



LUND UNIVERSITY
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Innovation and Spatial Dynamics**

A Comparative Analysis of Vocational Education and Training System in Sweden and China

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Abstract: In recent years, there has been a rising global need to train and educate certain number of workers to possess high-quality, relevant vocational skills which leads to an enormous increase in the demand for vocational education and training (VET). This thesis is dedicated to analyze and compare the competitiveness of the VET system of China and Sweden qualitatively and quantitatively and then gives some suggestions on China's VET development. In this paper, Porter's Diamond Model is applied as the methodological framework with necessary modifications for this paper's purpose. The aim is to see why Sweden is the leading country in VET system construction and what can China learn from Sweden's previous experience. At the end, some suggestions are proposed to improve China's VET system in order to suit the needs of ever growing demand for skilled labor force in recent years.

Key words: Vocational Education and Training (VET), Porter's diamond model, economic growth, government policy

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1 Introduction

1.1 Research Background

As we know, among the numerous advanced western countries, vocational education and training (VET), which has experienced a long development process, was affected and promoted and finally got mature by the first and second industrial revolution and the third information and technology revolution. As a result, VET is recognized as a legal form of the duties of government's education and become an integral part of the national education system (Zhai 2006). We have to admit that, to some extent, for some western powers, the connection between the economic prosperity and its vocational education and training is quite inseparable. Nowadays, with the development of the global economy and social integration, the rapid improvement of science and information technology, the competition among nations has become increasingly fierce. Under this circumstance, the competition of skilled and experienced workers and technicians was put on the focus. Moreover, over the last decade, because of the financial crisis and the changes of economic and social structure, a great deal of countries has to face the huge pressure from the unemployment issue and this forced the government to do the positive adjustment on the education structure and policy. With rapid transformation in social, political, economic, technological, and education environments, there has been a dramatic change in the need of VET, which serves as crucial element in the whole education system and also has large potential on fostering social inclusion (Nilsson 2010).

1.2 Vocational Education and Training System

Vocational Education and Training (VET) refers to “all structured activities that aim to provide people with knowledge, skills and competencies necessary to perform a

job or set of jobs, whether or not they lead to a formal qualification” (Cedefop 2009, p.8).

The modern VET system originated from the first industrial revolution, which started in the United Kingdom in late 18th century and opened the era of rapid development and improvement on a great number of fields, such as industry, education, technology and so on (Greinert 2005). Later this technological storm not only changed the economic and industrial pattern of Europe, but also shaped the new picture of the world. The old agricultural, craft-based and low productivity way no longer suit industry requirements any more, and meanwhile, more advanced management and capitalization were involved into the system. Under this circumstance, traditional class-based apprenticeship system had to be updated into specialized VET system correspondingly. Faced this new challenge, most of the European countries took the different actions based on the different cultural, historical and economical backgrounds (Greinert 2005).

As the industrial and technological momentum at that time, England represents a distinct model of VET system in which training needs and training provision were not controlled by the state but by the market. These needs fluctuated significantly geographically and chronologically. Consequently these training and education was not very formal and there were few generally accepted examinations and certificates (Greinert 2005). France, on the other hand, is where the school-based model of vocational training was founded. In this state bureaucratic model, the training needs and the vocational training are decided solely by the state, so this model is not very responsive to geographic and economic differences. Germany, by borrowing the experiences from both England and France, established its own VET system — dual model system — to keep a balance among labour, capital and the state.

1.3 Motivation

One of the most significant economic achievements for China is that it gradually becomes ‘the world factory’ in the recent decades (BBC News 2002). Indeed, nowadays products labeled “Made in China” can be found in every corner of the world. Cheap and abundant labor as well as rich resources gives China the advantage to win the international contract over its competitors and China really

benefits a lot from being the manufacturer. But in the recent years as China transits from traditional agricultural to modern industrial country, several issues come up that draw intensive attention. The most of China's economic growth in the recent decades are actually not sustainable. The price to pay for being "the world factory" is obvious. It costs non-renewable resources, lead to severe environmental pollution and at the same time profitability is relatively low since the most of the profits belong to the international companies that handle product design, raw material procurement, storage and transportation, order processing, wholesale business and retail (Lang¹ 2008). People are satisfied with the short term benefits from manufacturing low technology and low quality products and thus refuse to develop their own products that are more technology intensive and become more competitive. To make the things worse, aging society and inflation is undermining Chinese cheap labor advantage (Lang 2008). Factories find it hard to control the cost because rural migrants who consist of majority of labor force are no longer satisfied with the low wage they used to view as wealth. It is frequently reported that factories in dominant manufacture areas such as Yangtze River Delta, Pearl River Delta and Beijing–Tianjin–Hebei region are short of labor in the recent two or three years (People's Daily Online, 2012). Consequently an increasing number of international companies are seeking alternative places with lower wage demand to settle their factories. To change this situation and transform the Chinese industry into competitive high-tech producer, qualified workers with high level skills are badly needed instead of sheer quantity of labor. On the other hand, unemployment rate for Chinese college students is growing year by year and millions cannot find a job at the time when they graduate. The main reason for this situation is the mismatch between the demand governed by current Chinese featured industrial structure and the supply from Chinese education system. At this stage, more skilled workers are needed rather than college students (Lang 2008). It calls for the support from Chinese VET system, which, unfortunately our VET system yet to provide.

Therefore, the research on the vocational education and training in China has a far-reaching significance, both on theoretical and practical aspects. It can not only pave a way for developing countries in their VET system construction but also solve the emerging problem that China faces in economic transition. Compared to some of

¹ Prof. Larry Hsien Ping Lang got both his Master and Ph.D. degrees in Finance from the Wharton School, University of Pennsylvania in 1986. Now he is Chair Professor of Finance, the Faculty of Business Administration, the Chinese University of Hong Kong and is considered the most popular and most influential economist in China.

the most advanced countries, for instance Sweden, which has over 150 years history of VET experience, China has barely started.

With the development over the past three decades, the progress of Chinese VET is obvious, but the shortcomings are also noticeable and inevitable. The World Bank argued that, *“to support China’s shift from low-skilled, labor-intensive industries to more capital and skill-intensive ones, producing skilled workers via vocational education is critical”* (World Bank 2012). However, the transformation is indeed hard and the reasons are quite complicated. First, China is a hierarchical society, from the culture aspect, the working class who performs manual labor is called blue collar workers which include construction, mining, manufacturing, and technical installation and so on is generally considered inferior to the working class who performs work in an office environment which is called white collar workers because the white collar relates to administration and management. Second, in common Chinese traditional ideology, the concept of individual development is closely related to his/her educational achievement. In order to develop children in an ideal way, urban Chinese families including parents, grandparents and other closely related adults generously invest in educating the only child who will, as expected, generate dividends in the future (Woronov 2001). In their mind, the primary activity of young people, actually the only thing they should do, is studying; the single way of evaluating that activity and their child is the score on exams. In the future, this activity/studying and family investments will, hopefully be repaid as long as the child consistently get high grades and good test scores, which then consequently generate high-paying jobs, prestige and reputation (Woronov 2001).

The research questions about this thesis are as follows:

- *How does the VET system work in Sweden and China respectively?*
- *What are the main problems in Chinese VET system developments?*
- *What Factor conditions in Chinese VET could be improved?*
- *What can China learn from the advanced Swedish VET system in terms of the role of the Government?*

My approach to analyze China's VET system through comparisons is inspired by two previous studies. One is by several Australian researchers who develop a comparative model for VET by some selected indicators (Lamb, Davies, Polesel, & Teese, 2003). The other is by a group of European researchers who work in the area of continuing education and training (Behringer, Kapplinger, Moraal, & Schonfeld, 2005). Just like an ancient Chinese saying goes, "Among any three people walking, I will find something to learn for sure. Their good qualities are to be followed, and their shortcomings are to be avoided." And for VET system, Sweden is the walking people that China can learn from.

1.4 Outline of the thesis

This thesis consists of 6 chapters.

The first chapter is the introduction part. The big picture behind this study is first described followed by a brief introduction of vocational education and training system. The motivation of this paper is then elaborated and the purpose is that through analyzing and comparing the developed Swedish VET system and underdeveloped Chinese system, this study can shed some light on how to fundamentally improve Chinese VET system in every aspect to make it a crucial driving force of sustainable economic growth and also active factor in social status transition in the future.

The second chapter mainly deals with the model we applied in this study — Porter's diamond model. It is originally an economical model used to find out the factors lead to more sustainable competitiveness for some industries, but here we borrow its idea to analyze VET system. The definition of four major attributes and two accessorial elements are briefly introduced, namely factor conditions, demand conditions, related and supporting industries and firm strategy, structure and rivalry chance and government. Here modifications have to be made to analyze VET system with diamond model since in VET government plays the dominant role in every almost every aspect. Then the previous study are reviewed on vocational education and training history and status quo in both China and Sweden, in order to give a clear picture of what has been done previously.

The third chapter serves to illustrate the methodology used in this study. Qualitative and quantitative approaches are both applied to improve the credibility of the research and also strengthen the outcome.

The fourth chapter gives the detailed analysis for both Swedish and Chinese VET system using modified Porter's diamond model. Each factor is discussed based on figures, government policies and so on. In view of the size and diversity of China, it is not possible for us to cover all aspects of VET developments in all parts of this vast country. So we pick one of China's megalopolis — Tianjin — as our research focus for Chinese case.

Based on the analysis in the former chapter, the Chinese VET system is compared with the Swedish and thus feasible suggestions are given for Chinese VET development in chapter 5. From previous chapter, it is obvious that like Sweden, Chinese government has realized the significance of VET and is dedicated to develop VET in the recent decades, but it does not result in a sustainable and competitive VET system. One of the most critical issues is to fundamentally alter the low status of VET in China. Otherwise no matter how much money and efforts the government and companies put in, it is still hard for Chinese VET to become an ideal place for high-quality and relevant vocational skills training.

Chapter 6 summarizes the whole thesis and conclusion is drawn at the end of this study.

1.5 Limitations

The outcome of this study may be comprised by the following factors. Firstly, there is a lack of comprehensive, up-to-date and reliable information about VET in China, so this paper has to focus on a particular region of China to analyze. But given the size and diversity of China, one region may not be representative enough to cover all aspects of VET developments in all parts of the country. Furthermore, Porter's diamond model is originally an economical model to analyze the sustainable competitiveness of particular industries and is more descriptive than analytical, so changes have to be made when apply this model to analyze VET system since in VET the government is of particular importance.

2 Model and literature review

2.1 Overview of Porter's diamond model

Porter's diamond model is an economical model to analyze why particular industries enjoy more sustainable competitiveness in particular locations than others. It is for the first time that industrial competitiveness is thoroughly and systematically standardized into an analytical framework that later became a classical methodology among subsequent relevant researches. He argues that the conventional view on evaluating competitiveness, in which labor costs, interest rates, exchange rates and economics of scale are the most influential determinants, is fundamentally flawed. *"Pursing them, with all their short-term appeal, will virtually guarantee that the United States — or any other advanced nation — never achieves real and sustainable competitive advantage."* (Porter 1990)

Instead, Porter suggests that there are inherent reasons to be studied and therefore a new perspective as well as a new tool is needed to measure an industry's competitiveness. Globally, companies with world leading competitiveness in their own industries employ strategies that differ from one to another. But despite their varied strategies, there are some underlying factors that are fundamentally the same which produce innovation and subsequently improved competitive advantages that distinguish these elite firms from others. Innovation represents either a new technology or a new way of doing things which will always outperform the old ones in some sense. It will bring new skills, resources and perspectives that improve the company's diversity. So innovation is the driving force to a better competitiveness (Porter 1990).

According to Porter, there are four major attributes that can explain why some companies are able to create sustainable innovation and thus achieve an ever more sophisticated source of competitive advantage. They are factor conditions, demand conditions, related and supporting industries and firm strategy, structure and

rivalry. In addition, there are also two accessorial elements — chance and government — that serve to be the complementary factors which fall out of control of a firm (Porter 1990). These six factors in total are actually the context where a firm is rooted. Porter also argued that each individual determinant alone is not sufficient to produce competitiveness but rather, these factors together make up a system where the effect of one factor depends on the state of others.

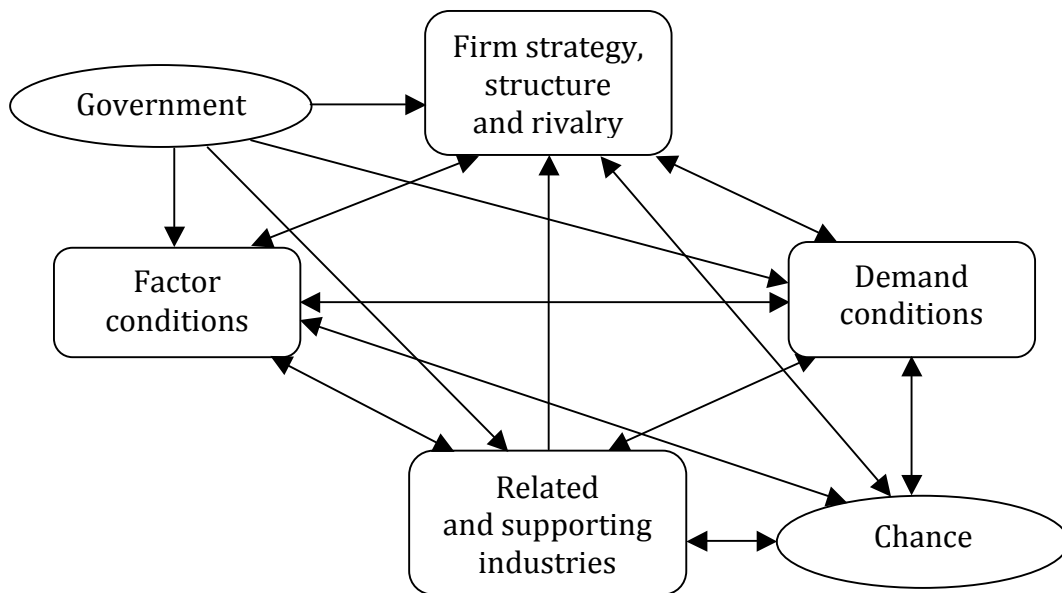


Figure 1: The Porter Diamond Model

In this study since the research object is VET instead of some companies, and VET has some fundamental differences with enterprises, certain modification has to be made to the model in order to facilitate the analysis.

2.1.1 Factor conditions

A long held true doctrine in classical economics is that the flow of trade is determined by factors such as labor, land, natural resource, capital and

infrastructure. However, such theory is considered at least incomplete and at worst incorrect by Porter. Instead, he argues that the “condition” of these factors such as quality, importance and even scarcity play a more crucial role than the endowment and cost of them because sometimes easy access to large amount of factors such as cheap raw materials and abundant labors results in inefficient deployment and thus impedes innovation (Mohammad Hosein Rezazadeh Mehrizi and Mohammad Packinat, 2008). Therefore, it is more reasonable to make generalization with factors such as human resources, physical resources, knowledge resources, capital resources and infrastructure.

- Human resources refer to the quantity, skills, cost of labor and their working ethics. They are of fundamental importance for a successful VET system because it is the teachers who pass on knowledge and values to students and prepare them for further education and for working life. If teachers’ knowledge in their respective fields is hardly updated, they will teach quite outdated vocational related knowledge in courses and thus employers will complain that the graduates from VET program are not well trained to work in practice. Having access to motivated and knowledgeable teachers is crucial to achieve the goal of good quality education.
- Physical resources stand for the abundance, quality of materials within environments that exist relatively undisturbed by mankind, in a natural form such as air, wind and minerals and so on. VET typically involves on site learning in industries which demand sufficient physical resources support.
- Capital resources, unlike physical resources, are man-made and employed in generation of income. They can be a productive asset such as equipment, inventory, and plant without which VET is not possible to bear successful fruit.
- Infrastructure can be either physical such as road, communication system or mental such as institutions that facilitate the development of an industry.

Furthermore, particularly for Chinese VET system we will also take people’s traditional view on VET as part of the factor condition since it greatly affects the VET student and teacher quality.

In Porter's view, to support competitiveness advantage, highly specialized resources are often needed for a specific industry. Selective disadvantage in one factor is not necessarily a bad thing because under certain conditions it will trigger innovation and upgrade to compete. For VET, the government is predominantly related to the factor condition since it is the government to make fundamental decisions and provide funding. We are particularly interested in explaining how factor conditions can be improved through interaction with other factors.

2.1.2 Demand conditions

Demand conditions in home market are the key to shape how industries perceive, interpret and respond to buyer needs as well as cater to local values and circumstances (Porter 1990). The demanding buyers will pressure companies to innovate and achieve more sophisticated competitiveness advantage. Likewise, the needs of employers have a huge impact on VET system because the students in VET will eventually become employees and they are subjected to meet the demand of their job providers. Furthermore, if the local buyers' needs anticipate or even shape those of other nations as indicators, they will help a nation's industry to gain some advantage. A company will always respond to challenge faster in domestic markets, so even small fluctuation in local buyer needs can raise serious feedback. Therefore, a nation's value is expected to be spread worldwide with its products. VET can also become such media to export a nation's value and taste when some VET graduates work abroad. In this study, we shall also look into how demand conditions shape VET.

2.1.3 Related and supporting industries

It is very unlikely to find a single successful industry without supportive related industries (Mohammad Hosein Rezazadeh Mehrizi and Mohammad Packinat, 2008). Competitive related and supporting industries are beneficial to create competitiveness advantage in downstream industries (Porter 1990). They serve to deliver the most cost-effective input in an efficient and rapid way. But solely access or availability does not automatically guarantee improvement. More importantly, related industries also provide incentive and support in innovation and upgrading

by taking advantage of short lines of communication, quick and frequent information exchange, and flow of innovation ideas. Furthermore, it is not necessarily needed that all the supporting industries to be competitive. Firms can resort to those abroad materials, components that without a major effect on innovation or performance of the industries' products.

Successful VET systems should be industry-led and thus highly adaptive and responsive to the needs of local industries. They usually follow up the industries demand and coordinate with them consistently. The pressure from local industries is a driving force for VET policy makers to use new methods and technologies. As a result, the offered programs can be modified and training can be customized to suit the needs of any organization. This flexibility means that the students can benefit from targeted and effective training that is highly focused and aligned with the goals of the local job providers.

2.1.4 Firm strategy, structure and rivalry

Porter claims that the strategy of firms, the structure of industry and the severity of rivalry as the fourth determinant of competitiveness that affect the competitiveness of a sector. Here we change this title into VET strategy, structure and rivalry since we are looking to VET systems instead of firms.

National circumstances and context have substantial influence on how companies are created, organized and managed as well as the characteristics of local rivalry. Likewise, for VET system in Europe countries in 19th century, following the First Industrial Revolution that was a profound and complex upheaval in terms of economy, culture and technology, though the challenge was similar in that traditional class-based apprenticeship system which was very typical since Middle Ages in Europe countries faced unprecedented impact, different countries with varied social and economical backgrounds came up with different solutions to this erosion of the old vocational education and training model. For example, the liberal model — first created in England, school-based model of vocational training founded in France and dual model system originated in Germany (Greinert 2005). It is also clear that the government plays the vital role in the strategy of VET.

Rivalry for VET system refers to the degree of competitive pressure exerted by other VET institutions or other forms of education. In this case, VET and its rivalries work as a system and are mutually reinforcing. The presence of rivalries is a strong stimulus for VET to innovate and keep competitiveness advantages, because it cancels the advantage that comes from being the only one to have the access to the home market and resources. Competing institutions will keep each other honest and competitive to get financial support. In fact, Porter argues that the more firms are geographically close, the fiercer would be the rivalry, and subsequently the better will be the whole industry (Mohammad Hosein Rezazadeh Mehrizi and Mohammad Packinat, 2008).

Since the VET strategy, structure and rivalry is mostly determined by the government without whose influence it is hard to discuss this issue. This study will dedicate more on the role of the government and VET strategy, structure and rivalry will be briefly discussed and not the focus of the research.

2.1.5 Chance

Chance events, according to Porter, refer to occurrences that a firm is not able to control. For instance, they can be new inventions, important political decisions, wars, rapid changes in financial markets or other radical technical changes. They are important because they create discontinuities in which some gain competitive positions and some lose.

But chance is not that important in vocational education and training system since the government is the dominant role and affects every aspect of VET, so in this paper, Porter's diamond model is modified that factor of chance is just omitted.

2.1.6 Government

The four determinants of competitiveness are all subject to be influenced by government that serves as "Catalyst" and "Challenger" (Mohammad Hosein Rezazadeh Mehrizi and Mohammad Packinat, 2008). In this model, government must be fully aware of its role and prevent from any direct intervention in the

market mechanism, but at the same time try to improve competitive environment, and inspire firms to innovate.

In fact, in most countries, government regulation is extremely influential to VET system since it makes substantiate investment through publicly funded training organizations and subsidized apprenticeship or traineeship initiatives. Many VET schools are funded by the federal or state budget, in addition to their own funding sources. The institutions are thus mainly managed by federal or state governments. In Sweden, overall responsibility for education (including VET) rests with Parliament and the Government. The Ministry of Education and Research is responsible for matters regarding pre-school education and child care for school children, pre-school classes, compulsory school and equivalent schools, upper secondary school, independent schools, adult education, popular adult education, post-secondary education, universities and university colleges, research, study support and student social issues (Cedefop 2008). The majority of income tax revenue goes to municipalities, because of the distinctive fact that these municipalities are highly autonomous and in charge of many administrative issues such as almost all education below university level, such as pre-, compulsory- and upper secondary school as well as adult education (Cedefop 2009). Therefore, I dedicate the majority of my efforts in analyzing the role of government, how it affects the four major attributes. The interaction among major attributes is not the mean concern since most of their interactions are actullay demonstrated through government.

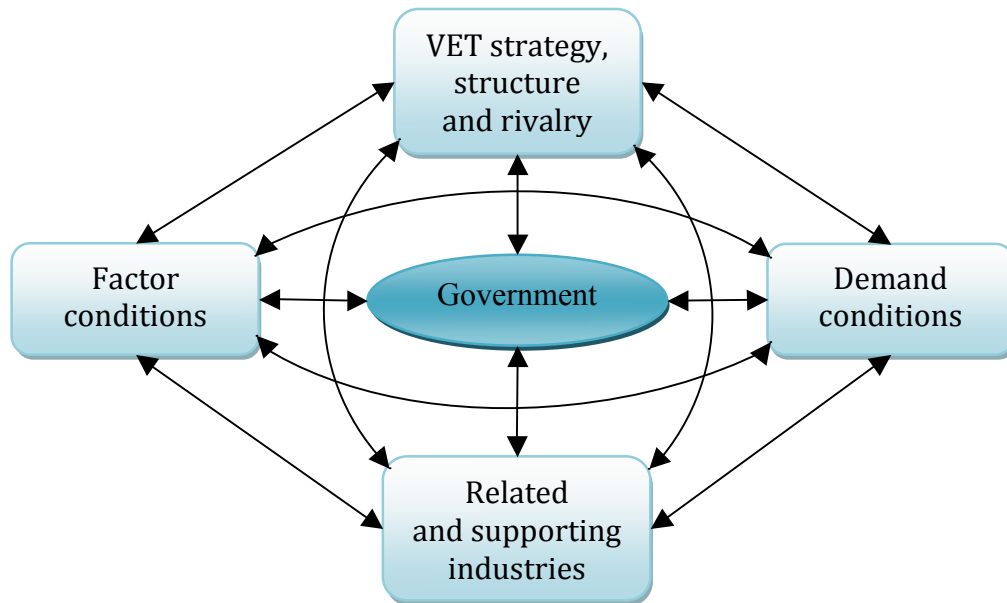


Figure 2: The modified model

The modified diamond model is then established based on previous discussions and is shown in Figure 2. It is the approach that will be applied in the following chapters.

2.2 Previous study on Swedish and Chinese VET respectively

In this section we will briefly review the previous study on Swedish and Chinese VET system respectively. VET in Sweden and China experienced a very different way of development due to varied cultural, economical and political background. However, it is these differences that create the momentum for China to learn from Sweden which is quite successful in VET construction.

2.2.1 Previous study on Swedish VET system

As one of the most developed countries in the world, Sweden has a long history of modern vocational education and training (VET) ever since 1850s (Nilsson 2008). Unlike UK, France and Germany, which developed their distinctive models of VET, namely market model, school-based model and dual model respectively (Greinert 2005), Swedish VET system changes its feature from time to time (Nilsson 2008).

At first it followed the English model with dominant informal and unregulated workplace training and supplementary schooling in late 19th century. This system received some reform in 1920s and then became more strictly regulated but still based on apprenticeship where the agreements between different social partners were of great importance. Ever since then, Sweden gradually moved away from English model and embraced German's dual model, especially when the social partners became more committed in 1940s. However, due to the absence of the legal protection of apprenticeship, this traditional form of vocational education became less and less important and State education started to take the main part. Since late 1960s, as the school based vocational education became the dominant form, the Swedish VET system actually turned its direction to French school-based model (Susan 1989).

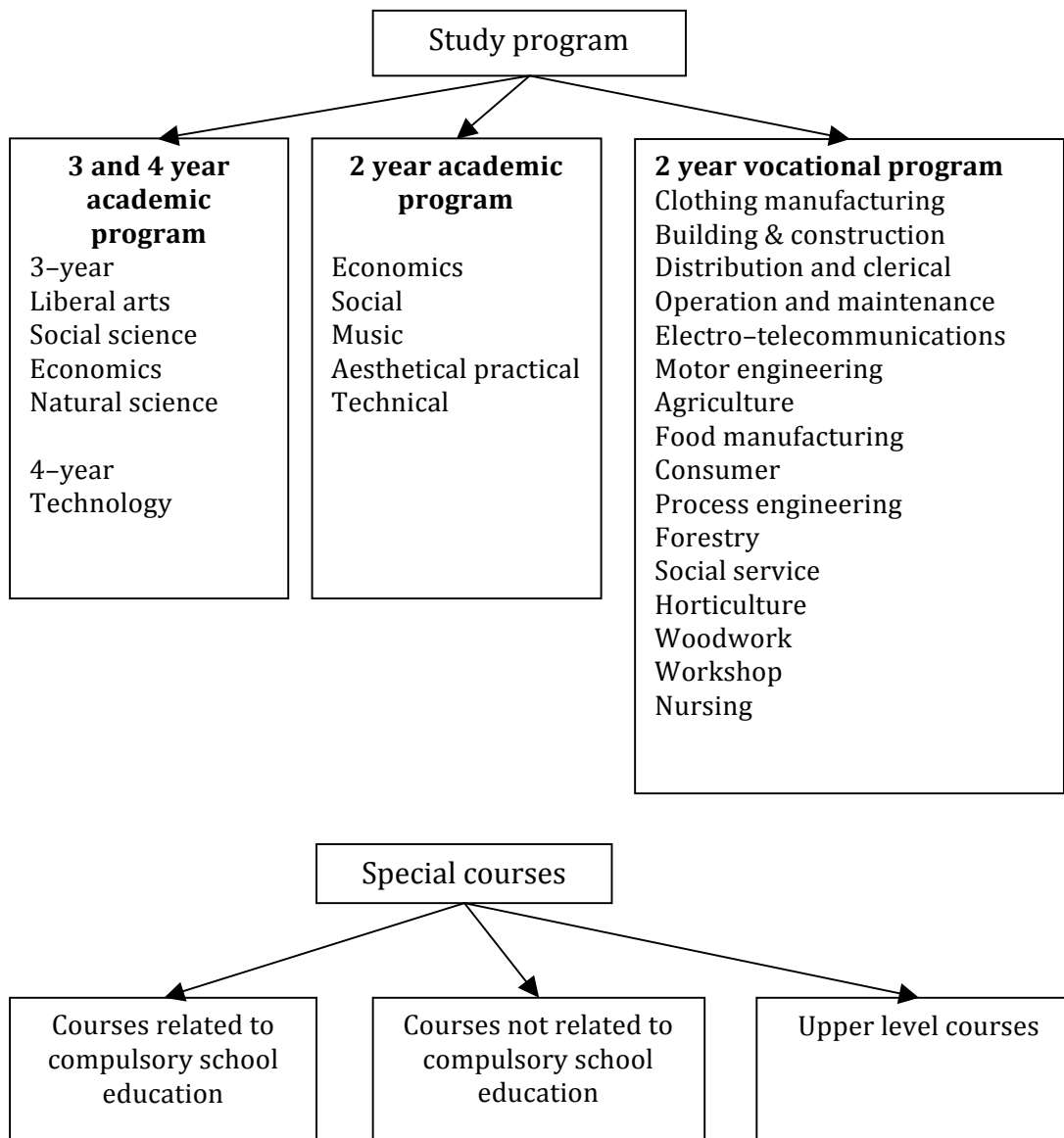


Figure 3: The integrated upper secondary school in Sweden. (Susan 1989)

Once more, since 1970's, drastic change was made in Swedish VET system which integrated several educational strands into single upper secondary system (see Fig.3). The full spectrum comprises two three and four year general "academic" study programs and two year vocational programs and special courses (Susan 1989). In this reform, two year vocational programs took the place of the former

vocational schools at county level. Students in vocational programs and two year academic programs are able to take the same general elective courses.

The idea is to bring uniformity — wherever upper secondary schooling is available, all studies can be integrated together. Despite some of the general education components in common in two year VET courses such as obligatory Swedish instruction, working orientation, PE and English, the quality of the upper secondary VET training varies from course to course (Susan 1989).

Theoretical education took much of the time in merely two years of the duration thus limited the vocational contents, which implies that the VET program was more oriented to a broad economy range than some specific and practical vocation. It is also complained that the vocational related knowledge taught in courses is quite outdated. Even though teachers are recruited from relevant business and industry or graduates of related major, once get employed, the knowledge in their respective fields is hardly updated — one week of training every six or seven years (Susan 1989). Lennar Nilsson, one of Sweden's leading researches on VET revealed more shortcomings of the VET education system (Nilsson 1983). Teacher were overloaded by large amount of work stations and students were unable to link their learned knowledge to workplace in reality due to the lack of adequate practical training experience, particularly in metal work, consumer technology, electro-telecommunications, woodwork and motor engineering programs. As a result, employers found that the graduates from two year upper secondary VET program were not as well trained as before. To make the things worse, the two year VET program is not enough to qualify the students for further education when people believe that theoretical understanding is more important (Susan 1989).

A new wave of fundamental reform policies came since the early 1990's, due to the more and more obvious disadvantages of the VET system together with a deep economical crisis striking Sweden which increased unemployment rate and thus rose the doubt of the efficiency of vocational education (Nilsson 2008). Efforts were made to bridge the gap between the vocational education and academic education. First of all, the duration of VET program was prolonged to three years and the theoretical courses were the focus of this prolongation, which gave the graduates from both VET and academic programs the qualification for further education. Additionally, sufficient practice time was secured in vocational program to enable

students with practical experiences and skills for real work environment. At the same time, municipalities took over the control of the upper secondary education, so much money went to municipalities to organize VET program. Since 1993, the same financial prerequisites as municipal ones have been granted to private vocational schools and thus became more and more popular. In 2008 about 19 per cent of upper secondary school students in vocational programs attended private schools (Cedefop 2008). In 1999, the Parliament replaced the timetable of upper secondary schools with a credit plan. All programs are worth 2,500 credits and project work was introduced. A new national technology program was introduced. One year later, the Parliament raised the number of guaranteed teaching hours in programs that are preparatory for further studies and by 60 hours in programs with vocational subjects (Cedefop 2008). Also since the beginning of the 21st century, The Committee for Upper Secondary Schools in Sweden started to propose forms for ways in which apprentice training could be introduced back into upper secondary school. The efforts have already been made and a new apprenticeship training pilot has been launched since 1st July 2008, in which apprenticeship training is considered to be an alternative in vocational programs where students take at least 50 percent of the training in enterprise (Cedefop 2008). The program leads to the same qualification as school-based vocational programs and apprentices may, or may not, earn a wage. Those who participate in upper secondary apprenticeship training will be able to reduce their load of core courses in Swedish or Swedish as a second language, English, mathematics, social sciences, history, religion and physical education. To meet the entry requirements to higher education, upper secondary apprentices may take additional core courses during their time at upper secondary school or can, at a later date, supplement their education through municipal adult education (Cedefop 2008).

2.2.2 Previous study on Chinese VET system

China has a long history of education that dates back to thousands of years ago. However, the emergence of an organized VET system is a far more recent phenomenon (Simmons and Polgar, 2005). Earliest VET in China emerged during 1860's, when China was in the late Qing Dynasty, in the form of education to support industrialization which based on western technology with practical skills. Modern Chinese VET system is established since the foundation of the Peoples' Republic of China in 1949 and centrally controlled by government. It is an imitation of the USSR's model. At that time, China and Russia shared similar economic and political

systems and thus it was quite natural for China to adopt Russian educational system since it was proven to be proven effective in meeting Russian technological needs (Durden and Yang, 2006). However, VET development was forced to give way to the fever of class conflict during the Cultural Revolution and thus stagnated for almost 10 years. Linkages between VET and industry were virtually eliminated at that time. Since early 1980s, after Mr. Deng Xiaoping seized power, China has opened up its economy to the world which results in spectacular growth in both the size of the Chinese economy and China's share of world trade. The government restored VET development and expanded secondary specialized education as well as vocational senior high schools. Nowadays Chinese vocational education follows German Model in curriculum design and vocational guidance (Alexander, Sun, & Kai, 2008).

It had long been an idea that the government is expected to fund mainstream education and vocational education on the other hand is expected to be maintained primarily by industry and other nonstate sources of income (Li and Lumby, 2005). The Document (CPCCC, 1986) expressed this principle:

"To develop vocational education, we need to mobilize the initiatives of company and institution, and to encourage the collective and the individual to participate in maintaining vocational education." (CPCCC, 1986, p994)

But without enough funding support from government, Chinese VET suffers from slow development, poor quality and relatively low level of employment of its graduates. These crises in vocational education forced the government to review its policy and 'The Decision' in 2003 suggests a noticeable change:

"... by the establishment of a new model in which government is the primary support while taking active measures to encourage business, institutions and social groups to participate in supporting vocational education. It is local government's responsibility to manage vocational education." (State Council, 2003, p.783)

From 'The Decision' we can see that Chinese government is fully aware of the fact that it is VET system that actually requires more investment than mainstream education. And financial support from the market alone is not sufficient to build up a developed vocational education system.

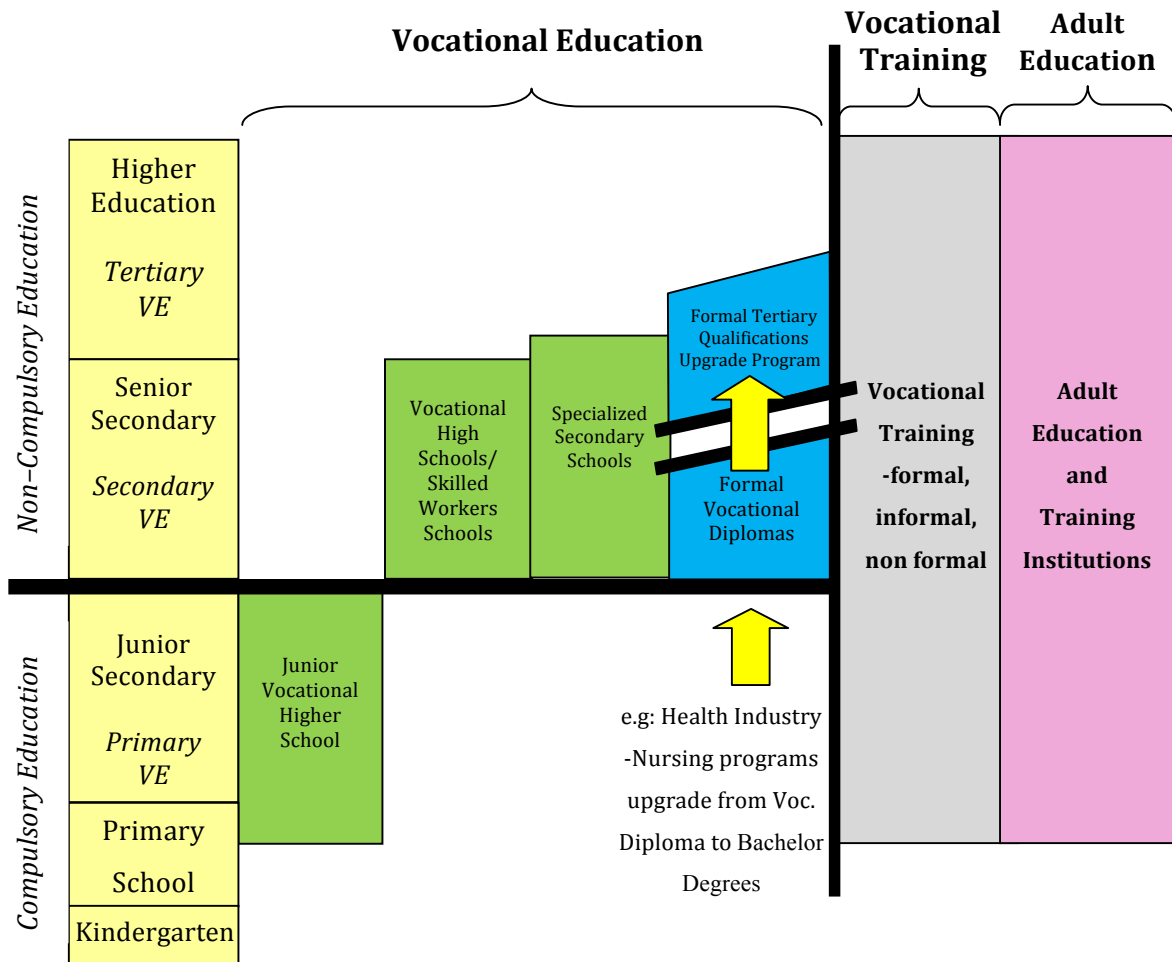
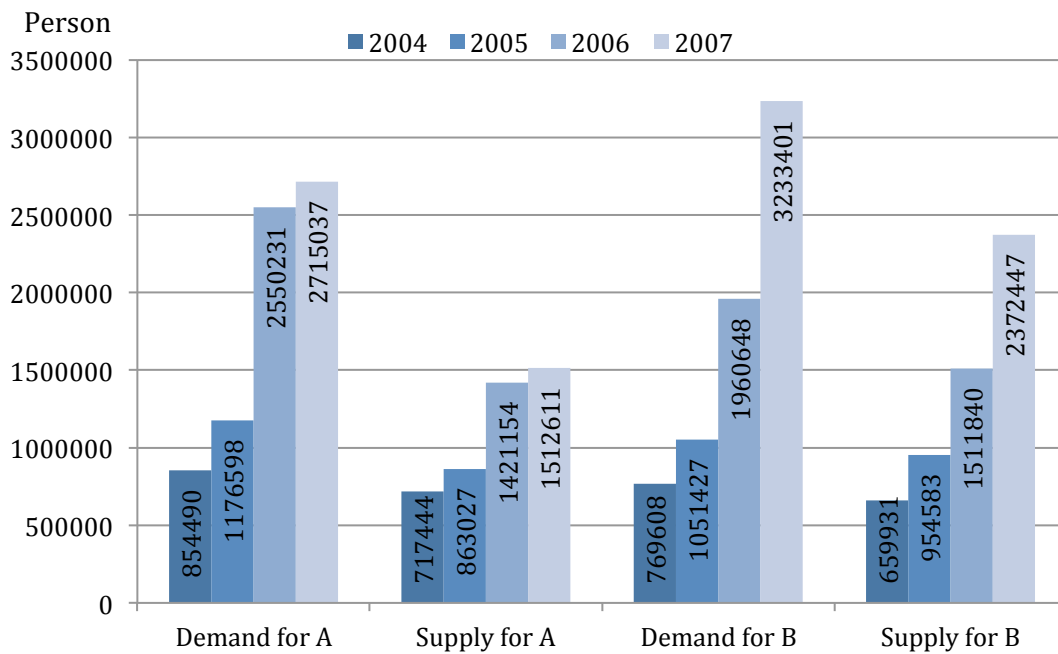


Figure 4: China's VET System Structure. (Simmons and Polgar, 2005)

In China, VET is normally carried out after the completion of the first nine years of state education. Unlike many other countries, Chinese VET system is not managed under single Ministry and/or government Department. Instead, it is divided into two major components. One is "Vocational Education" which is handled by the Ministry of Education and the associated provincial and county education commissions or bureaus (Simmons and Polgar, 2005). It is broader in scope and with less of an applied focus. The other is "Vocational Training" which is governed by the Ministry of Labor and Social Security and the associated provincial and county commissions or bureaus. It is more industry-oriented and offers specific skills and knowledge to

meet the demand of an occupation or occupational group. What is more, some major state owned industries, such as the power generation industry support their own training system including their own governance arrangements and schools/colleges. Figure 4 briefly illustrates the overall structure of China’s VET system. Junior secondary vocational education is the continuation after primary school and is a part of the nine year compulsory education in China. Its purpose is to provide basic knowledge and skills. The senior secondary vocational education serves as the foundation for vocational education in China. It typically enrolls junior high school graduates who will receive more specialized and higher technical skills training.



A= Production, transportation, machinery operating personnel

B= Personnel with technical qualifications

Figure 5: Demand and supply for technical and vocational workers in Guangdong, 2004-2007. (A) Production, transportation, machinery operating personnel. (B) Personnel with technical qualifications. Data Source: Guangdong Bureau of Labor and Social Security

At present, Chinese VET system faces new challenges both in terms of quality and quantity that came with the fast economic growth. The number of State Owned Enterprises has been shrinking and at the same time, the socialist market economy has emerged and posed a major impact on the VET system. On one hand, there has been more and more pressure on the Chinese companies to increase efficiency and effectiveness and become more competitive to survive in the fierce trade battle. On the other hand, thriving economy creates enormous number of job vacancies that makes skilled workers and technicians fall short of supply, as shown in Figure 5, which Guo and Lamb (2005) quoted from the data released by Guangdong Bureau of Labor and Social Security. Therefore, Chinese VET is expected to improve the country's competitiveness by training enough qualified graduates capable of contributing to all aspects of China's development. Furthermore, with the increasing popularity of self employment and rapid influx of foreign companies, new patterns of employment are impacting on the aspirations of China's young generation entering VET in China (Keating et al, 2002). Consequently, these changes serve as directions to guide the management of VET programs and institutions.

Based on historical reasons, the curriculum and evaluation standards of Chinese VET system were mostly not connected to the needs of industry (Simmons and Polgar, 2005). What is more, school equipment was outdated and failed to match industry standards or reflect current industry practice. Education quality was also relatively low and teachers used rote and didactic teaching methods therefore graduates were limited to narrow and low levels of skill and unable to meet the requirements that sought by employers. To make the things worse, there has been a cultural bias against attending VET. China has long standing cultural tradition that considers manual skill training as inferior to formal education, so the word "education" is preferred even when it is should be "training" (Cooke 2005). Furthermore, employers also prefer college graduates over those from VET because of college students' better quality. As a result, levels of participation in VET are quite low because people typically believe that VET graduates will not have a good employment prospect (Comyn and Barnaart, 2010).

Fully aware of the challenges that Chinese VET is facing, a trial of outcomes-oriented VET in vocational schools and colleges in Chongqing municipality of central China was conducted during the period between March 2002 and August 2007 with joint effort from China and Australia Government. A team of Australian advisors was deployed and worked closely with Chongqing Municipal Education Commission to

establish new VET programs in some key industry fields (Comyn and Barnaart, 2010). The reform involves several aspects such as school-based innovation, long-term development of the capacity of people, organizations and the state, VET teachers and poverty alleviation. The outcomes are very fruitful. There is a consistent increase in application of new teaching methodologies through the use of new assessment system and student-centered learning thus an increasing number of subjects and teaching can be put into practice. What is more, from the ratings of industry-based and school-based stakeholders, there is a steady improvement in quality of competency-based training teaching and assessment methodologies during the 5 years time. More and more students are willing to attend VET training. This project's achievements and successful experience are able to provide meaningful policy references for both Chongqing and China's vocational education reform and development. The ideas and experiences that have been introduced will continue to shape the views of how VET should best be constructed and managed in China (Comyn and Barnaart, 2010).

3 Methodology and data

3.1 Methodological framework

Porter's diamond model is applied in this paper as the methodological framework to compare the VET system between Sweden and China. But the modification is made to suit the particular needs of this paper since the government is the most influential factor in VET and thus the focus of this paper. The purpose is through comparative analysis, to discover the drawbacks of the current Chinese VET system and find out what China can learn from Swedish model to improve. Because the four determinants and two variables of diamond model are more of the quality sense, qualitative approach is also conducted in the following study with some numeric data. In this way, the macro scale difference between Sweden and China in many aspects such as the size of economy and the size of VET system can be eliminated and thus facilitate our comparison and analysis. Moreover we pick up a particular region in China which serves as a representative in order to rule out the possibility that certain import factors is leveled out in the national level and thus create difficulties in our analysis and discussion.

3.2 Data

3.2.1 Data source

This paper mainly makes use of the data from previous relevant study because they generally have good credibility. What is more, it is widely known that the government collects an incredible amount of data on daily basis. Everything from taxes on income and wealth, illiteracy rates, population that receive certain level of education and so on. Therefore, the statistics and reports from government or

relevant administrative department is also an important data source because of its authoritativeness, generality, comprehensiveness and easy accessibility. These statistics are crucial indicators that serve to compare and analyze VET systems in Sweden and China.

3.2.2 Data analysis method

Since Porter's diamond model is applied, the four determinants and two variables within this model must be studied and compared between Sweden and China. But the diamond model is more descriptive than analytic, therefore sufficient data must be presented. The data are means to identify the fundamental differences between Swedish and Chinese VET systems, based on which the suggestions and advices are given to the China's model to abandon the long standing cultural bias towards manual skill training over formal education and further improve this industry that enhances the skills and competences of the country's workforce, improve national competitiveness and economic growth as well as social inclusion (Mats 2004). Statistics serve as a supplement to the qualitative factors that mentioned in Porter's diamond model. It is also worth noticing that Porter's diamond model is originally intended to evaluate the competitiveness of an industry in the global scale. But in our case, it is used to compare the two different VET systems and find out some areas in VET that China, as a developing country, can learn from its Swedish counterpart.

4 Empirical analysis

4.1 Swedish VET system

Sweden has a highly developed system of vocational education and training with the key principle of lifelong learning. Figure 6 is a brief introduction of the Swedish education structure within which the VET is distinguished.

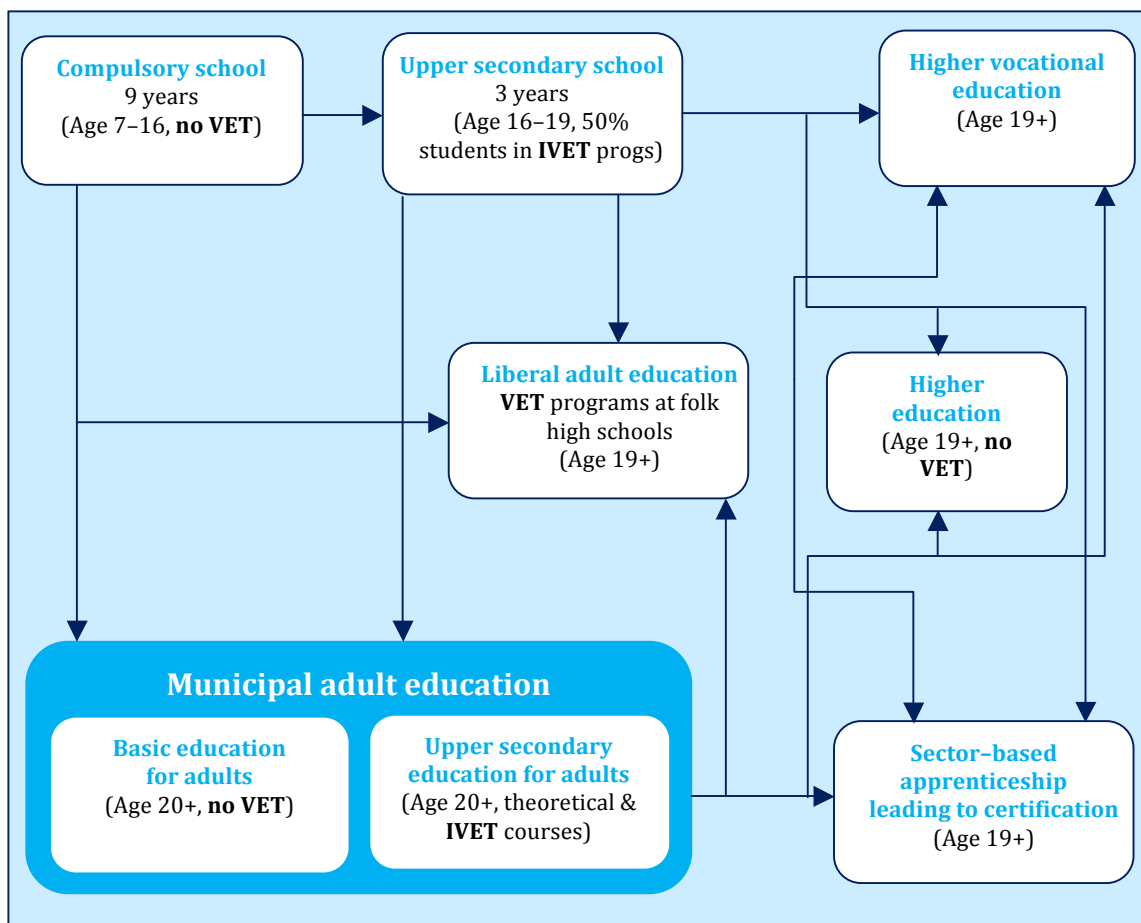


Figure 6: Structure of the Swedish education system (Cedefop 2009)

4.1.1 Factor conditions

The majority of VET in Sweden is publicly funded and Sweden is very generous in investing education. As illustrated in Figure 7(a), there has been a constant increase in the money spent to support education in the recent several years despite the economic crisis that strikes USA as well as Europe. Furthermore, from Figure 7(b), it is clear that Sweden spends a higher proportion of its GDP on education and training than the EU average.

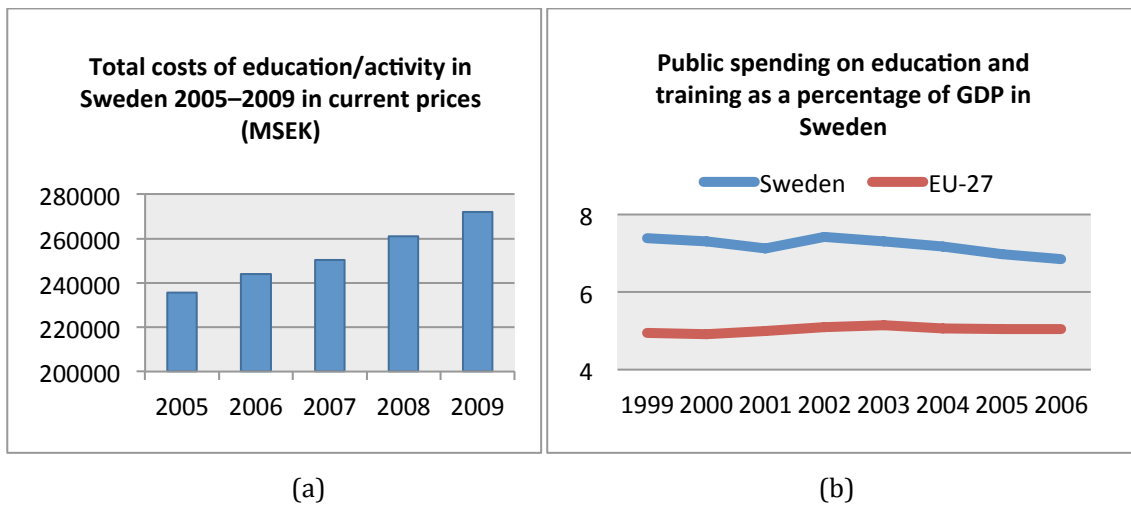


Figure 7: (a) Total costs of education/activity 2005-2009 in current prices (MSEK), (Statistics Sweden) (b) Public spending on education and training as a percentage of GDP in Sweden and EU-27, 1999-2006, (Eurostat, population and social conditions, online database 2009)

As an indispensable part of education, VET is also receiving abundant funds especially in upper secondary school where 50% students are in VET programs as shown in Table 1.

	2005	2006	2007	2008	2009
Upper Secondary School	31,907	33,516	34,988	35,975	37,060

Adult Secondary Education	4,740	4,522	3,957	3,688	3,710
Advanced Vocational Training	894	1,061	1,196	1,224	1,335
Employment Training	5,301	5,534	3,334	2,081	1,989
Total	42,842	44,633	43,475	42,968	44,094

Table 1: Total costs of VET in Sweden 2005-2009 (MSEK), (Statistics Sweden)
Note: 50% students in upper secondary school are in VET programs

Furthermore, as shown in Table 2, Swedish VET programs cover a wide range of fields.

National upper secondary programs	Proportion/total students
Arts/art and design, dance, music and theatre (Estetiska programmet)	6.5 %
Business and administration/commerce and service, tourism and travel (Handels-och Administrationsprogrammet)	5.3 %
Child and recreation/recreational, pedagogical and social activities (Barnoch Fritidsprogrammet)	4.4 %
Construction/building, house construction, painting, platework (Byggprogrammet)	4.7 %
Electrical engineering/automation, electronics, electrical engineering and computer technology (Elprogrammet)	6.6 %
Energy/operations and maintenance, marine technology, heating, ventilation and sanitation and refrigeration (Energiprogrammet)	1.1 %
Food/local specialisations, countrywide recruiting (Livsmedelsprogrammet)	0.5 %
Handicraft/various trades and crafts (Hantverksprogrammet)	2.7 %
Health and nursing/no national specialisations (Omvårdnadsprogrammet)	3.9 %
Hotel, restaurant and catering/hotels, restaurant and meal services (Hotell-och Restaurangprogrammet)	4.3 %
Industry/local specialisations, countrywide recruiting (Industriprogrammet)	2.9 %
Media/media production, printing technology (Medieprogrammet)	4.9 %
Natural resource use/local specialisations (Naturbruksprogrammet)	3.1 %
Natural science/natural sciences, mathematics and computer sciences, environmental sciences, (Naturvetenskapsprogrammet)	12.5 %

Social science/economics, culture, social sciences, languages (Samhällvetenskapsprogrammet)	25.7 %
Technology/local specialisations (Teknikprogrammet)	5.7 %
Vehicle engineering/aircraft, coach work, machine and lorry, cars, transport (Fordonsprogrammet)	4.7 %

Table 2: National upper secondary school programs and participation, 2008/09. (Cedefop 2009)

What is more, the Swedish Government also launched a major investment in teacher competence training with a total expenditure of over SEK 2.5 billion between 2007 and 2010 (Cedefop 2008). Funding of VET will also concerns about major reforms of upper secondary VET, the introduction of upper secondary apprenticeship and so on.

Educational institution & level	Upper secondary school	Municipal adult education	Advanced vocational education		
			College	Munic. adult educ.	Other
Type of teachers					
Vocational teachers	X	X	(X)	X	(X)
General teachers	X	(X)	X	X	X
Trainers, approved by employer	X	X	X	X	X
Trainers, approved by professional organization	(X)	-	-	-	-
Assistant masters	-	-	X	-	-

Table 3: Types of initial- and continuing vocational education teachers in Sweden, (Cedefop 2008)
Note: (X) indicates that this category of teachers may be found within some, but not all programs.

The types of teachers and trainers in Swedish VET vary widely by VET type (Cedefop 2008). As shown in Table 3, there are typically three kinds of teachers: specific subject teacher, core subject teachers for general subjects common for all

programs as well as trainers and assistant masters that are recruited on the basis of related practical professional experience rather than teaching certificate. The first two kinds of teachers are required to hold a valid teaching degree with three and half to five and half years of full time study. Work-life experience in a vocation can be validated as half of the credits required to teach the upper secondary level. Because of the shortage of vocational teachers, there is also a flexible policy that those teachers without a teaching degree can teach half time and study half time to achieve a teaching degree. For the last kind of teachers, it is the workplace's responsibility to train the teacher and trainer. The only general requirements are that teachers and trainers should be competent enough for what they teach from education or vocational experience. Around thirty percent of the total time in advanced vocational education programs, the trainers in charge of the workshop practical education are employees with extensive professional experience (Cedefop 2008).

4.1.2 Demand conditions

Table 4 illustrates the employment rate change from 1990 to 2005. Despite the increasing unemployment rate which indicates larger labor reserves comparing to the last decade of 20th century, many employers now still claim that the labor is in short of supply. Part of the reason is the effect of the good times that employers once enjoyed in the mid-1990s, when they could make choices out of abundant number of job seekers with relatively low prices.

	1990	1995	1999	2000	2005
Population, 16-64 (thousands)	5,397	5,523	5,581	5,602	5,770
Labor force, 16-64 (thousands)	4,560	4,319	4,309	4,362	4,622
Employed, % of population	83.1	72.2	72.9	74.2	73.9
-Men	85.2	73.5	74.8	76.1	75.9
-Women	81.0	70.8	70.9	72.2	71.8
Unemployed, % of labor force	1.6	7.7	5.6	4.7	7.8

-Men	1.7	8.5	5.9	5.0	7.9
-Women	1.6	6.9	5.2	4.3	7.6

Table 4: Employment rates in Sweden. (Cedefop 2008)

Table 5 illustrates how different the labor market in Sweden is for men and women. More women are employed by municipalities, which have responsibility for the delivery of education, social welfare, care of the elderly, etc. than men. In contrast, the private sector is dominated by male.

	Municipal	County	State administration and service	Commercial and industrial	Other organizations/institutions
All	827,756 (18.9%)	250,302 (5.7%)	234,699 (5.3%)	2,901,716 (66.1%)	176,086 (4.0%)
Men	172,903 (7.5%)	49,814 (2.2%)	120,123 (5.2%)	1,874,487 (81.8%)	73,720 (3.2%)
Women	654,853 (31.2%)	200,488 (9.5%)	114,576 (5.5%)	1,027,229 (48.9%)	102,366 (4.9%)

Table 5: Number (%) employed by sector in Sweden, 2007, (Cedefop 2009)

Data Source: Statistics Sweden, 2009

Available from Internet: http://www.scb.se/Pages/TableAndChart___23033.aspx.

4.1.3 Related and supporting industries

Porter believes that it is almost impossible to find a single successful industry without interacting with strong and challenging supportive and related industries. Likewise, vocational education and training system typically involves many different supportive sectors because there is a need for a better match between VET output and labor market needs.

However, for Sweden, it is complained that there is not sufficient involvement of industries in VET, so some countermeasures have been taken. For example, since

2011, a new apprenticeship program has been introduced into Swedish new upper secondary school (Cedefop 2009). In fact, the efforts have already been made and a new apprenticeship training pilot has been launched since 1 July 2008, in which apprenticeship training is considered to be an alternative in vocational programs where students take at least 50 percent of the training in enterprise. The program leads to the same qualification as school-based vocational programs and apprentices may, or may not, earn a wage. Those who participate in upper secondary apprenticeship training will be able to reduce their load of core courses in Swedish or Swedish as a second language, English, mathematics, social sciences, history, religion and physical education. To meet the entry requirements to higher education, upper secondary apprentices may take additional core courses during their time at upper secondary school or can, at a later date, supplement their education through municipal adult education (Cedefop, 2008).

In addition, as for another form of VET training — staff training (personalutbildning) — that is registered in Swedish statistics, employers in supporting industries also play a crucial role to improve Swedish VET system for adult (Cedefop 2009). Majority of this training is organized in the company or at the workplace. In Sweden, staff training is quite evenly distributed among employees that aged 25–54 but younger people (20–24) and older workers (55–64) seem to less willing to participate. On average, a higher proportion of women than men participate in staff training.

4.1.4 VET strategy, structure and rivalry

As mentioned in the beginning, The Ministry of Education and Research is the central institution in charge of the most educational issues in Sweden, under which The Swedish National Agency for Education (Skolverket) is the central administrative authority for the Swedish public school system for children, young people and adults, as well as for preschool activities and child care for school children. This covers initial vocational education and training (IVET, which is the vocationally-oriented programs at upper secondary school) as well as two smaller VET forms that can be IVET or continuing vocational education and training (CVET): supplementary education and post secondary training (Cedefop 2009). The differences between IVET and CVET are illustrated in Table 6.

Features	IVET	CVET
The vast majority consists of vocationally oriented programs at upper secondary level	√	
Labor market training	√	√
Vocational training within the framework of municipal adult education	√	√
In-company training or staff training		√
Advanced vocational education and training		√
Professional degrees at university level		√

Table 6: The comparisons between IVET and CVET (Cedefop, 2008)

Following the framework and guidelines established by the government and administered by the Swedish National Agency for Education (Skolverket), municipalities are in general responsible for educational activities within the school system for both IVET and CVET. In addition to the dominant upper secondary IVET, there is also a higher vocational educational college provides post-secondary school education. The courses are designed in consultation with employees and are tailored to meet the manpower needs of the labor market and lead to jobs. The content and direction of the courses may vary over time depending on the needs of the labor market. There are both higher vocational education courses (HVECs) and qualified vocational courses (KY courses) (Cedefop 2008). About a third of the training is workplace experience known as Learning in Work. Advanced vocational education and training is counted in credit points, where one week's full-time study corresponds to 1 credit point. An advanced vocational education or training course can be between 40 and 120 credit points, most last for 80 credit points (skolverket 2010).

'Individual programs' in upper secondary education is designed to help those students who have difficulties in three core subjects English, Mathematics and Swedish/Swedish as a second language thus are not eligible to apply to national or specially designed programs (Cedefop 2008). It is capable of giving those students another chance to enter one of the national or specially designed programs. Additionally, young people who arrived in Sweden recently are also included in individual programs. A student in the individual program can also combine

employment, as part of a vocational education with studies of certain subjects in upper secondary school. Although there is currently no IVET at tertiary level in Sweden, the possibility of introducing an entry point is investigated by the Government to include IVET for those with higher education (Cedefop 2008).

4.1.5 Government

Chance serves to offer the information of what needs to be changed under specific incoming situation, but actually there is no doubt that Government plays the dominant role in VET system. The factor 'Government' is not limited to influence or intervene but in a more significant sense, it is a decisive factor. As long as the Government is fully aware of how important and serious the issue is and makes the corresponding effort to improve, then this industry will continue to move forward in a sustainable way. In Sweden, overall responsibility for education (including VET) rests with Parliament and the Government. Autonomous municipalities are main providers of VET funds because the majority of income tax revenue goes to them to support almost all education below university level (Cedefop 2008).

Following the general trend in Swedish society towards decentralization of responsibility and decision-making powers, the education system (including VET) has gone through fundamental changes in recent decades. In 1991, in accordance with decisions in Parliament, responsibility for teaching staff was transferred from central authorities to municipalities and local school authorities (Nilsson 2008). The reforms also started a new era of school management by focusing on objectives and results with fewer regulations and clearer goals.

The Government is in charge of formulating national goals and guidelines, central and local education authorities as well as education providers' task is to make sure that the system is implemented in the way that conform to national goals. Within the Government framework and administered by the Swedish National Agency for Education (Skolverket), education providers are given enough freedom to determine how activities are to be implemented in practice. Central and local authorities together with individual schools are required to follow up and evaluate educational activities relative to nationally established goals. Responsibility to make general policy decisions on education system regarding objectives, activities and financing are shared between Parliament and the Government. Legislation and policy on education funding is handled by Parliament, while the Government issues

ordinances, approves curricula and determines general guidelines on the appropriations distribution (Cedefop 2009).

Furthermore, in order to financially support new apprenticeship policy, the Government subsidize employers that hire and supervise apprentices approximately SEK 25, 000 per apprentice per year to cover the cost of employing the apprentice and for training supervisors (Cedefop 2009). In total, the Swedish Government will provide SEK 500 million over three years with SEK 400 million assigned to cover the costs for employing an apprentice and the rest SEK 100 million for training apprentice supervisors (Cedefop 2009).

4.2 Chinese VET system

Chinese school system is a monopoly one which is dominantly ruled and financed by the Government. The Vocational Education Law in China is just a political reference (Guo and Lamb 2010). In fact, due to regional differences and incomplete organization concept, there hardly exists a unified and detailed regulation on curricula, examinations, teacher training and cooperation with industry. Furthermore, China has long adopted a culture and value systems where society highly evaluate academic qualifications and scholarships because they would create pathways towards respected employment, so there has long been a cultural bias on vocational education and training which prevents people from attending it.

China is a vast country. Economic, culture and policies vary from place to place, in this paper we will take Tianjin as the case to study. Tianjin is a metropolis locates in northern China and one of the five national central cities of China. It was established as one of four municipalities in China in 1997, reporting directly to the Central Government, with Beijing, Shanghai and Chongqing being the other three. Therefore it is under direct administration of the Central Government.

Tianjin is an important component of the so called Bohai Economic Rim, which describes the economic hinterland surrounding Beijing and Tianjin as well as parts of Hebei province, Liaoning province and Shandong province which surrounds the Bohai Sea. The Bohai Economic Rim has traditionally been closely involved in heavy industries and manufacturing while Tianjin's strengths have always been in

aviation, logistics and shipping due to its geographical advantage. Since Opening and Reform, this region has gone through fundamental changes in economic and infrastructures. This emerging region is rising as a Northern economic driving force and sharing the similar economic significance with the Pearl River Delta in the south and the Yangtze River Delta in east China. This is also the motivation behind selecting Tianjin as the example because of its representativeness.

4.2.1 Factor conditions

Like anywhere else in China, Tianjin is experiencing extraordinary economic growth in recent years that results in corresponding expansion of private enterprise and the development of commercial ownership by individuals and companies. Under such circumstances, the traditional VET system is no longer able to catch up and thus in need to adapt to changing market conditions, particularly the raising needs of the private sector and foreign firms. Therefore, in response of the new challenges, the Government is spending an increasing volume of resources to improve its VET system. It is reported that the financial funding goes to education increased by 29% from 11 billion RMB in 2007 to about 14 billion in 2008 (Tianjin Government official website). In addition, what is worth noticing is that quality is the first priority over quantity. Table 7 briefly shows the number of VET institutions at secondary level and students and teachers in 2007 and 2008. No significant change can be observed in these numbers during these two years. But from Table 8 it is very clear that there are more senior technicians entering the labor market in the past few years despite the fluctuation on number of workers with inferior qualification. So it can be an indicator that shows the overall skills and experiences of the workers that enter the industry are steadily improving.

	Number of Schools		Students enrollment		Teacher, staff and workers	
	2007	2008	2007	2008	2007	2008
Specialized Secondary School	41	40	87,695	88,851	5,517	6,850
Secondary Technical Schools	47	44	47,806	43,400	5,664	4,833

Vocational Secondary Schools	36	37	48,179	47,025	4,307	4,284
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Table 7: Schools, students and teachers by level and type of secondary VET school in Tianjin

Persons Granted Vocational Certificate	2005	2006	2007	2008
Junior worker	137,961	128,219	145,986	136,350
Middle worker	55,256	68,195	66,557	77,123
Senior worker	16,102	20,307	20,998	25,154
Technician	5,549	6,151	4,638	4,665
Senior Technician	349	441	767	1,304

Table 8: Statistics on vocational skill training and employment service in Tianjin from 2005 to 2008

4.2.2 Demand conditions

In most market economies, labor market demand especially domestic labor market demand is seen as the key driving force of VET systems design and operation. As an emerging country, China is currently experiencing profound changes in every sector of economy since it transitions from a planned to a market economy. Furthermore, China is also in the process of rapid technological development and increasingly fierce economic competition. It is predicted that there is likely to be an increase of 3% in the populations of urban centers in China over the next two decades (Simmons and Polgar, 2005). Keep China's 1.4 billion population in mind, the number of new urban residents is actually more than 40 million. With 70% of this new labor force is expected to be employed in the manufacturing sector (which is nearly 30 million), this will also result in increased demands for technical and VET. Woronov's description gives a glimpse of the prosperous Chinese job market (2011):

"The growing city needs receptionists and transcriptionists, data entry operators and copy machine repairmen. Jobs are open to sell tickets in the new subway stations, and to sell furniture or bathroom fixtures in the new home-decorating centers. Call

centers need operators; trucking companies need dispatchers. Small retail outlets need salesclerks.”

Again, besides quantity, there is also a greater demand for workers with better quality such as improved communication skills, higher levels of numeracy, better technical competencies and greater interpersonal skills.

Take Tianjin for example, from Table 9 we can see that the total number of graduates from Secondary VET Schools rises by 13.7% from 24668 to 28042. Especially for students in Agriculture and Forestry, the number has a rapid growth for more than five times. For the rest, most sectors also show a mild increase. So an increasing number of workers enter the labor market every year to meet the also growing demand for employers in firms, private mostly.

Number of graduates from Secondary VET Schools	2007	2008
Agriculture and Forestry	131	834
Resources and Environment	196	240
Energy	N/A	187
Civil and Hydraulic Engineering	1,593	2,112
Processing and Manufacturing	6,468	7,963
Communication and Transportation	1,491	1,045
Information Technology	7,614	7,798
Medicine and Health	1,679	1,969
Trade and Tourism	3,548	3,745
Finance and Economics	611	697
Culture, Arts and Physical Education	528	813
Public Affairs	152	150
Teacher Training	453	348
Others	199	141
Total	24,668	28,042

Table 9: Graduates from Secondary VET Schools in Tianjin from 2007 to 2008
Data Source: China Data Online

The reason for China's dramatic demand rising in labor is that China has managed to make achievements within only one or two generation while other countries took centuries (Simmons and Polgar, 2005). There is no country previously has tried to accomplish so much in such a short time. China's attempt to push two transitions at the same time is without any historical precedent — from a command to a rural economy and then continuously from a rural economy to an urban one. The dilemma that Chinese VET education is facing during its development these years makes the things worse. On one hand, job market demand for skilled workers is soaring due to economic boom but on the other hand the skilled labor supply fails to keep the pace with the demand because Chinese people historically prefer attending universities and thus keep their children from attending VET. Taking advantage of flourishing Chinese economy, there is increasing activity and investment from foreign companies as demand shrinks in the Western world while the huge demand in China continues to grow. Take Tianjin as example, from January to February this year, there are 93 new foreign firms approved to make investment in Tianjin and 2.02 billion dollars of foreign capital has been reported to be in actual use which increases by 18% comparing to the same time last year (People's daily online, window of Tianjin). Because of the significant role in China's economy, labor demand in Tianjin will continue to grow in quantity and quality.

4.2.3 Related and supporting industries

It is a common sense for industry that training and development of the workforce is a crucial way to increase workers' capacity to contribute to quality and productivity improvements and therefore competitiveness. Furthermore, due to high customer expectations, more advanced products and technological change, the level of skills now required in the industry is also rising. Therefore, it is not hard to imagine the importance of the involvement of related industries in VET system.

However, traditionally there is not enough integration of practical industry demand with education and theory offered by teaching and learning in China's VET system. The majority of teachers are typically with university qualifications but do not have industry experience. A small number of teachers do have some industrial experience but usually this is merely in the form of observation rather than working on the job (Simmons and Polgar, 2005).

The Chinese central and provincial governments as well as industry in general, have expressed deep concern over the lack of relevance of many current VET offerings (Durden and Yang, 2006). Fortunately situation is likely to change in the future. State Council has noticed the gap between VET education and industry and released some regulations related to VET. These regulations are intended to emphasize the importance of teacher training and ensure an effective VET system that produces graduates who are work ready.

Many world famous international companies with decades of experiences in personnel training have their branches in Tianjin. It is a big advantage if Tianjin can make good use of these international resources to improve VET education. It is expected that high quality intern, practice and training bases being built in recent years to enhance cooperation and communication with industries and hence to make a breakthrough in VET development.

4.2.4 VET strategy, structure and rivalry

As inheritance from the old centralized economy decades ago, Chinese VET system has long been administered solely by Chinese central, provincial governments and Ministry of Education. However in recent years, to better implement the national policy that actively promoting the construction of lifelong education system and learning oriented society, various approaches have been taken to improve the pluralism of VET. For example, since 2005, several experimental areas for national vocational education innovation have been established in Tianjin, Sichuan, Henan, Guangxi and the Three Gorges zone, under cooperation with provincial authority and Ministry of Education (State Council, 2003). These experimental areas serve to pave the way for several important policies regarding vocational innovation and development in the new era. Through years of exploration and practice, Chinese VET system is claimed to have achieved preliminary shifts from centrally planned to market driven education, from direct government administration to simply macro guidance, from degree oriented to ability oriented.

To improve the geographical density of VET institutions and thus enhance rivalry, in Tianjin alone, during the recent 5 years, 50 practical training bases with advanced equipments, various skill categories and meeting the need for professional skilled personnel education are expected to be established in batches, covering areas of electrical engineering, petroleum and oceanic chemistry engineering,

automobile and equipment manufacturing, petroleum steel pipe, high quality raw steel, biotechnology, modern medication, novel energy and materials, oceanic transportation and environment protection which are local advantages (Tianjin Government official website).

China is currently experiencing a rapid transition from agricultural economy to modern industrial economy. Farmers still take up majority of the population. Therefore it is of essential importance to extend the previous VET education to rural area where VET networks can serve as a carrier, are implemented and completed to train a large amount of workers with practical skills. Considering the financial problems which prevail in rural areas, the coverage of scholarships and stipends are greatly improved for VET education (Tianjin Government official website).

Besides the vast countryside, urban communities are another focus for VET development. In Tianjin, it is advocated that VET institutions make full use of community educational resources and perform education training and skill train suitable for all community residents and thus form an important component for VET education. It is expected that in the recent 5 years the number of trainees from various VET institutions can reach more than 30% of the community population (Tianjin Government official website).

4.2.5 Government

Government plays an active and important role in VET development as can be seen in previous discussion. It mainly serves to improve competitive environment, and inspire firms to innovate without any “direct” intervention in the market mechanism (Mohammad Hosein Rezazadeh Mehrizi and Mohammad Packinat, 2008). Fully aware of this, the Chinese government regulates vocational and education training and also dedicated to find a balance between intervention from government and from the market through appropriately exploiting the market’s ability to distribute resources while make use of the leading role of government in administering vocational education and its development.

As mentioned in section 2.2.2, Chinese VET system is mainly administrated by Ministry of Labor and Social Security and Ministry of Education with small portion administrated by different ministries of industry/trade. About three decades ago, the development and reform of VET in China was heavily influenced by planned

economy (Zhai 2006). The central government first decides a 'human resource plan' based on the development plan for the economy, and then vocational education is supposed to prepare and train personnel for economic development exactly follow the related 'personnel plan' of the government. But the disadvantages of this rigid centralized structure are obvious. The 'personnel plan' cannot precisely estimate or predict the growth rate of the economy and thus the number of graduates provided by the system of vocational education which exactly based on the government's personnel plan may differ from the reality of the demands of the economy which either leads to unemployment or insufficient supply of labor. Furthermore, because of various situations in different parts of China, VET development has to be carried out adaptively and responsively to suit different needs instead of blindly following one plan. What is more, the central budget alone is not sufficient to support the growing VET system. As a result, changes were made since 1998 (The Clerical Office of the State Council, 1998). Since then, the central ministries' administrative function over their relevant schools has been gradually transferred to the local education administrative bodies (Guo and Lamb, 2010). However, this shift has also caused some problems. The central government intended to take this chance to shift the responsibility of supporting VET away from central budgets, but it also leads to the loss of some resources for VET schools and institutions during the transition process. This problem has been addressed in the year of 2000 by the Department of Education, with the release of another document (Department of Education P.R. of China, 2000) to make sure that the resources are properly maintained during the reform process.

Work-based training of various forms is an important aspect in technical and vocational education. To encourage employee training in enterprises, government is committed to provide funding for personnel training with amount equal to 1.5% of companies' total employee wages or 2.5% for companies with higher skill requirements, heavy training tasks and good profit (Tianjin Government official website). Furthermore, since 2006, at least 20% of the addition funding for city education must be distributed to VET in general areas and 30% in regions with popularization of the 9-year compulsory education. In vast rural areas, the funding for technology development and propagation can be appropriately applied to rural vocational education. Training provided by VET institutions for reemployment can also receive reemployment subsidies.

5 Results and discussion

Based on the detailed analysis in chapter 4, we are now ready to discuss our research questions.

Let's first look at Swedish vocational education and training system. From previous chapter, we can see that Swedish VET system is well funded and has very rich capital resources. But Sweden is facing the problem of an ageing society and subsequently short of working labors because the retirement is higher than labor force entry of newly trained young people with VET skills (Cedefop 2009). In particular, there are some industries and services that are expected to demand a large number of workers entering the labor market (Cedefop 2009). For example, there has been a major shortage of health and social care staff according to Statistics Sweden's Labor Market Tendency Survey and other sources. The number of young students entering health and social care program stays very low compared with the situation 10 years ago and it is very likely that this shortage will continue to grow in the future. What is more, the number of technicians joining the labor market every year is about 6 000, while the gap between demand and supply is a couple of thousand more and may close to 10 per cent of the total number currently available (Statistics Sweden). In addition, the newly qualified IT staff available such as systems engineers and programmers only covers no more than half the recruitment needs.

To make the things worse, there has been much emphasis on university education thus leads to the relatively low number of students entering VET in recent decades. Therefore, VET faces the challenge to train an increasing number of young people that enter the trades with labor shortages.

However, it is worth noticing that there are some industries with supply exceeding demand. Employment in manufacturing industries is subjected to a continuous decline, following its long-term downward trend. It has also been reported that the availability of newly educated labor in the humanities clearly

outnumbers the demand and existing labor reserve is expected to grow. The same situation applies to social scientists, the hotel, restaurant and catering program (Statistics Sweden). Furthermore, on the long run, the number of employment in agriculture and forestry is expected to fall by 50 % by 2020.

In addition, the competence of Swedish vocational teachers is not that satisfactory especially in the eyes of employers (Lundahl & Sander, 1998). The enrollment requirements of formal education are notably lower than teachers for other types of education. Approximately 45% of the VET teachers have only got an upper secondary level education when they become teachers and get training. Furthermore, some VET teachers are complained to be too specialized and thus not suitable for the new, broad upper secondary programs. For the people from industry and trade union, the competence of VET teachers is insufficient and out of date. However for VET student, it is a totally different picture. More than 2/3 of the VET students believe that they are ready for working life. 90% of VET students claim that they learned new and high level knowledge in the vocational subjects and also received enough training to work independently (Lundahl & Sander, 1998). So it is clear that there is some discrepancy between the employers expectation and students self assessment.

Another thing is that Swedish VET system must be able to make corresponding adjustments following the variations among different sectors and along with economic cycles. Gender difference is another issue to be aware of. There should be rich interaction between local demand and VET system to heighten the process of interactive learning.

Now let's turn to Chinese VET. It is not surprising that Chinese VET now receives an increasing attention and is growing faster and faster these years. From the factor condition comparison in capital resources, it is not hard to see that one of the bottlenecks hindering Chinese VET development is insufficient financial support. As shown in section 4.1.1, Sweden is very generous in funding its VET system. It spends roughly 7% of its GDP on education and training which is about 1% more than the EU average. What is more, billions of SEK is spent on teacher training. But China, on the other hand, is lagged far behind. As early as in 1993, Chinese government has set the goal that the proportion of education expense should reach 4% of its GDP (State Council 1993). However, this target never comes true. The actual number is only 3.83% in 2011 and expected to finally achieve 4% this year

(State Council 2012). To make the things worse, majority of education funding goes to general academic senior secondary schools despite the fact that the number of students attending VET is actually almost the same. This serious imbalance is mainly because of China's longstanding financial allocation strategy to give top priority on so called elite education. For instance, in 2005, the total budget for senior secondary education is roughly 104.637 billion RMB where 93.605 billion RMB goes to general academic senior secondary schools and takes up 89.46% of the total budget where VET institutions only get 10.54% percent (Hu and Ma, 2006). Therefore, most VET institutions rely dominantly on tuition to survive and find themselves with very limited budget. As a result, the infrastructure and equipment are usually quite old and outdated, the quality of teachers are often relatively low since it is not possible to hire teachers with high qualification.

Moreover, the Chinese human resources are also in need of improvement, mainly in terms of VET students and teachers.

In China, almost no students would choose to join VET if they can be enrolled in colleges for normal education. So VET students are generally those with either lower learning ability or worse self control and choose VET as their last resort. In fact, many VET students choose vocational schools not to learn a specific skill. Instead, they choose VET in order to maintain their status as students because Chinese believe that more education produces better citizens. Sometimes even "*The teachers were very straightforward in stating that they would never consider sending their own children to the schools in which they worked.*" (Woronov 2011). In many Chinese' view, the VET students are usually undisciplined and unruly; because if they weren't, they would have been better students and get better grades in university entrance examination (UEE) or high school entrance examination (HSEE) and would not end up in these schools.

In addition, in general VET teachers in China receive relatively low levels of training which mainly focuses on theoretical and teaching skills rather than theoretical and practical skills. Because the Chinese system of teacher training aims at preparing teachers for mainstream, and not vocational schools, a large number of VET teachers are graduates with academic qualifications from low quality normal university and have no industry experience before entering teaching. So it is already brought to Government's attention to assure sufficient and appropriate teachers in

the field of vocational education and focus on more student-centered and collective problem solving approaches for VET education.

However, the fact is, in China, VET teachers are employed on the basis of being a “theory” or a “practical” teacher, with the former type getting more salary. As to trainers from industry, they are employed on a quite casual basis and paid on an hourly rate. Generally VET teachers are expected to keep a minimum of 30 students in a class. If the class drops below 30 participants, the teacher’s pay will become less. As a result, Chinese vocational secondary schools is not capable of encouraging staff to improve course construction, because most teachers are busy with a full teaching load and thus not willing to give up income through taking fewer classes or improve course content, in order to be involved in course development. Consequently, bored students who are not engaged with teachers or classroom material are arguably not uncommon in China’s lower tier secondary schools, as depicted by Woronov (2001):

“Although I am perched on a low stool at the far back of a large classroom ... I have a clear view of the blackboard at the front of the room, because almost all the students in front of me are asleep at their desks. With their faces planted on the long, narrow tables that serve as desks and their arms dangling... the teacher, who — oblivious to the students’ lack of attention — lectures in an endless drone while facing the blackboard, her back to the room.”

On the other hand, experienced industry trainers are difficult to employ because they are typically earning much more in industry than from teaching. So it is not hard to see that changes must be made to improve VET teacher quality and get a better balance between theoretical and practical skill training for students. Feasible approaches may include increasing training intensity for VET teachers, reducing their loads and improving their payment. Furthermore, better flexibility for students within courses, more effective and efficient use of training facilities are also core needs for VET system improvement.

There is good news that an increasing amount of funding has been allocated to VET every year. Furthermore, subsidies are provided to companies to encourage work-based training. Comparing to Sweden, these actions are far from enough to promote investment in Chinese VET into Swedish level, so China still has a long way to go in financial supporting VET. Besides hardware, the software gap between the

two countries is also obvious. Even though the competitiveness of Swedish VET teachers may not be satisfactory in employer's eyes, it is still much better than its Chinese counterpart. In view of the relatively low qualification of VET teachers in China, the government has actively advocate the training of teachers and those who with double qualification — teacher certificate and engineer qualifications — are considered the backbone of VET education (Hu and Ma, 2006).

As to demand conditions, both Sweden and China face the same problem that the skilled young workers are short of supply due to various reasons. Sweden is mainly troubled by aging and low birthrate and China is because of rapid economic growth which creates many job vacancies mainly in manufacture industry. But the structure of Chinese education is not designed to suit such need. As a result, ironically many Chinese undergraduate students find it hard to find a job when they graduate from university because they are supposed to work as white collar which is actually not very badly needed in China. So the suggestion is that there should be more emphasis on VET system than general higher education to produce an increasing number of skilled workers with high qualifications.

Both Sweden and China are in need of intensive support from related and supporting industries in worker training. There has been deep concern from Chinese governments as well as industry over the lack of relevance of many current VET offerings to practical demand. The integration of industry practical demand with what China's VET system can offer is in need of strengthening. Fortunately this is the problem that receives attention especially in economic developed region like in Tianjin where many world famous international companies have their branches there. Making good use of these international resources is expected to improve VET education. For example, apprenticeship training can be regulated to become an alternative in vocational programs where students can spend certain amount of time in enterprise and get the same qualification as school-based vocational programs. Hopefully this trend can prevail all over the country in the near future.

Regarding VET strategy, structure and rivalry, China still has a long way to go as it suffers from long being administered rigidly by Chinese governments and Ministry of Education and thus lack of diversity, flexibility and competitiveness. In recent year, several experimental areas for national vocational education innovation have been established in many regions and provinces. Furthermore, the rural area which consists of majority of Chinese landscape is also taken care of by extending the VET

education to vast rural area and thus trains a large amount of workers with practical skills.

No doubt that the government plays the central role in VET construction as no single companies is possible to afford and coordinate such costly system. Actually from previous discussion, we can see that government is everywhere in VET, as funding provider, policy maker and promoter and at the same time finds the balance that preventing from any direct intervention in the market mechanism but also improving competitive environment and inspire VET to innovate. It is seen that both Sweden and China are in favour of decentralization of responsibility and decision-making powers for VET in recent years. Indeed, to suit the various needs in different regions with different economical, cultural characteristic, there is no single policy can be applied to all the places in the country. In China, the government also has the responsibility to change people's longstanding discrimination on VET student by increasing financial support and adequate propaganda. Only with enough funding the VET institution can hire high quality teachers and afford necessary equipment and thus improve graduate student competence. Furthermore, Chinese government should also actively promote standardization process in both teachers and students in VET system. The teachers with certified qualifications both in academic and industry skills are most welcome with higher pay and students with certain certification can find themselves much easier to find a job. Then teachers will strive to improve themselves and students will have a much clearer goal in VET education.

6 Summary

Within the methodological framework described in Chapter 3, we see how Sweden and China are doing in VET development with the modified diamond model focusing more on government. Indeed, government support is vital in all the factors that are involved. Sweden is the forerunner that China can follow in finding government's role in VET regulation. China has to spend a higher proportion of its increasing GDP every year to education in which a higher proportion should go to VET to build up a more competitive VET system just like Sweden. Furthermore, in addition to generous investment, Chinese longstanding discrimination which is not seen in Sweden on VET must be altered because it prevents high quality students from attending VET and also prevents VET students from finding a satisfied job. It is also expected that there can be a closer corporation between industry and VET in China and some of the measures carried out in Sweden can be borrowed, such as apprenticeship with equal qualification and staff training. Besides similarities, there are also differences between Sweden and China. For example, there is huge economical and cultural imbalance geographically in China, so the diversity and complexity of VET policies is much higher than Sweden which is very balanced. Fortunately, we can see that Chinese government has already noticed many problems in VET development and some countermeasures have already been carried out, so Chinese VET can be expected to be increasingly competitive over the years. Last but not least, there is also something that the modified diamond model can improve in analyzing VET competitiveness since it cannot show the different aspects of different levels of VET in different countries quantitatively. It is suggested that more indicators under each determinant or variables can be provided to perform a more fair and in depth analysis in VET.

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