

Technological specialization and patenting strategies in East Asia – Insights  
from the electronics industry

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Abstract:

We elicit filing strategies for patent families in China and Japan in two prominent technology fields: telecommunications and audiovisual technology. For the two destination countries we find substantial heterogeneity in filing strategies among applications from different countries. This heterogeneity cannot be explained with activities in technological subfields.

Key words: China, Japan, patent filing strategies, triadic patents

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## 1. Introduction

The stunning growth rates of the Chinese economy (NATIONAL BUREAU OF STATISTICS OF CHINA, 2005) go hand in hand with an increase in the country's budget in research and development (R&D) expenses (UNCTAD, 2005, pp. 105-106/133/153). Despite the well-known mayor hurdles in protecting intellectual property in the People's Republic of China (see e.g. YANG, 2003), the economic development is accompanied by a surge in patenting (see e.g. the SIPO website). While in the 1990s the majority of the patents filed in China came from abroad, domestic applications recently outnumbered the foreign ones. Nevertheless, in 2006 about ca. 88,000 foreign patents were registered at the Chinese State Intellectual Property Office (SIPO). Until recently, Japan was the major country for firms from all around the world to file patents in East Asia (GEHRKE & GRUPP, 1994, p. 48; GRUPP, 1998, pp. 156-157; GRUPP & SCHMOCH, 1999; STERNITZKE, 2008a). However, in 2004 foreign applicants filed about 55,000 patent applications in Japan, of which about 12,500 were granted (EPO, 2006). Hence, China already overtook Japan as the leading country for foreign patent applications in East Asia. For a general overview on worldwide patent statistics see the WIPO Statistics on Patents website.

O'KEEFFE (2005) found for a number of large electrical engineering/electronics firms that, in particular, those from the United States prefer filing patents rather in Japan than in China, while European and Japanese firms were more open to file in China, even though enforcing their intellectual property rights is still regarded as a major problem.

Based on these findings, we more thoroughly investigate patent filing strategies in China and Japan for applications originating from a number of different countries. The findings aim to contribute to a better understanding of patenting activities in East Asia with particular focus on China. In doing so, we seek to elicit if differences in technological specialization are the main driving forces that determine filings in China, in Japan, and/or in both countries simultaneously.

## 2. Methodology

To compare filing strategies in China and Japan, we chose patent *families* registered in the triad region, i.e. in Europe, North America, and Asia. Patent families registered in these economically most important world regions are called triadic patents, and they are a frequently used indicator to assess the technological strengths of nations (EUROPEAN COMMISSION, 2003, pp. 333-334; LEGLER & GEHRKE, 2005, pp. 55-56). A prominent approach for defining triadic patent families is to take the European Patent Office (EPO), the US Patent and Trademark Office (USPTO) and the Japanese Patent Office (JPO) as reference authorities (GEHRKE & GRUPP, 1994, p. 48; GRUPP, 1998, pp. 156-157; GRUPP & SCHMOCH, 1999). In this paper, we build on the approach from STERNITZKE (2008a) who extended the triadic patent family concept to Japanese *or* Chinese patent families. Recently, GLÄNZEL ET AL. (2008) even introduced the concept of a tetrad, seeing China as a separate pillar in East Asia. The differences among these two approaches are rather philosophical ones. While GLÄNZEL ET AL. (2008) take the corresponding countries as cornerstones of the triad model,

STERNITZKE (2008a) sees the economically most important world regions that are particularly relevant for (important) world patents as fundamentals of the triad. As STERNITZKE (2008a) could show, patent families not registered at the classical triadic patent offices but in China or Germany are not necessarily of less impact.

In this paper, we follow the latter approach and define triadic patent families as patent families filed at the USPTO, the EPO, and at the SIPO *or* JPO. More specifically, we distinguish if such a patent family was registered in East Asia solely at the SIPO, solely at the JPO, or at both offices simultaneously. In general, a patent family is defined via the existence of national patent documents at various patent offices, implying that a fee for the corresponding office had been paid.

The analysis was limited on two broader technological fields, namely telecommunications/audiovisual technology as defined by the Department of Trade and Industry (DTI) and the Office of Science and Technology (OST) of the United Kingdom who provide a definition of technology classes linked to classifications of the International Patent Classification (IPC). The exact definition can be found in Table 1.

*{insert Table 1 about here}*

Telecommunications/audiovisual technology are particularly interesting fields since they cover activities from a number of firms investigated by O'KEEFFE (2005). In 2002, the share of patent applications at the SIPO was higher in these fields than in Japan with its world famous electronics

industry. This implies that telecommunications and audiovisual technology are also key technological fields.

To better capture the geographic origin of knowledge embedded in the patent families, we tracked the country where the inventors originate from and hence, the applicants have their R&D centres. Changes in the patenting strategies were elicited for the years 1999 and 2002. All analyses were carried out in the Derwent World Patents Index database that comprises records on patent families.

Preferences for filing in China and/or Japan between various countries of origin were obtained by means of a contingency table, calculating relative differences between observed and expected values. Similarities in patenting preferences among the countries of origin were computed with the Pearson correlation coefficient and visualized via multidimensional scaling (MDS), using the Proxscal algorithm in UCINET/Netdraw. The same methodology was employed when controlling for patenting activity in a number of technological subfields (4-digit IPC classes) for the countries of origin.

### 3. Results and Discussion

Results can be found in Table 2 and Figure 1. In total, four different groups of filing strategies can be identified:

- The first group of applicants originates from (South) Korea and China and shows a clear preference for filing exclusively at the Chinese patent office. The Japanese Patent Office receives less attention than expected. For China, this patenting behaviour is merely surprising because Japan alone is no alternative for filing a

patent since this would contradict the practice of filing at one's home-country office first. Korean applicants, however, seem to have less interest in the Japanese market, they aim to focus more on the US and, as can be seen, China.

- The second filing strategy is a strong focus on filing patents in China, with less emphasize on filings both in China and Japan simultaneously. Applicants from countries such as Canada, Finland, and Italy are examples following this approach while they put less focus on Japan as an alternative to China. Applicants coming from Germany, Sweden, the United Kingdom, and the United States, in contrast, put high emphasize on filings in Japan as an alternative to China. They seem to follow a strategy that can rather be described as selective. This also means that the results from O'KEEFFE (2005) who found reluctance of some major US applicants to file in China cannot be generalized.
- The third strategy sets a focus on filing patents rather at both offices simultaneously. It can be found for applicants coming from France and the Netherlands.
- The fourth strategy is a clear focus on Japan and applies only for the latter country, which is understandable because, as in the case of China, it would not make much sense for Japanese applicants to file in China instead of in Japan.

*{insert Table 2 and Figure 1 about here}*

The variance in filing strategies described above could be based on different activity levels in technological subfields, varying by country of origin, that make protection in some countries more feasible than in other. Hence, applicants from some states should prefer filing in China, others in Japan. If these differences in the technological basis were the major driving forces behind the filing strategies in Figure 1, then computing a similarity measure based on correlations in patenting activities in technological subclasses should yield about the same cluster structure for the countries of origin. This is, however, not the case: Figure 2 presents the findings for triadic patents filed exclusively in China (a), in Japan (b), in both countries (c), and for all triadic patents filed in China or Japan (d). In general, several clusters can be found in each graph, and there are only few similarities between Figures 1 and 2.

According to Figure 2, triadic patent families from Germany, the United Kingdom, and United States are technologically similar. As one would expect, the applicants should show similar filing strategies, and for these three countries they do (see Figure 1). However, in this picture, Swedish applicants who tend to pursue a filing strategy similar to British and American counterparts, drop out and show a different technological focus for patents filed solely in China, which partially may explain their filing position between Germany and the US in Figure 1. The Netherlands are another interesting example: most of the Dutch patent filings certainly originate from Philips, the most active applicant at the European Patent Office. The company is strong in consumer electronics like many applicants from Japan and South Korea. This technological proximity can also be seen

in Figures 2 (a)-(d) and explains the strong emphasis on Japan. Dutch as well as French applicants do not neglect patenting in China and are, hence, in line to other European firms regarding their activity in the People's Republic. Dutch patents filed only there seem, however, to be quite different from Japanese and Korean ones, implying that the Dutch strategy is clearly affected by technological specialization. French patent filings also tend to follow a technology field-based strategy since the patents registered at single offices only are technologically similar to US patents. This is less the case for filings at both offices. These particularities might explain the filing strategies of French and Dutch applicants in Figure 1 that can clearly be distinguished from the ones applied by other countries.

*{insert Figure 2 about here}*

#### 4. Conclusions

This paper elicited patent filing strategies for world market-related patents in China and Japan by applicants from a range of countries. The results indicate a growing importance of filing patents in China. There is, controlling for the technological field, considerable variance in filing strategies among countries, but the general focus is shifting towards patenting in China. Finally, technological specialization cannot explain the various filing strategies sufficiently.

The existence of R&D facilities in China by (multinational) enterprises may be one factor that adds further explanatory power to filing strategies by applicants from different countries. More specifically, it can be that certain technologies are already developed by multinationals within China, so our



analysis building on the *origin* of patent families cannot fully capture these developments. We expect that, as long as corporate R&D centres are set up in various countries, the effect for a single country such as China should be small. As mentioned in the previous section, *individual* strategies from large multinational firms may also have impact on filings on the country level. Since patenting activity is rather skewed, it is likely that in some (in particular small) countries only a few applicants dominate the scenery, so their individual patenting behaviour may have considerable impact.

Future research should investigate the reasons for the discrepancies found. We speculate that they can, at least to some degree, be explained with different expectations about the future development of patent enforcement in China – an argument that can already be found in the work of O'KEEFE (2005). There must, however, be some more reasons because telecommunications and audiovisual technology are fields with short technological lifecycles. As STERNITZKE (2008b) argued, in these complex product industries the creation of patent portfolios for cross licensing and patent pools represents a strategy that overcomes the “problem” of short patent life. So it should be an important factor that determines filing strategies as well. Furthermore, a dynamic approach that more thoroughly investigates the creation of R&D subsidiaries in China by foreign enterprises and their impact on patenting strategies deserves further attention. Finally, a large-scale survey taking into account patenting activities of individual firms may contribute to a better understanding of the development of patenting strategies in East Asia.

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WIPO World Intellectual Property Organization - Statistics on patents  
<http://www.wipo.int/ipstats/en/statistics/patents/>.

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**Table 1: Technology fields of the investigation.**

OST code	Description of technology field:	IPC classification (4 digits)
2	Audiovisual technology	G09F, G09G, G11B, H03F, H03G, H03J, H04R, H04S
3	Telecommunications	G08C, H01P, H01Q, H03B, H03C, H03D, H03H, H03K, H03L, H03M, H04B, H04H, H04J, H04K, H04L, H04M, H04N, H04Q

**Table 2: Chi-square-test regarding the origin of triadic patent applications in telecommunications for 2002. Source: WPINDEX.**

Country of origin		Triadic patent families (priority year 2002) registered at the EPO, USPTO, and the patent offices of		
		only China	only Japan	China and Japan
Canada	Observed	41	20	76
	Expected	15	23	100
China	Observed	19	9	97
	Expected	13	21	91
Finland	Observed	102	18	95
	Expected	23	35	157
France	Observed	36	64	302
	Expected	43	66	293
Germany	Observed	110	107	321
	Expected	57	89	392
Italy	Observed	28	10	53
	Expected	10	15	66
Japan	Observed	10	342	1573
	Expected	205	318	1402
Korea	Observed	126	54	511
	Expected	74	114	503
Netherlands	Observed	9	60	810
	Expected	94	145	640
Sweden	Observed	18	27	59
	Expected	11	17	76
United Kingdom	Observed	40	78	206
	Expected	35	53	236
United States	Observed	286	489	1535
	Expected	246	381	1682

p<0.000

Figure 1: Multidimensional Scaling of source countries and filing strategies.

Algorithm: Proxscal; 9 dimensions; stress: <0.02.

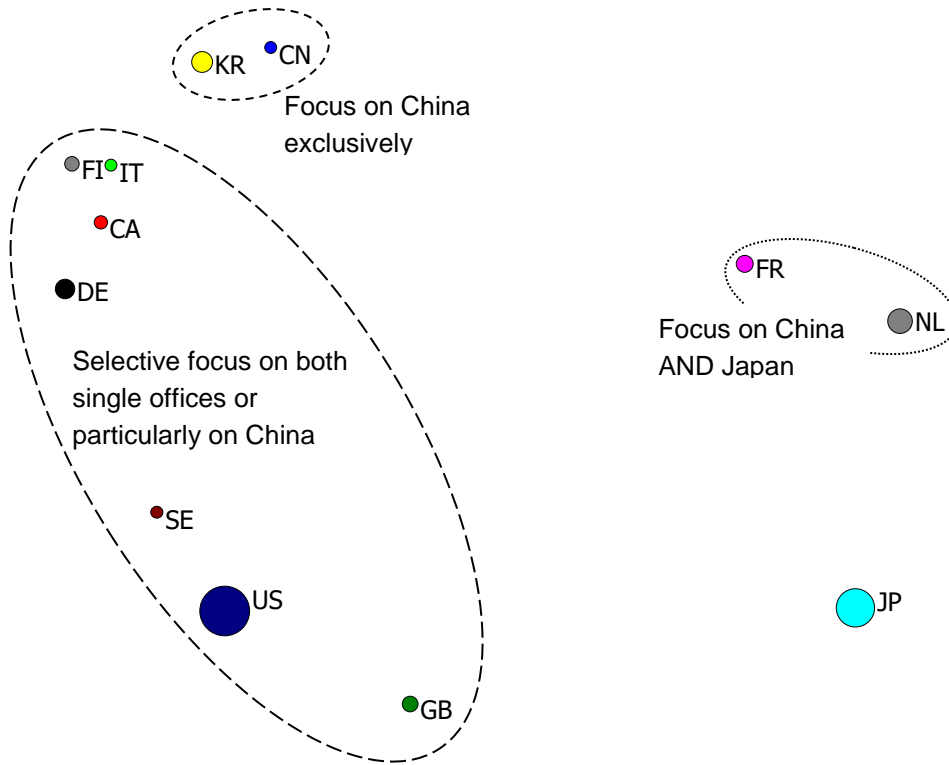


Figure 2 (a)-(d): Multidimensional Scaling (MDS) of triadic patents from source countries and similarities between technological subfields in telecommunications/audiovisual technology (based on 4-digit IPC classes).

Algorithm: Proxscal; 9 dimensions; stress: <0.02.

