

The Country Where Trains Leave Early

Boosted by stimulus investments, China is fast catching up to become a technological innovator

In recent months, when taking the new high speed trains out of Shanghai, a time-conscious frequent traveler would have noticed that his train left the station at least 1 minute early, every time. It needs careful attention to notice because, when the train leaves, there is no commotion of last minute passengers trying to get on: the platform is empty and every traveler is already on the train, early as well.

The whole country is coming on board for China's advanced rail schedule. 42 high-speed train lines (13'000 km of track at 350 Km/h to 250 Km/h speeds) are under construction. These lines were planned for completion in 10 years. But when the world financial crisis hit, investments were made by the Chinese government and the project timelines were brought forward to finish all the high-speed railway lines by 2012! Over 100'000 workers alone are building the 1'500 Km Shanghai Beijing line. This will cut rail transportation time from 12, to less than 5 hours, making the train trip competitive with flying and saving considerable amounts of fuel. Just as China's transportation sector is accelerating so is every other facet of the Chinese landscape.

By 2020, China plans to build 3 times more nuclear power plants than the rest of the whole world combined (approximately one new nuclear plant every two months). This is in addition to a new coal power plant coming online every week.

BYD, which was a 20 worker battery producer in 1995, today employs 130'000 people and produces hybrid cars with exclusive battery technology. The company received a USD 250 Mio. investment from Warren Buffet's Berkshire Hathaway, and signed a deal (on March 1st) with Daimler Benz to co-produce a Smart e-car for China's domestic market. The Chairman of BYD - which stands for "Build Your Dream" - intends to live by his company's name and become the world's biggest car producer. At only 47 years old, he may well succeed, given the push that China is making towards switching to electrical vehicles. Already 13 cities have been earmarked for complete electric conversion of public transportation (including taxis). Incentives for private buyers of electric vehicles are also being readied.

Not content with simply making half of the world's personal computers, on May 31st China unveiled one of the fastest super computers available. In first practical tests, it ranked second in number crunching speed after a US machine.

These outstanding examples illustrate how far China has come in the last 20 years, from producing the worlds' plush toys and t-shirts, to developing its own top of the line technology. But this is not surprising, as China has a long tradition of invention. The most famous among its discoveries are the compass, printing, paper and gunpowder. Until the Renaissance the Middle Kingdom was the world's innovation center.

Still, China's current technological developments did not happen without considerable underlying efforts.

Lead by engineers¹, China's government has planned the country's move into developing the technologies that will power China. In addition to the obvious economic advantage of owning the technological added value, they concluded that China's development challenges will need homegrown solutions. Indeed, no other country faces problems of the type and magnitude that China must deal with to fulfill the aspirations of a billion people hoping to enjoy western standards of living in their lifetime.

While approximately the size of the USA, China hosts four times as many citizens. Moreover a third of the country is made of deserts and mountains.

Fossil fuel powered and chemically fertilized, China's environment is already strained to the limit. Water is becoming scarce and water tables are falling in both the North and the South West. Pollution and its health effects are becoming the top worry of citizens and an important source of social unrest.

To deal with such issues, a project is under way to divert water from the Yangtze River 1'000 Km to the north. Besides, China will be installing the first a 1 Mio. Kilovolt high-tension line in the world; it is needed to transfer electricity from the west, rich in hydropower, to the coast, which uses it. These are just some examples of the literally unheard of projects that China undertakes to deal with its development challenges.

"Soft" social and psychological issues are significant as well. Pressure on spoiled single children to excel in an environment, more competitive every day, is enormous. Twelve year olds spend more time studying than the long hours put in by low-wage industrial workers.

China's drive to become an innovator and to achieve the means of its development has been formalized in the National Science & Technology Plan, started on January 1st, 2006 and is set to end in 2020. By then, the objective is to render the country capable of fulfilling its own needs in a range of key technologies. 16 national projects are specifically defined, including the development of CNC machine tools. The fields of "new energy, new material, biomedical, IT and advanced manufacturing"² have been singled out for accelerated development. From 1.5% of GDP used for R&D in 2005, the target is to reach 2.5% in 2020, the level of Germany.

The emphasis on the development of universities and research may be the most important effect of the plan in the long run. Chinese universities get markedly stronger yearly and now compete at the top echelons world-wide. For example, in February 2010, Shanghai Jiaotong University beat close to 2'000 other universities to become World Champions in the International Collegiate Programming Contest³.

Top overseas Chinese scientists have been made offers to come back and enter Chinese universities with more funds, means and students than they have in the West. And, every year 6'000 of the nation's top PhD students receive a scholarship to study abroad. Upon completion they have an obligation to return and work for China's government. They will become the researchers, labs and universities leaders of the coming decade. Like every other government employee, researchers have a variable pay system with a performance bonus to spur innovation. They are encouraged to build start-ups and allowed to own a majority of the ventures they establish based on their discoveries.

The results of these efforts are already showing. In terms of scientific research production China only produces around 1/3 the papers as the USA but that means it is now second place to the USA⁴. In some areas, China dominates world research. For example, in material sciences China publishes over 20 % of the world's important scientific articles - and over 30% in the sub-fields of metallurgy and crystallography.

¹ 7 out of 9 top leaders of the country (Standing Members of the Communist Party Politburo) are engineers and Hu Jintao's motto "Build a Harmonious Society through Scientific Development" says it all.

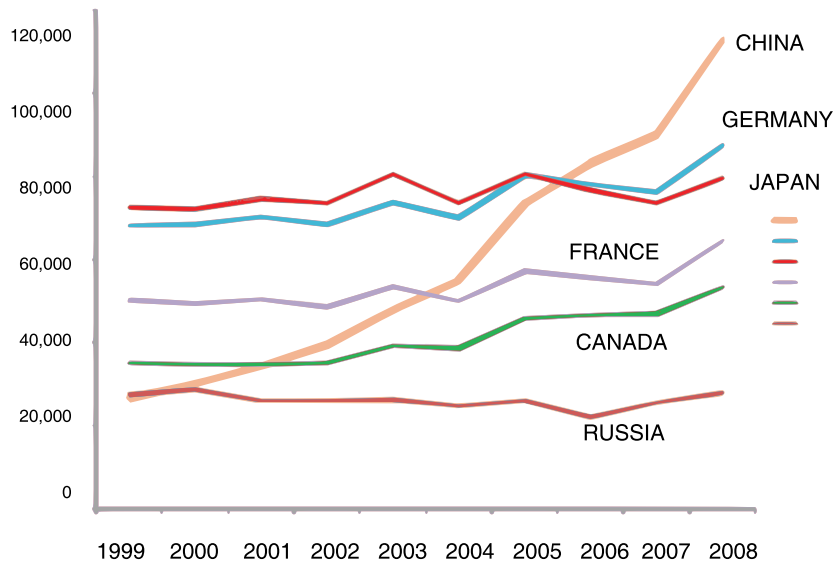
² Wen Jiabao's speech to the National People's Congress, March 7, 2010.

³ <http://cm.baylor.edu/welcome.icpc>

⁴ Thomson Reuters – "GLOBAL RESEARCH REPORT CHINA: Research and collaboration in the new geography of science", November 2009

Research output: 1999 - 2008

Annual publications in *Web of Science*



On the innovation side, China ranks only fifth in international patent filing (after the USA, Japan, Germany and Korea), yet Huawei, one of its telecommunication equipment companies, was the top patent filer in 2008 (and the No 2 in 2009 after Panasonic). And, while most countries (and the world on average) registered decreases in patent filing in 2009, China's rate of patent growth remained around 30% last year. For comparison with other emerging economies, India, files less than 1/10th the number of China's patents.

At current growth rates, by 2020, China will have caught up with the USA, both in quantity of scientific research production and patent filing. 2020 is also the optimistic estimate by which China may become the largest world economy (2035 is the pessimistic one).

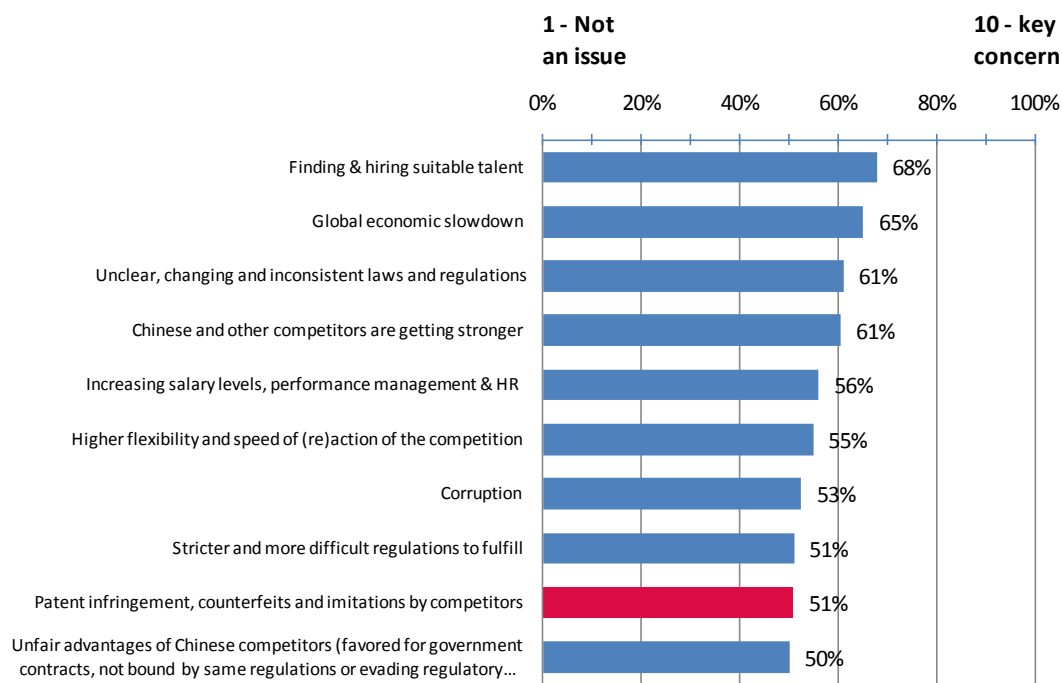
Now, what does this all mean for western societies and companies?

The closest example of a large Asian country reaching western technological levels in recent history is Japan. The country made good machines and became dominant in cars and electronic consumer goods. However, in the 30 years it took Japan to achieve technological excellence, living standards also caught up to bring production costs on a par with the West. For 20 years the West and Japan have competed on a generally even footing.

There are important differences between China and Japan's development story though, and two of them are worth mentioning. First, China is 10 times bigger in population size than Japan which makes China's development slower and longer. After 30 years of "open-door policy", China still has hundreds of millions of unskilled workers and farmers earning between 60 and 120 Euros per month. Factoring in the productivity improvement that can be achieved with organizational improvement and the localization of machinery, it will take another 20 years until Chinese costs of production increase significantly faster than in the rest of the world. Second, China is a much more open market and society than Japan, allowing both a better access to the market for foreigners and a faster assimilation of new technologies.

The improper "assimilation" of new technologies (i.e. intellectual property infringement) is anecdotally what concerns many people about China. However a recent research study indicates that is actually not any more a top concern of those companies already operating in China.

What is causing the most difficulties/concern in the running of their China subsidiary:



With a better intellectual property environment and with China on track to develop its own technology for its own market, foreign companies are now directing their resources to suit local needs and tastes to sell in China.

But not only must international firms develop the right products for a market that starts to serve its higher end needs, they must also offer these products at competitive prices and with the right service. To do so they count on local product development and, indeed, according to the same survey, two third of European companies have set-up local R&D or are planning to do so in the next 3 years.

To participate fully in the development of China, foreign companies need more and more to develop products in China for China to be produced at local costs⁵. If foreign companies fail to adjust to the realities of China's market, markets will be left to Chinese competitors, already existing or yet to be born.

China started its latest race towards innovation 5 years ago, slowly but steadily like the tortoise of the fable. Western firms are far ahead and have all the opportunities to keep both a top position in world markets and to continue developing the technologies and products of tomorrow. Still, they will maintain this position only if they acquire a top position in China as well. To do so they have to start racing at full speed now and not stop and nap like the hare!

⁵ Adjusting products to the market and to the local production circumstances are the two top reasons for companies to do R&D in China.

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