences in education traditions can be observed between geographical regions and places in Sweden. The town with the industry–school collaboration discussed below has a short average education level. In 2016, c.52% of the local population had an educational background in the form of either a three-year secondary school programme or university course compared with the average of 60% for the Swedish population as a whole (Statistics Sweden).

In Sweden, each municipality has a locally elected government, with a high degree of political sovereignty and wide ranging responsibilities for a number of social services and tasks, including the provision of education programmes for primary and secondary schools. However, in the Swedish case, the studied municipality is integrated into the wider region in terms of its labour market and the ‘school market’. Most commuters crossing the boundary of this municipality move to and from the neighbouring municipality, which is a regional centre with 120,000 inhabitants.

The Swedish case is located in a central region of Sweden where several major manufacturing plants are located. This particular town has a very long tradition of manufacturing that dates back to iron ore mining in the sixteenth century. The working population in the municipality as a whole is c.10,000 people, of which 42% (in 2015) work in the manufacturing industry (Statistics Sweden). The largest local employer (in November 2016) is a branch plant of a transnational engineering company with c.2600 employees (Ekonomifakta). This global company has its headquarters in Germany. The plant located in the town has produced turbines for power transmission for a long time. Company ownership has changed and the most recent acquisition by the German transnational corporation took place in 2003.

The town experienced almost uninterrupted growth during the period of heavy industrialisation of Sweden between the beginning of the twentieth century and the 1970s. However, the 1970s brought stagnation and employment reduction in the manufacturing sector, and as people had to move elsewhere, the population declined. This situation was stabilised only in the last few years and since then the population has grown slightly. Since 1997, local manufacturing employment has increased, which is in contrast to the continuing decline of employment in this industry in Sweden as a whole. Nevertheless, the local manufacturing industry is diverse, and we observed parallel growth in use of advanced technology and highly skilled activities (i.e. primarily in the dominant German-owned company), while more basic and low-skilled manufacturing have continued to decline.

## The industry–school collaboration

The Swedish case of industry–school collaboration on a VET programme was, and still is, managed through a school co-owned by the local industry (51%) and the local municipality (49%). The school is one of c.10 secondary schools in Sweden that have been established by major manufacturing companies. These companies are important partners in the management of these schools and are the main owners or co-owners. The schools fully or partly owned by manufacturing companies are called *industrigymnasier* (industry schools).

The local manufacturing base and traditions formed the background for the 1995 inauguration of the local industry school in the Swedish case. The school was one of the pioneer industry schools to become an accredited technical college – a concept developed by a council in Sweden, with the collaboration members representing companies and trade unions in engineering-based industries. Requirements



for schools' accreditation for technical college include specialisation in education programmes for manufacturing and engineering skills, and working in close collaboration with companies. The overall vision of technical colleges is to integrate training in vocational skills and courses for theoretical competence: 'Technical college aims to educate theoretically skilled practitioners and practical skilled theorists' (Industrirådet 2013, 29, our translation), which is in line with the vision of a dual theoretical and practical education programme discussed in the Introduction in the present article.

When the industry school was first established, it was owned by a transnational company with a background from Sweden; this was ABB, or more precisely its precursor, ASEA, which at the time owned the local manufacturing plant. The school was offering to modernise the traditional vocational training programmes organised by local industries. The local industry-school collaboration was inspired by other such schools in Sweden that had been established by ABB at its major production sites.

The manufacturing plant in the Swedish case town has had the same owner since 2003, a German-owned transnational corporation (Johnson 2012). The acquisition involved changes in the ownership structure, which in turn involved the municipality and a number of local companies. The co-ownership of schools by companies and municipalities is unique to Sweden. Companies sign three-year contracts for co-ownership and partnerships, which means that the industry schools can control access to resources from their industrial partners for the entire duration of three-year educational programmes in secondary schools.

However, it is important to stress that the industrial partners' resources for industry-school collaborations are supplementary to the basic funding for all Swedish secondary schools, which is based on a tax-financed voucher system. The school system in Sweden is comprehensive; all schools need to align with the general national regulations and the national curriculum. By contrast, the 'production' of education is a local responsibility. The funding system managed by the municipalities is based on local taxes.

The industry-school collaboration in the Swedish case study currently (2017) runs four education programmes, of which three are in technology and one in health care. The school arose from the manufacturing companies' demand for skilled workers in technology, and the three technology programmes have existed since the start, while the health care programme was introduced few years back. The following discussion below primarily relates to the collaborative context for VET training technology and technological skills.

The companies' contribution to the school is financial, work-in-kind, internships and machinery for the school workshop. The work-in-kind is primarily for the organisation of internships among the partner companies, which entails iterative contacts between the school and the hosting companies that involve supervisors and mentors at the workplaces. The pupils have periods of internship at the companies corresponding to 15 weeks in each school year. The pupils do not receive remuneration for their internships.

The school devotes substantial resources and effort to marketing and information campaigns among pupils in compulsory education to inspire them to apply for the VET courses. This has been considered a successful way of recruiting for technical studies, which elsewhere often receive few applicants. The industry school also attracts some girls to the technical programmes, which elsewhere are strongly dominated by boys. The market for the industry school is outside the administrative boundaries of the municipality in which it is located. A substantial proportion of its pupils live in the neighbouring, much larger municipality. The movement of pupils living in regional centres and choosing to enrol in programmes at schools in smaller settlements is a departure from the general trend in Sweden of flows of pupils from sparsely populated areas to urban regional centres for their upper secondary education. This demonstrates how the industry-school collaboration in the municipality has mobilised resources that enhance the attractiveness of its VET programmes.

Local stakeholders in politics and industry share a vision that the industry school will contribute to local development and trigger processes of renewal and reorientation. The aims of the school and local politics are integrated and are expressed through two visions: (1) the local industry school should offer excellent secondary education, and (2) the local industry school should make education a dynamic local industry. These missions should be seen in the context of long periods of local population decline

and absence of an education tradition. The industry school aims to act as a magnet to attract young people to the municipality.

Based on the accomplishments of the local industry–school collaboration over c.10 years of operation, the studied industry school may be assessed as having developed resources. This refers to the number of educated and employable young people available to industry and to resources that are more abstract, including local social capital, networks, and local identity, which have led to the school having a strong reputation for education. Regarding the risk of lock-in, it is important to acknowledge the introduction of a similar programme in health and social care, which targets a growing and important labour market. Its robustness in the future is difficult to determine. However, the co-ownership of the school by industrial companies and the municipality may mean a comparable stable organisational configuration that is resistant to short-term fluctuations.

## **Norwegian industry–school collaboration-based VET**

The upper secondary education system in Norway can be classified into two main categories: three years of general studies, which are seen as a preparation for university studies, or four-year apprenticeships (Statistics Norway 2014b). Similar to Sweden, this level of education system in Norway has an almost compulsory status. The schools in Norway also face similar challenges with regard to dropouts. Norwegian municipalities are responsible for the operation and administration of primary schools and lower secondary schools. Of the 426 municipalities (as of January 2017), three-quarters have fewer than 10,000 inhabitants. Compared with Sweden, the municipalities are generally smaller, and therefore upper secondary schools are a county responsibility in Norway. Both primary and secondary education is based on public funding.

There are two main models for vocational training programmes: (1) theoretical and practical vocational training with an apprenticeship, and (2) theoretical, vocational, and general subjects with an apprenticeship (TAF). The first of these models is by far the largest, with close to 38,000 apprenticeship contracts in Norway (including all education categories), whereas the TAF dual model includes local initiatives that account for c.1591 contracts (Statistics Norway 2014, unpublished data). The main focus in this case study is the TAF model, which is an ambitious initiative in line with the visions of a dual model of secondary education.

The Norwegian regional case of cross-sector industry–school collaboration on secondary school vocational training by TAF is from the county of Hordaland in Western Norway, which has a large cluster of industries related to various parts of the offshore and onshore activities of the petroleum sector, including branches of larger, externally owned companies as well as smaller companies that are locally owned.

Additional sectors include fish farming and mechanical industries. One-third of the jobs in the region are in manufacturing, building, and construction. Trades and services mainly supply the nearby markets.

The labour market in the region showed low number of unemployment for some years, and therefore companies have been forced to focus actively and continuously on recruitment. For several years, the industrial structure kept unemployment very low and produced some labour shortages, especially in technically trained personnel such as engineers. Therefore, local education has been much engaged in trying to meet the demand in this local labour market.

At the time when we conducted our study, 21% of the population of the study region had a college or university level education, which was well below the 29.8% for the county as a whole (Hordaland Fylkeskommune 2013). Since we completed our study, the region has experienced a severe downturn in its oil industry and a high increase in unemployment. In some cases, some companies' ability to engage in VET programmes has been challenged.

The TAF dual model and programme was introduced for first time nationally in 1992 in the industrial town that that is part of our study. The TAF model represents an innovation in educational services in Norway and is seen as a flagship example of industry–school collaboration. TAF is currently offered at 20 secondary schools in the country. All of these schools are located in major industrial regions and 14



are in non-urban locations. Nationally, the number of pupils has increased continuously from 592 in 2006 to 1591 in 2013 (Statistics Norway 2016, unpublished data). The region including our case study town has the most pupils, with 20% of the national total and three TAF schools (Statistics Norway 2016, unpublished data).

The upper secondary school in our study was, and still is, the largest school to include both general studies and VET studies in the county. It accommodates c.200 TAF pupils at different levels in three electrical and/or mechanical programmes, in addition to building and construction and health care programmes. As already mentioned for Sweden, the health care programme has made an important contribution to a growing sector. The inclusion of courses in health and childhood studies in TAF in 2007 represents an important diversification of educational possibilities in the industrial town and the surrounding region.

TAF is offered to pupils in the age group 15–16 years when they begin their upper secondary education. Their education includes vocational professional and general subjects. TAF qualifies them for manual work as well as higher studies at college and university. After four years, pupils who have chosen technical courses obtain both a certificate for the completion of an apprenticeship and a general studies certificate with a specialisation in mathematics and physics.

### ***The school–industry collaboration***

The idea for the first TAF programme in Norway in 1992 came from a brainstorming session between the principal of the case secondary school and head of a leading engineering manufacturer of equipment for shipping and offshore industries. The manufacturing company's headquarters are in the nearby city and its factories are dispersed in several locations in the county. The motivation for initiating the TAF education programme was the disproportionate focus on general studies in education at that time. The TAF model was planned as an alternative course format combining vocational and general studies certificates in a way that would attract the most talented youths.

The number of applications for the TAF education programme is quite high. It attracts pupils from the region and nearby city. The TAF programme was an innovative solution that clearly bent the rules by which secondary training had previously been organised. A combination of general studies and VET in a four-year programme instead of the normal three-year programme was also a more costly option for the county compared with the normal three-year programme and therefore faced some resistance during the first years.

Through TAF, the knowledge, competencies, and skills needed to perform a specific job in the work environment can be developed through on-the-job training and work on projects with operational staff members. These arrangements are often supported by mentorships organised by the companies, with a combination of work and tools training in classrooms and workstations at the production sites. In this way, TAF programme-accredited companies have been able to invest in well-qualified staff for the future.

The TAF programmes also motivate many pupils to undertake college and university studies. Estimations based on career data indicate that c.70% of graduates enrol for engineering or related tertiary education programmes after completing TAF programmes.

The TAF programme linked to the school we studied had c.70 collaborating companies or institutions, mostly located within the region, but also in other locations within commuting distance. A company's ability to offer an apprenticeship may vary from year to year. In cases of staff cutbacks, companies normally attempt to protect the pupils from dismissal. The TAF board, which comprises members from the school and the participating companies, makes the final intake decisions and the results are sent to the county school administration section for approval. TAF pupils have two days at work and three days at school for the first two years of their four-year course. For their third and fourth years, their week is organised into three days at work and two days at school. The pupils follow the holiday schedules of the workplace rather than the school year and they are financially compensated for their work. For the first two years, their wages are based on time spent in the workplace. For the final two years, which are regulated by an apprentice contract, the salary also covers the hours spent

at school. The county financially supports the TAF programme with equipment and training facilities, and teaching and mentoring. Apprenticeship wages are co-financed by public and company funding. Some companies have also ensured that the pupils are technologically current by donating expensive machinery for use at the school; thus, they provide pupils with unique technological training through access to and use of modern tools and machinery.

The companies participating in the programmes have no obligation to offer the pupils a job, and the pupils are not committed to accepting any job offers from them. Nonetheless, an empirical study of careers has shown that a significant proportion of companies that have hosted apprenticeships have also used the opportunity as a recruitment platform (Rusten 2016).

TAF training is organised to ensure that pupils receive an integrated position and undertake relevant practice from the very beginning of their studies, which includes mentorship by a senior expert among the staff, a mentor from the school regularly visiting the workplace, and a support arrangement whereby fourth-year pupils mentor first-year pupils. It is important for new pupils to be introduced to the different fields of expertise and workstations on the factory floor efficiently. Going through the factory in this way allows them to understand the processes, products, and overall production system. It is also important for the TAF pupils to become familiar with the engineering staff and their expertise and jobs. All levels of workers and managers have lunch together daily at the factory canteen, which appears to be another factor that strengthens the informal atmosphere and social ties. The TAF pupils acquire a combination of theoretical knowledge and practical skills that places them in a more favourable position than that for secondary school programme leavers without extensive practical experience (Rusten 2016).

According to our career data, in many cases, TAF pupils with additional engineering training on their school certificates are quite attractive in the labour market in the region and elsewhere in Norway, not least in the dominant petroleum and maritime sectors, and in building and construction, and technical consultant services (Rusten 2016).

## **Comparison of the cases in Sweden and Norway**

The goal of improving the reputation and quality of VET was the background to the studied industry–education VET collaboration initiatives, which were designed to meet the needs for skills required by industry. This was the motivation for company engagement in both of the cases we studied and clearly differs from the understanding that most of these kinds of involvements are socially motivated (Leney and Green 2005; Ehlen, van der Klink, and Boshuizen 2016).

### ***Background to the initiatives***

This form of training support concerns the need to have access to a sufficiently well qualified and technologically relevant workforce for recruitment on smaller or larger scales. Large-scale projects are currently being pursued, and the major engineering companies in both regional cases base their market orientation on large, often project-based contracts.

The goal of improving the quality and attractiveness of VET was achieved through two distinct models. The Swedish model involves company co-ownership of the school, which is a longer-term commitment, but with comparatively short-term work placements. The Norwegian TAF model is based on looser, formal institutional agreements between industry and education, but combined with a more intense and long-term commitment for training at industry workplaces.

### ***Transferability, robustness, and lock in***

We have described how these two local programmes were initiated. The Swedish case was influenced by earlier initiatives of industry-owned schools and both the Swedish and Norwegian cases have inspired other actors. These industry–school collaboration concepts have since been diffused into some other schools and regions in the respective countries.

The Swedish case was part of a national concept of industry–school collaboration inaugurated by the industry partners, named ‘Industry College’. The technical college concept has been established among schools in many Swedish regions, which have captured a large proportion of all secondary school pupils for technical programmes targeting the labour market for manufacturing work.

The experiences in the Norwegian case demonstrated how the branding and exchange of information through the network of schools, websites, media publicity, and oral presentations have been important arenas in which network members have shared their experiences. This has been an important source of inspiration for several other schools and regions to follow up and establish similar programmes. Some have succeeded in doing so, but we were informed that others had not had sufficient institutional or local support from the schools, regional education authorities, or industry to reach this goal. Norway has a number of regions with small company populations; a few sectors in some cases have experienced problems in developing resilient programmes of the kind described above. Therefore, it is questionable whether the chosen organisational cross-sector collaborations can be transferred (while maintaining relevance) to any environment and geographical context. Both the Swedish and Norwegian dual VET models presented by these two cases may be seen as success stories. Still the dual model is not the standard form of VET education in either of the countries. It would hardly be realistic to organise in practice everywhere, since many places will not have enough dedicated companies and workplaces being engaged in this. Secondly are a full-scale implementation hindered by the fact that this is a more costly alternative than the standard VET model.

It is important to consider ways in which the experiences in the two case studies represent robust models against changes in external conditions such as companies occasionally moving or going bankrupt, or more severe economic downturns such as in the Norwegian case with respect to oil-sector activities. An educational programme in which much of the training takes place in the workplace rather than in the schools is probably exposed to greater vulnerability to economic cycles.

However, as demonstrated in the Swedish case, a school-based training system is somewhat less ambitious in terms of the amount of time pupils spend in training at a workplace compared with the Norwegian TAF example, but they are still vulnerable due to eventual changes in priorities regarding the participation of companies that are co-owners or partners in the school. The standards and activities of the studied Swedish school depend on resources (financial and in-kind) originating from companies. In comparison, to the Norwegian case this school recruits and supports pupils who are at high risk of leaving school early, which challenges the school to demonstrate high standards to its industry partners.

Both the Swedish and Norwegian programmes include firms that share their technological knowhow and costly equipment in a way that ensures that technical skills are updated continuously. It would be neither technologically nor economically possible for the schools to manage the programmes on their own. The Swedish model, wherein a large share of the technological training takes place at the school, will probably produce more general, and hence therefore more easily transferable technical skills than in the Norwegian model, wherein the pupils are much more actively exposed to the technological specifications and priorities of their study workplace. The latter model may be less robust in cases of changes in the labour market, because the acquired skills might turn out to be too technologically narrow to be relevant to workplaces other than where the training took place. However, the results from the career study do not support this suggestion because the data showed a balance between those who continued their career in the company they were associated with during TAF and those who moved on to other companies (Rusten 2016). A general impression that TAF is an attractive qualification was also expressed through our interviews. For example, several interviewees at the TAF-affiliated company who had continued to higher education and become engineers had far more relevant practical training than pupils with a general secondary school educational background.

Although our study has revealed important contributions made by industry–education collaboration in the endeavour to educate employable young people for the manufacturing industry and thus contribute to economic and social sustainability, we also need to point out the challenges of such collaborations. Not least, partners with shared interests across sectors represent organisations with different missions and cultures and therefore it may be demanding to reproduce collaboration

agreements in the longer term. Due to capacity restrictions, business priorities, or simple weakening of local social ties due to decisions being taken elsewhere at the corporate level, parties may reduce the resources they spend on such engagements. Furthermore, existing educational programmes may create regional lock-in situations regarding their ability to restructure and develop new skills for new sectors, because only current companies manage this training. In other words, the fact that existing companies and industries set the agenda regarding the competences that should be taught in schools may cause a lock-in situation. In this respect, a lock-in situation can make it more difficult for a region to adjust to new and more robust industrial directions. From this perspective, it is also important to highlight that participants in our study stressed the importance of pedagogical methods to support reflective learning and even encourage some young pupils to undertake further education at university.

The results of our comparison of the cases from Sweden and Norway also address the need to be sensitive to nuances concerning the particularities of corporate arrangements, industries, geographical contexts, and processes over time, as well as to be aware of the role of respective national institutional settings. To a significant extent, education is a national concern, and one that is regulated and monitored through national politics and regulations. The context for the Swedish example was a school-based arrangement, while the Norwegian example was mainly workplace based. The case-based empirical approach of our study also revealed local specificities relying on local and regional pathways of social structures, relations, and codes of conduct. These variations were underpinned by divergent organisational and institutional principles for VET.

The term 'contingencies' should be mentioned in reference to the initiatives of individuals or networks of individuals in the case studies, who had the resources to act through their organisations and networks. These individuals included local members of the management team of the main industry partner in the Swedish case, as well as the leadership of the local school and prominent local politicians. In the Norwegian case, the business community and the regional chamber of commerce, represented by key members, together with TAF managers and co-ordinators at the school played a key role. The county (Hordaland), which represented the owners of the secondary school, mainly had an administrative and controlling role rather than one of a co-creator of the programme.

In the theoretical discussion presented earlier in this article, we have mentioned the motivation of the parties, which involved issues such as solving the talent wars (e.g. Keep 2012) or covering industrial skill shortages (e.g. Flynn, Pillay, and Watters 2016). However, we have not mentioned the motivation of parties in securing the stock of labour and livelihood of the community through employment (in a geographical sense). This combined argument was found in both of the studied cases, but cannot necessarily be seen as purely socially motivated. An example of the lessons learnt from the Norwegian case is that companies perceive training local youths as a long-term recruitment investment, with a lower risk of not seeing the candidates again because the youths often wish to return to the same company after they have graduated from higher education if they have a prospect of securing a job. Information from the Norwegian case also indicates that codes of conduct and social control among the companies in the region, minimises the risk of poaching candidates that others have spent training resources on. Those that recruit labour with this kind of training are expected to contribute by offering apprenticeship positions. Thus, social and business interests operate hand in hand in this way.

In this article, we have explored the industry-education collaboration on vocational education and training (VET) in upper secondary school, and emphasised a management, geographical approach. Our study has questioned the theories discussing the understanding of the engagement of industries as merely being a good deed (e.g. Leney and Green 2005) or as social engagements driven by the wish to strengthen the reputation of the company as a brand and an attractive workplace (e.g. Porter and Kramer 2011). Rather, we have added to these understandings by seeing their collaborations as efficient strategies to secure a highly qualified and motivated labour force. Further, we have shown that dual arrangements that combine school and work based training may take different organisational forms. The capacity of the region, its industrial structure, scale, and traditions for community engagements, and this linked to the national policy and economic framework, all represent components that explain why the conditions and occurrence of the forms of collaborations vary across space. Finally, the results

of our study have added to the existing institutional research in this field (e.g. Le Ber and Branzei 2010; Busemeyer and Trampusch 2012) by addressing the risks of lock-in and path dependency by the structures and priorities of the present VET arrangements.

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