Effects of export on technological innovation:
an analysis based on the current economic crisis

Li Ping
School of Economics
Shandong University of Technology
Zibo, P.R.China
E-mail: lpkx@sdut.edu.cn

Tian Shuo
School of Economics
Shandong University of Technology
Zibo, P.R.China
E-mail:yutiants@163.com

Abstract—China’s export has been inevitably impacted by the current economic crisis, and many export enterprises are striving against the pressure of international market. Further and continual development of these enterprises depends on technology innovation, thus, this paper tries to identify the other side of the current crisis influences namely the technological innovation opportunity. The finding is that technological innovation can be improved through competition effect and spillover effect by means of learning by exporting and connection. The corresponding policies and measures are also explored.

Keywords- economic crisis, export enterprises, technological innovation

I. INTRODUCTION

The American subprime mortgage crisis eventually evolved into the world economic crisis, and global economy develops difficulty as the result of this huge challenge. The USA, Japan and Euro-zone countries are the main trade partners of China, so China’s export enterprises are heavily impacted because of declining demands of the above economies. According to statistics from Chinese customs, China’s gross export growth has dropped by 2.2% compared to the same period of the former year. To make up the loss of export quantities declining, enterprises are forced to gain their qualitative advantages by improving innovation capacity. Export has effects on technological innovation, and it means to opportunities for export enterprises at the time of current crisis if such effects could be well grasped. This paper will analyze the influencing mechanisms which export takes to innovation and propose some corresponding suggestions.

II. CHINA’S EXPORT IN THE CURRENT CRISIS

After joining the World Trade Organization, China is accelerating to be one member of the world and to be more and more related to such developed countries as America and Japan, who always have large demands for Chinese goods in recent years. But things change a little at the time of current crisis happening since their wealth has shrunk largely. According to statistics from Chinese customs, the total value that China exported to the USA was about 252.3 billion dollars in the last year which increased by 8.4% but only made a single-digit growth since the former seven years. Moreover, global consumers’ confidence is hurt when American financial crisis spread widely and deep, and then global economy growth has an obvious slowdown resulting in a drop of exports from China to other economies. And many small and medium manufacturing enterprises lay off employees, stop producing or even go out of business for the shortage of orders. Economic crisis has weakened and caused depreciation of US dollar, and simultaneously America government requests main economies including China to revaluate exchange for the purpose of sharing the loss of the USA. The RMB revaluation and US dollar depreciation will make export even more difficult for foreign currency prices of Chinese export goods are higher than before. Prices of international resource rise along with US dollar depreciation which causes an increase of production cost of export enterprises. Undoubtedly, it will weaken the international competitiveness of export products. Except for foreign demands and exchange mentioned above, policies made by other countries act as another mechanism through which economic crisis influence export. In order to protect their own markets, governments of the principal trade partners may introduce trade protection policies, for example, tariff, hygiene standards and intellectual property rights etc to restrict export from China.

III. INFLUENCES OF EXPORT ON TECHNOLOGICAL INNOVATION

The development difficulties with which export manufacturing enterprises encounter indicate that China should develop qualitative advantages instead of growth just depending on large quantities of labor-intense products. Spread of current economic crisis brings huge pressure to China’s export enterprises, but it is also an opportunity: market competition effect and technology spillover effect can spur innovation incentives and improve competition capacity in international market. The following section will analyze these two kinds of effects in details.

A. Market competition effect

While global demands shrink a lot, export enterprises encounter more fierce competition. It is hard for export enterprises to maintain international competition capacity if only relying on the consumption of resources and labor. Technological innovation can promote enterprises to make full use of all resources, add value to their products and finally
improve the efficiency and maximize profits. While a competitive industry of a country carries on export trade technological innovation will ensure enterprises to obtain huge profits by their monopoly advantage and thus change international market structure. This will both turn into further innovation power and provide funds for expanding overseas market, so there are mutually reinforcing effects between technological innovation and trade advantage.

Geroski (1995), Nickell (1996) and Blundell et al (1999) pointed out there existed positive correlation between market competition and technological innovation. Market demand is the powerful source of enterprises meanwhile market competition is an underlying force for enterprises to form quicker and better products to fulfill market demand. The positive impacts which market competition makes to technological innovation are mainly reflected as follows:

1) International market competition urges export enterprises collect intelligence information in time, and this is vital to their technological innovation. Under the background of economic crisis, consumers’ demand and preference will change, so enterprises should seize the changing information in time and then judge whether their own quality level, product variety and specification meet the changes or not. Adequate information about foreign market also can help enterprises to determine direction, duty and request of technology development for the next step as well as improve the rate of technological innovation.

2) Market competition does good to develop products which are suitable for sale, excellent in quality and reasonable in prices. The common modes of technological innovation are process innovation and product innovation. Facing fierce competition, enterprises should improve equipment and technique on the base of advanced technology so as to raise their international market share. Process innovation means studying and using new technique or new operational procedures and so on, by doing so, product quality as well as production efficiency can be improved following reduction of production cost. The more influences that profit has on cost, the more motives enterprises have to introduce process innovation. On the other hand, enterprises can also update their ideas and develop new products to satisfy new market demands. This is product innovation which is determined by both market demand and profit level gained from the new products. If international market competition is insufficient, export enterprises will lack innovation motive since there is not enough pressure from the market.

3) Market competition will increase the ability of people who are engaged in technological innovations. Superintendents and staffs all have intense crisis feeling and the sense of urgency after economic crisis occurs. In this case, superintendents will improve staffs’ ability particularly their technological innovation capacity by training while staffs will study voluntarily to meet high requirements. This will provide guarantee for effective enterprises to carry on more technological innovation activities.

B. Technology spillover effect

Export facilitates international communication, and relationship between enterprises becomes more and more closed in today’s globalization system. Spillovers from foreign enterprises to domestic enterprises or among domestic enterprises have influences on technological innovation, and the main channels could be summed up as learning by exporting and connection effects.

1) Learning by exporting

According to the theory of technology diffusion, a country in an open economic system can contact giant knowledge which is accumulated in international research field. Trade is an important channel through which knowledge is exchanged, so export enterprises could boost their technological level or ability by learning knowledge and experience from their trade partners. This is called learning by exporting. Orders from foreign consumers often have higher qualitative and technological standards, so importers will provide product design or technical assistance for their suppliers. Moreover, non-import enterprises and experts of foreign countries can supply technological information too. Domestic enterprises improve production efficiency by the way of learning specialized technology, that is to say, there exists technology spillover effects. Some empirical and case studies of Rhee have shown learning by exporting improves production efficiency during the process of enterprises’ development in Korean. Exporters gain knowledge which is lacked in domestic country through export trade, and the knowledge may affect key enterprises and promote more innovation. Salomon, Robert and Shaver (2005) concluded that learning by exporting could enhance innovation using sample data of Spanish manufacturing enterprises during the year of 1990 to 1997. However, researches on spillover effects from learning by exporting are not completely consistent. Clerides, Lach Tybout (1998) showed production efficiency differences between exporter and non-exporter are not the results of learning by exporting after doing researches on samples from Colombian, Moroccan and Mexican manufacturing enterprises. But Keller (2004) pointed out that more data should be contained in their analysis to justify or deny spillover effects of learning by exporting.

2) Connection effects.

Export enterprises or one industry could have influences on technological progress and industry restructure. From the aspect of production, technological innovation belongs to the scope of productivity, and it realizes efficiency improvements of output by introducing a new technology function. Economic connections exist among different enterprises and different industrial sections, so changes happened in one section will influence other relative sections forcing the latter to make corresponding changes. These connection effects are divided into two groups: forward-linkage effects and backward-linkage effects. We suppose there are two enterprises or industries namely A and B, and the output of A is the input of B. Forward-linkage is while A uses new technology or equipment it causes B to improve itself according to A’s innovation investment. Correspondingly, back-ward linkage is while production technology system of B changes it requires A to conduct technological innovation.
The lending rate of several developed countries goes down after this economic crisis, so pressure to pay exchange loan is smaller for those enterprises which need to introduce technology equipments. This undoubtedly makes a better environment for technological innovation. New product equipment supply new input to forward-linkage enterprises or industries promoting their technological changes, and while enterprises or industries adapt new technology they also can influence through backward linkage, that is to say, they set new requirements for new technology of backward-linkage section. So it can be seen that connection effects lead to a higher whole technological innovation level.

Processing trade accounts for a great proportion in China’s export, and connection effects mentioned above are primarily obvious in processing trade mainly manifest for requests of orders and technical assistance from supporting enterprises. Usually, the higher technology which processing enterprises purchase contain, the more obvious of technology transfer or spillover, and the more important simulative role will be played on local technological progress. If local enterprises do not possess supporting production capacity or appropriate technological level, multinational firms will help the necessary suppliers who are engaged in the processing trade by the way of technological assistance. By doing this, technological level and product quality are both improved by promoting technological advancement and competition capacity of supporting enterprises. On the basis of high-level, high-quality and high-standard, processing enterprises can enter international market more smoothly.

IV. POLICY IMPLICATIONS

Through the above analysis we can see that economic crisis does have an adverse impact on China’s export, but it would turn out to be a long-term advantage for enterprises if we can grasp the opportunity which export brings to technological innovation. It is quite important for China whose technological innovation level is relatively weak, so in order to reduce bad influences of current economic crisis, it is necessary to find policies which can ensure whole technological innovation and economic development.

A. Government should strengthen policies such as export R&D (research and development) subsidies, export tax rebate and send emphasis on the protection of intellectual property rights.

Export R&D subsidies are commonly considered as an important government intervention. Government gives certain subsidies to those export enterprises which are engaged in R&D, as a result, it can both strengthen international market share and promote more innovation activities. Export tax rebate is a main financial and irreplaceable tax policy on keeping stable exporting growth. In the conditions of given resources and labor, more innovation will be made if government raise rate of export tax rebate. Different goods are set by different export tax rebate rates, and this encourages forming an optimized product structure. Moreover, intellectual property rights policy offers a fair rule and legal environment for technological competition by giving an exclusive right to enjoy own technological innovation achievement, so it is a kind of encouraging mechanism for enterprises’ innovation. Therefore, government ought to set powerful intellectual property rights policy to ensure technological innovation achievement of enterprises.

B. Enhance cooperative innovation.

The uncertainties and varieties of environment boil up risks when enterprises carry on technological innovation. It is hard for single enterprise to afford such risks. High and complicated technique as well as quicker speed of technological progress makes some important and large technological innovation surpass the withstanding scope of single enterprise. Cooperative innovation makes resources complementary and shared among enterprises and their cooperative enterprises, universities or other research institutions. Firstly, enterprises’ ability of researching new product or improving original product will be raised by absorbing external resources. Secondly, resources and information transferred during the process of cooperation can either improve research efficiency or reduce innovative risks. Thirdly, cooperation innovation realizes achievement sharing and increases innovation benefits.

C. Increase human capital input.

As a source of technological advantage human capital plays a decisive role on the development of an enterprise. Competition among enterprises can be finally summarized as competition of human capital. In order to maintain technological advantage and gain more profit from international market enterprises should carry on training as well as effective management towards technical personnel. This is good for technological innovation. Human capital’s migration is a vital way of knowledge or technology transfer. Under the background of current economic crisis, flow of human resources is quite frequent especially from developed countries which suffered setbacks in the crisis to potential countries such as China. Export enterprises ought to abstract these high-tech employees by offering good salary or fine treatment. It is another opportunity to promote technological innovation.

D. Pay great attention to the technological innovation of small and medium sized enterprises.

During the process of economic crisis, some small and medium enterprises (SMEs) which are engaged in export trade suffer a lot due to the limits of finance and size. SMEs are basic units of an economy, so government should help them to go through when they are weak to withstand risks. In the long run, technological innovation is the trend for the development of SMEs, and the more flexible system owned by SMEs will help technological innovation too. Government could support technological innovation of SMEs by means of setting better financial system, guarantee institution for applying loan as well as purchasing stock or bond of SMEs. All the measures will create good conditions for SMEs to carry on technological innovation and change crisis into opportunities.

V. CONCLUSIONS

In this paper, we have analyzed different effects undertaken by export enterprises facing huge pressure from current economic crisis. And market competition effect and technology spillover effect consist as two main mechanisms through which export play roles on technological innovation. It is not enough
to develop only depending on quantities’ growth. To seek qualitative advantages for export enterprises, technological innovation is the best long-term method. We also find opportunities which economic crisis brings to export enterprises if we can understand the two mechanisms mentioned above correctly and take effective measures such as increasing human capital input and so on. Of course, government should do something to support technological innovation as mentioned in this paper.

REFERENCES


