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Capitalizing on home grown IP: A deeper look into global tech transfer

Anne Marie Clark, CAS, discusses why companies are capitalizing on homegrown intellectual property, and takes a deeper look into the global tech transfer story.

Technology transfer – the transmission of ideas and patented inventions from the discovering entity, usually academic and government institutions, to another organization with plans to commercialize it – has provided the world with numerous scientific products that may not have existed otherwise. Private licensing of publically-funded inventions has generated the cancer drug 'paclitaxel' (Taxol®), hepatitis B vaccines, the leukemia drug 'imatinib' (Gleevec®), water sanitizers, light-emitting diodes, artificial joints and numerous other products that serve to make life healthier and safer for everyone.[1] These business-to-business (also known as "business development"), government-to-business, and university-to-business transmissions of information expand current markets, hasten the pace of innovation and provide ways in which countries can positively impact their economies.

Across the globe, tech transfer has been implemented to various extents, with differing degrees of success. In the U.S., the federal government funds slightly less than 60% of all basic research, with $135 billion budgeted in 2015 alone[2]. These values, however, represent a decline from 2010, with amounts mirroring an overall reduction in federal science funding in recent years. This drop in government dollars, combined with the recent recession, means that fewer research dollars are reaching academic and government institutions, compelling these organizations to better capitalize on their home grown intellectual property[3]. Tech transfer in the U.S., as measured by the number of patent startup companies created and licensing income generated, has increased substantially over the past five years[2].

The results of tech transfer worldwide are, predictably, as varied as the implementations, economic focus, and funding within each country. Federal government funding for science in Japan equaled approximately $36 billion in 2014, and since the late 1990s, the government has vigorously enacted legislation to promote the flow of commercially viable ideas from the government and universities to the private sector[4]. The University of Tokyo, Kyoto University and Osaka University were the most prolific tech transfer centers in 2013 as measured by licensing revenue. In 2013, Japan's universities collectively produced nearly 7,000 patent applications, but recent studies show that Japan lags behind many other countries in IP-derived income, with only 20% of the IP revenue of similarly sized countries[5].

The Chinese government's 13th five-year plan (2016-2020) specifically encourages tech transfer. In the document, the government stresses the value of applied - as opposed to basic - research, and the importance of commercializing those applied innovations. The government invested $10.3 billion in basic research in 2015, and they expect scientific research to contribute 60% towards economic growth by 2020[6].

In European tech transfer circles, a theory called the "European Paradox" prevails. The belief asserts that high-quality European academic innovations abound but the resulting IP is not commercialized at a sufficient rate. The concept is a controversial one, with many arguing against its validity and others speculating as to why the situation exists. A 2011 study directly addresses this controversy and suggests that even though the data generally supports the idea that other countries, such as the U.S., substantially lead Europe in licensing income, there are many contributing factors that, once overcome, would remove Europe's tech transfer impediments. One of these factors may stem from the fact that European tech transfer offices typically employ fewer people with hands-on business knowledge than their American counterparts[7]. Another reason the study discusses is that European income averages suffer from geographic heterogeneity with countries like Italy performing well below the EU average in licensing agreement income, but countries like Switzerland performing well above the EU average[7].

Current data pulled from the WIPO database uncovers a deeper layer of information in this global tech

Résumé

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transfer story. Although the information does not directly address commercialization or licensing, these intellectual property trends are still powerful tools by which to analyze the activity that powers tech transfer transactions.

When the numbers of resident patent applications (normalized per million inhabitants) for China, Japan, France, Germany, Italy, Spain, Great Britain, Switzerland, and the U.S. are graphed across the years 2011-2015, Japan is clearly the most active country, with nearly 9,000 patent applications per million people in population (Figure 1). Of the countries explored here, Spain was the least active, with only about 400 patent applications per million inhabitants. Although China has recently emphasized the importance of commercialized academic research, when normalized for their population, the country sits towards the bottom in this analysis, with just below 2,000 patent applications per million inhabitants. Germany, Switzerland and the U.S. were roughly equal, with approximately 4,000 patent applications per million inhabitants. This data strongly supports the assertions of the 2011 European tech transfer study mentioned above, illustrating the heterogeneity of patenting activity seen across the world (and particularly in Europe) with more active countries like Switzerland and Germany far outpacing Italy, Spain and Great Britain.

A notable finding that isn't revealed in the first figure is highlighted in Figure 2. Although China, France, and Great Britain showed similar amounts of patent application activity in 2011, China has far outpaced the other two since. Furthermore, an analysis of data from STN® demonstrates that the percentage of total chemistry-related Chinese patents originating from Chinese universities has risen from 58% to 77% in the past ten years (STN; CAplus[SM]; November 2015 searched). These findings closely reflect the recent media reports which describe an "explosion" in recent Chinese patenting, with over 1 million patent applications received during 2015. This value represents an over 18% increase in Chinese patent applications from the year before[8]. Collectively, this data suggests that China's most recent five-year plan is already well underway, with a strong emphasis on entrepreneurship and the public to private transfer of innovation.

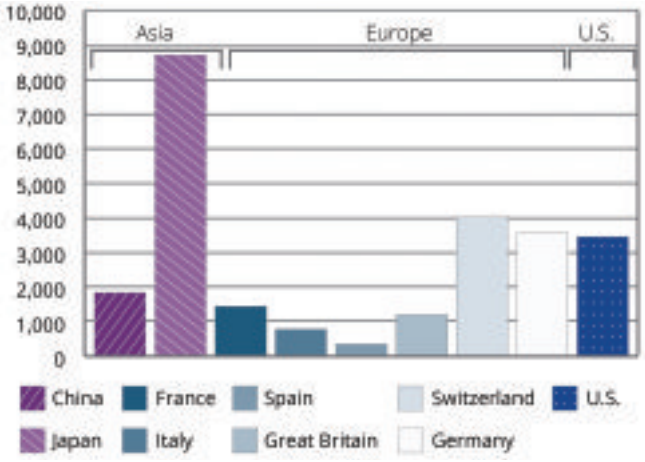

Figure 1. Comparison of number of resident-assigned patent applications per million inhabitants for Asia, Europe and U.S. for 2011-2015 (WIPO data, accessed June 2016). CN – China; JP – Japan; FR – France; DE – Germany; IT – Italy; ES – Spain; GB – Great Britain; CH – Switzerland; US – U.S.

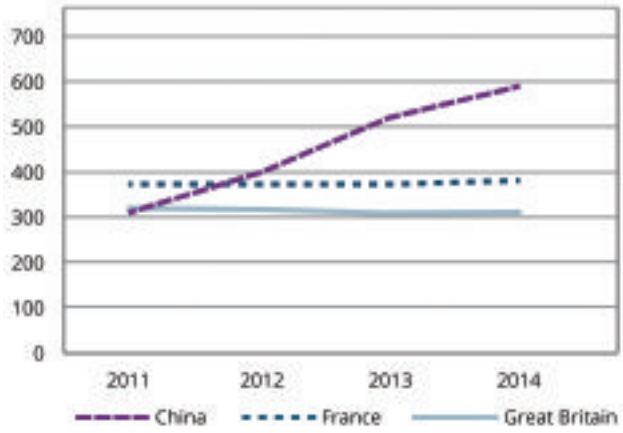

Figure 2. Resident applications per million inhabitants from 2011-2014 for China (CN), France (FR) and Great Britain (GB).

Another way to examine these records is to normalize the number of public or government organization-assigned patents in each country to a single year of U.S. R&D funding, using information from INPADOC on STN (accessed June 2016) and data.oecd.org, respectively, to get a picture of activity independent of variations in funding (Figure 3).

On a per investment dollar basis, Spain, Switzerland and France are extremely proficient when it comes to patenting by public organizations, with China, Japan, and Italy less so and the U.S. and Great Britain falling in the middle of the countries analyzed here. Consequently, it can be said that even though Spain is on the low end of patenting activity overall, their public organizations provide a healthy return on investment relative to the other countries investigated here. It will be interesting to observe if, in the coming years, China's public organization-derived patenting activity on a 'per investment dollar' basis substantially increases.

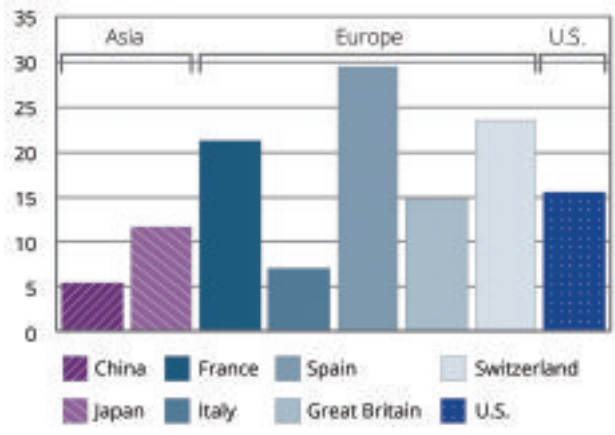

Figure 3. Number of public organization-assigned patents from 2011-2014 normalized to 2012 U.S. R&D dollars on a per country basis. (INPADOC on STN, OECD.org, accessed June 2016). CN – China; JP – Japan; FR – France; IT – Italy; ES – Spain; GB – Great Britain; CH – Switzerland; US – U.S.

The sets of data describe current events, but it requires an examination of each country's predominant patenting entities by sector to provide explanations for the differences reported in the graphs above. According to the CIA's World Factbook, Switzerland, Japan, and Germany's economies are largely comprised of businesses in the areas of chemicals, pharmaceuticals, metals, electronic products and equipment, and machinery[9]. These industries represent what the USPTO, U.S. Chamber of Commerce, and others refer to as"IP-intensive industries", where patenting is of significant direct or indirect economic benefit. Although most economies depend on patenting in some measure, these IP-centric industries tend to be major drivers of employment, gross domestic product and exports. In contrast, countries including Italy and Great Britain dominate in industrial sectors where intellectual property is of lesser economic value, such as textiles, production equipment, food, manufactured goods and tobacco. It is easy to see, therefore, why tech transfer is far more likely to occur in countries with a prevalence of IP-centric businesses.

In conclusion, tech transfer is increasingly seen as a key global economic driver as research dollars have become less plentiful and the world recovers from the economic hardships that began in 2008. Tech transfer has taken root more strongly in some countries than others, with economies largely comprised of "IP-intensive industries" being more capable of capitalizing on tech transfer opportunities than those countries whose economies are dominated with less IP-focused businesses. Economic data imply that, although some countries demonstrate high patenting activity, these countries are not always capable of converting intellectual property into licensing revenue. Regional averages and generalizations can be misleading, however, some countries, such as China, have not shown strong activity in the past but have seen drastic changes in recent years. Countries such as Spain, for instance, are low on patenting activity overall as compared to their neighbors, but their public organizations have high rates of patent activity per investment dollar. The data should be examined on a country-by-country basis and normalized for population and/or R&D investment to get the clearest picture of each country's current situation. With tech transfer success stories accruing each year, most countries around the world are taking another look at tech transfer as a productive way in which to make the most of their own home grown innovations.

Are you currently involved in tech transfer and need help with due diligence projects? ScienceIP has expert searchers who can provide you with the precise information needed to empower your tech transfer enterprise. Contact Anne Marie at AClark@cas.org.

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