

Openness, Innovation and Quality Convergence in the Trade of Creative Products

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Openness, Innovation and Quality Convergence in the Trade of Creative Products

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1 . Introduction

Acemoglu, Zilibotti and Aghion (2006) in their paper, *Distance to Frontier, Selection, and Economic growth*, provided an idea that the appropriate institution at early stages of development may become inferior at later stages. Therefore, the institution applied by an economy should be switched at some point to speed up the economic growth. If this switch delays too much, the economy may fall into the “non-convergence traps”, namely stay away from the productivity frontier.

This paper develops a simple dynamic model, based on the framework from Acemoglu *et al.* (2006), to analyze the appropriate strategy applied by firms to develop the quality of their creative products. Moreover, we analyze the likely effects of openness to shed some light on the heated debate of whether creative products deserve special protection in trade. Bala and van Long (2005), applying the evolutionary theory, argued that in the international trade of cultural goods¹⁾, the preference of large country subverts that of small countries. Francois & van Ypersele (2002) argued that trade restrictions on cultural goods raise welfare on both sides of the trade under the condition of heterogeneous preferences. However, Rauch and Trindade (2009), incorporating the consumption network externality of cultural goods, explained that too restrictive protection motivates imitation of the dominant style, which in turn damages the domestic style, even though this protection may support domestic production. In keeping with the findings of the aforementioned research, countries such as Canada, France, and China have already taken steps, including import restrictions, content quotas, (film) co-production agreements, and so on, to

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1) Cultural goods: the range of creative products and cultural goods is almost the same, though there are differences in some cases. In this paper, the usage of these two terms is interchangeable.

protect indigenous products. It is one goal of this paper to provide ideas on this issue from the endogenous growth perspective.

There is a main addition in our framework compared to the current model. The model from Acemoglu *et al.* is based on a closed economy. They assumed that this country imitates technology of only the country at the frontier of technological development. We extend this framework to an open economy taking the international trade of creative products into account. The reason for our extension underlies differences between creative products and other material products, such as automobile, food products, and cellphones. In the production of these latter products, exclusive imitation of frontier technology makes sense because technology is supposed to be the main driver of productivity. As for creative products, such as motion pictures, music, performing art, and design, frontier products with the highest quality may also exist. However, to produce high quality creative products, it is necessary to look beyond simple imitation of advanced technique. The composition of music stands as one example of this. Sometimes music from the remote African continent inspires more creativity than does music originating from dominant cultures. In this way, it can be seen that imitation of a wide variety of foreign products, and not simply those from countries on the frontier of developmental technology, plays an important role in improving the quality of creative products. Imitating a variety of products enhances the knowledge stock of producers and also inspires these individuals' creativity. This is the reason that we think openness is important in the development of creative industry, and why we incorporate it into our model.

Moreover, the international trade of creative products has already become a driving force of world economy. According to a report from the United Nations (2010), world export of all creative goods in 2008 (accounting for 2.73% of total world export, with \$406,992 million) experienced an annual growth rate of 11.5% from 2003 to 2008²⁾. At the same time, because of the advance of information technology and the spread of globalization, individuals in most countries can access to other creative products with a significant declined cost. In this sense, openness in the trade of creative products deserves more attention.

In our framework, domestic producers decide their strategies of enhancing innovation or imitation, and then develop appropriate organizational institution to fulfill their strategies. We assume that domestic producers imitate those foreign products that enter the domestic market, which are easier to access and likely have a market share already. Imitation of these products is more prudent and less costly. Thus, if the import restriction is severe, the variety of products that domestic producers can imitate is too thin. However, if there is no restriction, domestic producers in minor countries may not survive the competition from foreign products. This is

2) United Nations, 2010, *Creative Economy Report 2010*, pp. 126.

also the reason why we are interested in the likely effects of openness. Our result shows that strategy varies with the quality level of domestic products in terms of the distance between their own quality and the worldwide average quality level. However, the firms may find themselves trapped in early-stage strategies because of endogenous preference from previous consumption and the difficulty inherent in switching. It should be seen that greater openness is a possible way to ease the problem. Actually, openness generally benefits the development of domestic creative industry in the circumstance that its own creative products survive.

Our research suggests that, for domestic producers, it is beneficial to change their strategies according to the stage in which the industry finds itself. For government regulators, regularly increasing openness facilitates the quality evolution of domestic products, and also postpones non-convergence traps. From a broader perspective, our results apply to all those products that gain quality or productivity from imitating other countries, not only the frontier.

The remaining part is structured as follows: section 2 describes the basic setting of our model. Section 3 provides preliminary results. In Section 4 the effects of openness are analyzed. Section 4 concludes.

2 . Model

Consider a model with \bar{n} economies. Each economy consists of non-overlapping generations, wherein each generation there is a continuum of one-period lived agents. Each economy supplies only one type of creative products, but with varieties. In a dominated economy i , firm k provides creative products with the quality level of B_{kt} at period t . Thus, the average quality of domestic industry can be denoted as $B_t = \int_0^1 B_{kt} dk$. A representative consumer's utility function is given by:

$$U_t = B_{it}^{1-\alpha} x_{it}^\alpha + \sum_{j \in S_{it}} B_{jt}^{1-\alpha} x_{jt}^\alpha \quad (1)$$

$$s.t. \quad p_{it} x_{it} + \sum_{j \in S_{it}} p_{jt} x_{jt} \leq E_t$$

Where B_t , p_t , x_t denote the quality, price and demand at period t , with subscripts i and j standing t for domestic products and foreign products j . S_{it} and E_t are separately the set of available foreign products and the expenditure on creative products. Under markup condition, $mc=1$, $p=1/\alpha$, $x_{it} = \alpha E_t B_{it} / (B_{it} + \sum_{j \in S_{it}} B_{jt})$ and $x_{jt} = \alpha E_t B_{jt} / (B_{it} + \sum_{j \in S_{it}} B_{jt})$. Suppose that domestic producers involve a one-off fixed cost C_{it} . Their profits are obtained as $\pi_{it} = x_{it}(p-1) - C_{it}$. To ensure the survival of domestic producers,

$$\sum_{j \in S_{it}} B_{jt} \leq \frac{(1-\alpha)E_t - C_t}{C_t} \cdot B_{it} \quad (2)$$

We refer $\sum_{j \in S_{it}} B_{jt}$ to the trade openness of domestic country. Under a certain level of

expenditure and fixed cost, the lower the import restriction is, the greater $\sum_{j \in S_{it}} B_{jt}$ is. Here we assume that each economy exports as much as possible. Equation (2) implies that under the lowest condition of import restriction, country i can import foreign products at the maximal level of $[(1-\alpha)E_t - C_t]B_{it}/C_t$.

The evolution of product quality is driven by incorporation of creativity to production. We assume that there are two dimensions of quality improvement, innovation, through which firms discover initial novelty based on the creativity stock of indigenous products, as well as imitation, through absorbing creativity from other nations' products. Accordingly, each creative firm faces a strategic choice, of whether to enhance innovation or imitation. We suppose that these two strategies require dissimilar organizational institutions. Taking the organizational culture as an example, "adhocracy cultures foster innovation strategies and hierarchical cultures promote imitation cultures." (Naranjo-Valencia *et al.* 2011). In this example, firms structure their organizational cultures to enhance innovation or imitation. Accordingly, the process of quality evolution takes the following form:

$$B_{it} = \gamma B_{i,t-1} + \eta \sum_{j \in S_{i,t-1}} B_{j,t-1} \tag{3}$$

$\gamma B_{i,t-1}$ and $\eta \sum_{j \in S_{i,t-1}} B_{j,t-1}$ separately stand for the quality improvement from innovation and imitation. We assume that imitation only takes place on those foreign products, which are purchased on domestic market, captured by $\sum_{j \in S_{i,t-1}} B_{j,t-1}$. This assumption seems too restrictive. Producers can discover and research any profitable products from all other countries. However, imitating those products, which are already popular among domestic consumers, is less risky and costly. Here parameters γ and η show the efficiency that the process of innovation and imitation go through under a certain strategy. For example, "Adhocracy cultures" refer to a higher γ and a lower η compared to that under "hierarchical cultures".

We assume that \bar{B}_t denotes the average quality of worldwide products at t period, $\bar{B}_t = \frac{\bar{n}}{\sum_{i=1}^{\bar{n}} B_{it}} / \bar{n}$. The motion of average quality follows

$$\bar{B}_t = (1+g)\bar{B}_{t-1} \tag{4}$$

with g being the change rate of average quality. g , treated as an exogenous variable here, is decided by strategies applied by other countries. We assume that the strategy of this dominated country does not affect other countries'. If $g < 0$, the average quality decreases.

3 . Preliminary Results

Dividing (3) by (4), we can obtain

$$b_{it} = \frac{\gamma}{1+g} b_{i,t-1} + \frac{\eta}{1+g} \bar{n}_{i,t-1} \tag{5}$$

b_{it} is the quality distance between domestic products to the average level, $0 < b_{it} < \bar{b}_{it}$. Here $\bar{b}_{it} = \bar{B}_{it}/\bar{B}_t$, \bar{B}_{it} refers to the quality frontier at period t . A bigger b_{it} implies that domestic products possess a higher quality. Here $\tilde{n}_{i,t-1}$, equals to $\sum_{j \in S_{i,j-1}} B_{j,t-1}/\bar{B}_{t-1}$, also indicates the degree of trade openness at period $t-1$. It can be understood as that government regulators set import quotas for each other country and then license \tilde{n}_{it} countries to enter the domestic market. $\tilde{n}_{i,t-1} \leq \bar{n}_{i,t-1}$, $\bar{n}_{i,t-1} = [(1-\alpha)E_t - C_t]B_{it}/C_t\bar{B}_t$.

Appropriate strategies can be obtained through imitating the analysis of Acemoglu *et al.* (2006). Assume that $\eta \in [\underline{\eta}, \bar{\eta}]$ and $\gamma \in [\underline{\gamma}, \bar{\gamma}]$. It is assumed that $\{\bar{\gamma}, \underline{\eta}\}$ and $\{\underline{\gamma}, \bar{\eta}\}$ represent situations under the innovation and imitation strategy separately. In Figure 1, the line with a lower intercept but a steeper slope refers to the innovation strategy, while the other stands for the imitation strategy. Accordingly, we can get that $\hat{b}_{i,t-1} = \tilde{n}_{i,t-1}(\bar{\eta} - \underline{\eta})/(\bar{\gamma} - \underline{\gamma})$, $\bar{b}_{i,t-1} = \tilde{n}_{i,t-1}\underline{\eta}/(1+g-\bar{\gamma})$, as well as

$$b_{trap} = \tilde{n}_{i,t-1}\bar{\eta}/(1+g-\underline{\gamma}) \quad (6)$$

Proposition 1: *If 2) holds and $\underline{\gamma} - g < 1$, when $b_{i,t-1} \leq \hat{b}_{i,t-1}$, enhancing imitation brings more benefits, whereas while $b_{i,t-1} > \hat{b}_{i,t-1}$, relying more on innovation is appropriate. If this switch does not take place until the point of b_{trap} , b_i fails to converge to the quality frontier level.*

From Figure 1, it is obvious that before $\hat{b}_{i,t-1}$, imitation matters more in improving quality, while innovation favors more after $\hat{b}_{i,t-1}$. The optimal point to switch strategies is $\hat{b}_{i,t-1}$. If a country switch too early, it cannot take full advantage of imitation; while after $\hat{b}_{i,t-1}$, it loses some benefits from the innovation. However, “non-convergence traps” are generated if the switch takes place after b_{trap} . In this case, the domestic products get trapped. The red line below shows one possible switch, which leads to the convergence to the frontier.

Two main reasons may lead to the failure of switch. In the above analysis, consumers have no special bias towards domestic products, or imitated products. However, consumers’ preference is, likely, endogenously formed on the process of consumption. Researches on taste cultivation (McCain 1981), habit formation (Spinnewyn 1981), rational addiction (Becker & Murphy 1988), and so on, provide evidence. It implies that consumers’ taste may be cultivated to bias towards those products with imitated traits, after a period of consuming imitated products. Thus, even if firms decide to switch from imitation strategy to innovation strategy before b_{trap} they may get trapped while taking the consumers’ demand into account. The other reason is from firms’ perspective. Once an institution (organizational culture here) is established, switching it to another one takes time, and sometimes with great internal difficulty. It seems that the longer time a country persists with the strategy of imitation, the more difficult it will be for this country to switch to a strategy of innovation. This, in turn, implies that the country in question is likely to fall into the aforementioned trap.

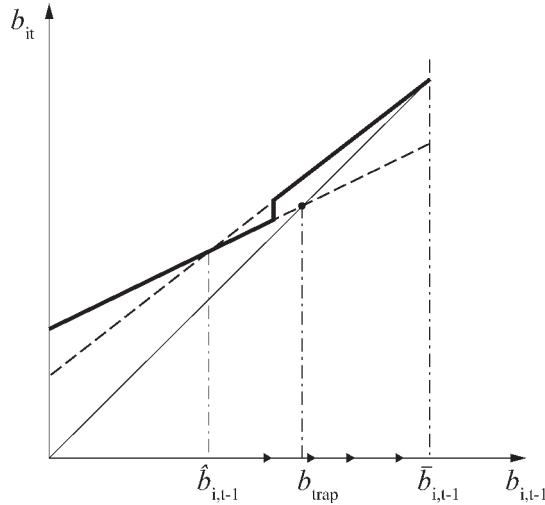


Figure 1. Quality evolution and non-convergence traps

4 . Openness and Non-convergence Traps

Here our attention turns to analyze the likely effects of openness on non-convergence traps. Openness is fixed in the above analysis. However, in reality, along with the improvement in quality of domestic products, domestic producers gradually gain competitiveness. Accordingly, government regulators can loosen import restrictions gradually. Suppose that $\tilde{n}_{i,t-1}$ is increased to $\bar{n}_{i,t-1}$ at period $t-1$. The updated situation is showed by the two dotted lines in Figure 2. Reflecting this change, the trap point is postponed to b'_{trap} , at the same time, the frontier level increase to $\bar{b}'_{i,t-1}$. This implied that greater openness alleviates the problem of non-convergence traps. Meanwhile, it lifts up the possible level of frontier quality. Under the condition of $\tilde{n}_{i,t-1}$, non-convergence traps rise if the country fails to change strategies until the level of b_{trap} . However, this level changes to b'_{trap} after increasing openness. It means while $b_{trap} < b_{i,t-1} \leq b'_{trap}$, this country can still adjust to a focused strategy of innovation, and furthermore, converge to the frontier. The red line in Figure 2 shows a possible process of this convergence.

Proposition 2: *If 2) holds and $\underline{\gamma} - g < 1$, greater openness lifts the worldwide frontier of quality and alleviates the problem of non-convergence traps. If $\tilde{n}_{i,t-1}$ is increased to $\bar{n}_{i,t-1}$, $\bar{b}_{i,t-1}$ and b_{trap} change to $\bar{b}'_{i,t-1}$ and b'_{trap} separately. A country still converges to the frontier level if the switch takes place among $b_{trap} < b_{i,t-1} \leq b'_{trap}$.*

This proposition implies that when an economy falls into non-convergence traps, raising

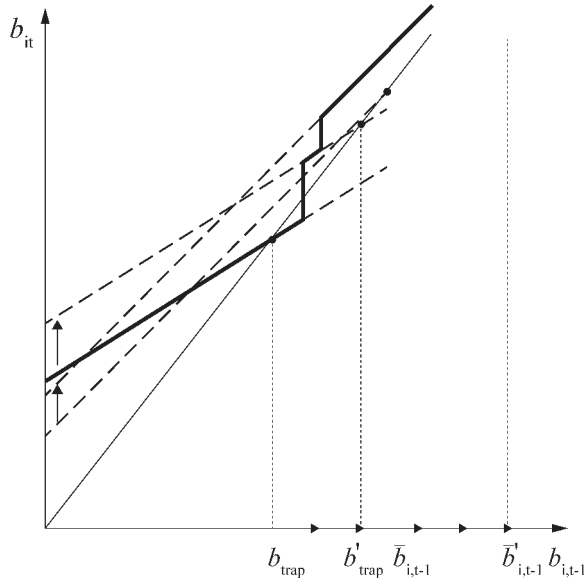


Figure 2. Greater openness and convergence

openness can be seen as a solution. Greater openness introduces more available products that, in turn, bring more novel ideas and ingredients for recreation. It also directly improves the quality level through imitation and enlarges the maximal level of potential quality. Actually, raising openness generally favors a country, especially those countries that apply imitation strategies, since $\bar{\eta} > \underline{\eta}$. Meanwhile, because of the quality improvement due to greater openness, domestic producers could survive a more open economy. From Figure 2, we know that the optimal switch level increases. However, the solution of raising openness, would outlive its usefulness if the switch takes place too late, while $b_{i,t-1} > \bar{b}'_{i,t-1}$.

5 . Conclusion

In this paper, we applied the framework of Acemoglu *et al.* (2006) to analyze development policy of the creative industry. By including the international trade of creative products into the existing framework, we figure out that greater openness in general proves beneficial to domestic products, especially in alleviating the problem of “non-convergence traps” to some extent. At earlier stages of the domestic creative industry, it is appropriate for firms to imitate foreign products, while at a later stage innovation brings more benefits. If a country cannot switch out of the imitation strategy until a certain level, in terms of the distance between its quality and worldwide average quality, this country fails to converge to the quality frontier, resulting in “non-convergence traps”. This paper intends to provide some suggestions for the development

of the creative industry. Obviously, much still needs to be done in this field. In future research, we intend to provide evidence on the efficacy of the general equilibrium on both labor and products markets.

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