

China research and development

Economic note

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Australia stands to benefit enormously from China's technological advance. For many years China has been little more than a buyer and replicator of technology. The examples are too numerous to mention. This pattern, however, is changing and new Chinese technology and solutions will have important implications for Australia.

There are two factors underpinning this process. First, there is a cultural shift towards greater support of innovation and technology that comes from senior leaders and is reflected in improved protection of intellectual property (IP) and R&D focused companies in competitive markets. Second, the economy is set to deliver innovation for two key reasons; the country has pressing problems to solve and in many areas, access to labour and capital for firms focused on R&D is unconstrained.

China's focus on *scientific development* is, in part, due to the background of its leaders. All nine members of the Standing Committee of the Chinese Communist Party are scientists, while ministers for Science and Technology and Health have been appointed because of their background and despite being from outside the Communist Party. The Minister of Science and Technology came from Audi and produced a seminal paper on clean fuel technology. The Minister of Health has a 25 year background in US cancer research.

Protection of intellectual property rights in China is viewed sceptically. China began protecting intellectual property in 1984. Initial efforts were to meet Western demands, including a change in 2000 to become World Trade Organisation compliant. In 2010, however, changes to the IP law were focused on domestic innovation suggesting China now has more to lose than gain from disregarding intellectual property law. Recently, China fined a state owned insurance company for using pirated software.

At a more micro level, this culture of innovation is seen at firm level. First, many firms are spun out of successful research institutes. For example Sany, a heavy equipment manufacturer from Changsha in Hunan province with achievements including the world's highest concrete pour, came from Changsha Construction Machinery Research Institute. Second, competition between innovation firms is strong. Sany, itself, competes with another Changsha firm, Zoomlion, for dominance of the heavy equipment market while in Shenzhen there are two global telecommunications hardware companies, ZTE and Huawei.

This improved culture is driven, in part, by the need to solve large problems. These problems include raising living standards, which includes improving the environment, and making do with scarce resources. Is it surprising that one of the world's largest energy importers with 1.3 billion people, who with rising living standards demand a car, and severe pollution, is leading the way in the production of a mass market electric car? Or that a country running out of water is leading the world in water technology such that US companies base water research headquarters in China? Other areas where China's problems make it a global leader are in energy efficiency and rail.

The resources exist to solve these problems. China graduated 4.5 million university students in 2007 compared to 950,000 in 2000. The next largest graduating class was in the US with 2.7 million. 36% of Chinese graduates were in engineering, compared to 7% in the US and 18% in Japan while a further 14% graduated in one of health, science or agriculture.

The quality is high too. 30% of US PhD students come from China and if Tsinghua University was a country it would have the most students at the Massachusetts Institute of Technology (MIT). Capital, too, is relatively abundant for innovation. Many of the firms have large profitable businesses. BYD, the electric car developer partly owned by Warren Buffet, is the ninth largest conventional car maker in China and is a leading battery maker. There are sufficient capital owners, both public and private, that don't mind businesses focusing on innovation despite the shorter term volatility these investments might create and their high cost. Huawei is looking to hire 5,000 R&D graduates each year for the next five. There may be no serial entrepreneurs in China, as there are in the US, but this is, in part, less relevant in an economy of such scale.

There are two broad consequences for Australia from the emergence of China as a leader in innovation; the development of cheap technology platforms and solutions for Australia's more unique problems.

Cheaper technology platforms will play an important role in the global economy. Some, like electric bikes, are important role in emerging markets where the technology will lower urban transport costs while others, like mobile phone technology, will apply to developed markets. Better technology platforms allow the development of better serves through improved design, adaptation and marketing. Some of these platforms will be *de novo* innovations while others will be created by lowering the cost of manufacturing.

The areas in which China is developing technology relevant to Australia include energy and water efficiency and mining technology. Areas of relevance for energy efficiency include less polluting solar panel production and heat transfer technology to improve domestic energy consumption efficiency. China's Sany mining equipment is creating remote controlled coal mining equipment designed to improve workplace safety in coal mines.

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