Indigenous Reverse Innovation from the Base of the Pyramid

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***How do small electric vehicle (EV) makers from the base of the pyramid of China’s automobile industry overcome institution-based barriers at home? How do they leverage their strengths overseas?***

Reverse innovation is “any innovation that is adopted first in the developing world.” Gurus such as C. K. Prahalad noted that from the bottom of the pyramid (BoP), reverse innovation is likely to diffuse from emerging economies to developed economies. Yet, concrete examples of reverse innovation are few. Of the list of examples noted in Govindarajan and Trimble’s excellent new book *Reverse Innovation, all* of them are multinational subsidiaries in emerging economies developing innovative, low cost products (such as GE’s storied portable ultrasound developed in China). Other examples in *Reverse Innovation* include Deere & Company, EMC, Harman, Logitech, PepsiCo, and P&G. Are there any examples of reverse innovation that are truly *indigenous* in nature (i.e., developed by local/non-multinational firms) and that have successfully penetrated developed markets?

The electric vehicle (EV) makers in China can be a great example of such indigenous reverse innovation. An EV is an electric car that does not burn a single drop of gasoline. Known as a “plug-in” vehicle, an EV is totally based on battery power, has no tailpipe, and thus has zero emission. It would be more revolutionary than Toyota’s hybrid Prius, which drives on battery power before its gasoline engine kicks in and recharges the battery. If you go to Beijing or Shanghai, you do not see many EVs. Like everywhere else in the world, the roads and highways in urban China are full of conventional cars. But if you travel to certain rural areas (such as Liaocheng and Zibo in Shandong province), locally produced EVs seem everywhere. In fact, dozens of EV makers have popped up in China, and most of them are experimenting with new products in a great entrepreneurial drive. While most of them have a hard time cracking the top tier market in China, a small number of them—in a fashion described by Prahalad and Govindarajan—have already penetrated the US market. If you see someone (or you yourself are) driving a Wheego or CODA EV in the United States, you are witnessing indigenous reverse innovation at work.

How can the humble EV makers of China accomplish so much in a remarkably short span of time? After all, none of the traditional automakers in China has cracked the US market. Other than the Nissan Leaf (which is a full EV), few traditional automakers active in the US market have launched EVs.

**From the Bottom of the Pyramid—Within China**

Prahalad’s BoP model divides the whole world in three tiers, with low-income emerging economies occupying the base. We can extend the BoP model to what is unfolding in the automobile industry *within* one emerging economy (Exhibit 1). In the Chinese automobile industry, the top tier is occupied by foreign-branded cars produced by the joint ventures (JVs) between global heavyweights and top Chinese automakers, such as Shanghai-GM, Shanghai-Volkswagen, and Guangzhou-Honda. As China’s auto market becomes the largest in the world, it has also become the most competitive—as measured by the number of new models unleashed in a given year. The global heavyweights increasingly bring their newest designs with the fanciest styles and the most powerful engines to produce in China. The second tier consists of smaller Chinese automakers and their JVs with smaller global players. All the top-tier and most of the second-tier are state-owned automakers. But the second tier also includes privately-owned producers such as Geely (which recently took over Volvo) and BYD (which is the most aggressive in developing EVs powered by lithium-ion battery technology). Overall, the second tier players’ capabilities and aspirations are similar to those of the top tier.

**Exhibit 1The Automobile Industry Pyramid in China**





The BoP in China’s automobile industry consists of nontraditional producers of specialty vehicles—some of which are not necessarily “automakers” if you define automakers as the Toyotas, Fords, and Fiats of the world or the SAICs, FAWs, and Dongfengs of China. The BoP producers in China can typically trace their roots to agricultural vehicles (such as tractors and small pickups), recreational vehicles (such as golf carts), and/or electric motorcycles (such as mopads). They tend to be much smaller than the top-tier and second-tier automakers in China, have little influence or brand awareness outside their own regions, and thus are outside the radar screens of the global heavyweights. While larger automakers in China (and their foreign JV partners) are still embracing a largely “wait-and-see” attitude regarding EVs, BoP automakers in China, being smaller and more entrepreneurial, have rushed in. While dozens of them have entered, a few leading ones have emerged as winners. For example, Shandong-based Shifeng has sold more than 10,000 EVs, and has built an EV plant with a maximum capacity of producing 200,000 vehicles a year.

So far, the EVs in China are technically known as *low-speed* EVs, because their maximum speed is typically only 40–80 kilometers (25–50 miles) per hour. They typically have a range of 80–100 kilometers (50–65 miles). Instead of using the more advanced lithium-ion battery, they often use off-the-shelf lead acid battery. While primitive by conventional standards, these EVs are meeting a great deal of demand in rural China. In such a BoP market within China, road conditions are not great (so high speed is not necessary), income levels are low, but people’s needs to travel longer distances are increasing. Marketed at about 30,000 yuan (about $4,400), these cars are not as inexpensive as Tata’s storied Nano (priced at $2,000–$3,000 in India). With the rising income levels, EVs become increasingly affordable to the rural population in China. For the same distance traveled, electricity is only 25% the cost of gasoline. Last but not the least, with zero emission, EVs offer unparalleled environmental benefits—potentially a great solution to China’s pollution problems.

A total of 70% of China’s population live in small towns and rural areas—that is a huge market of about 900 million (three times the total size of the US population). Few of the rural folks commute more than 20 kilometers (12.5 miles) a day. Travel speed rarely exceeds 60 kilometers (37.5 miles) per hour. Moreover, from an infrastructure standpoint, EVs have a huge *advantage* in rural areas because of the low population density and more spacious housing—typically with a yard or a driveway where EVs can be plugged in and charged with little need to build additional and costly charging stations. In contrast, widespread development of EVs in urban China has to overcome significant infrastructure challenges: population density is high and housing tight (high-rises everywhere). Few can afford single-family dwellings that would allow for convenient charging in the yard or on the driveway. Therefore, wide spread investment in and construction of charging stations is a must, but urban land is much more expensive than rural areas. Overall, whether EVs can take off in urban China remains a question mark, but EVs—especially low-speed EVs made by BoP automakers such as Shifeng—have already taken off in many parts of rural China.

**Institution-Based Barriers to BoP Automakers**

One of the recent (and controversial) policy initiatives in China is to promote “indigenous innovation.” The Chinese government has announced that in theory, EVs are being promoted to be one of the pillars of the automobile industry, which is one of the “strategic” industries earmarked for government support. A *Development Plan for the “New Energy” Car Industry (2011–2020)* has listed nine specific EV models on its catalog for nationwide promotion in terms of qualifying for subsidies. While many foreign firms and governments naturally worry that the promotion of “indigenous innovation” would shut them out and some have complained to the Chinese government, not a single foreign automaker has complained. The reason is very simple: instead of being promoted by the government, BoP automakers are being *discriminated* against by institution-based barriers in China. Foreign automakers simply have no need to worry about any preferential treatment of the BoP automakers.

Instead, BoP EVs are technically not even defined as “cars” (or “passenger vehicles”) by existing Chinese standards. Only *high-speed* EVs are classified as “cars” in China. But of the nine (high-speed) EV models on the catalog for the *Development Plan for the “New Energy” Car Industry (2011*–*2020)* that are eligible for subsidies, only one high speed EV—the BYD F3DM with a maximum speed of 150 kilometers (95 miles) per hour and a maximum range of 100 kilometers (62.5 miles)—has entered mass market. But the BYD F3DM is a Prius-like hybrid and not a pure EV. Despite the subsidies, its high price and low performance have not attracted many customers. On the other hand, none of the dozens of BoP EV models appears on the government’s catalog for subsidies.

Despite the proclamation to promote “green cars,” the omission of BoP EVs on the government promotion catalogue is not an oversight. It is *intentional*. This is because the government promotion catalogue is influenced by China’s top-tier and second-tier automakers (and their foreign JV partners). Although these incumbents themselves are not too enthusiastic to introduce EVs, they do not wish to legitimate BoP EVs.

Because low speed EVs are not classified as “cars,” in most parts of China they do not need to carry a license plate, but then their owners cannot purchase insurance either. Such EVs thus are potentially a safety hazard. As a result, they may not be “street legal” in many parts of China. Because of their low speed and lack of insurance, they certainly cannot drive on freeways. So their mobility is by definition limited. This is not a huge problem for now, given their short range per charge. Just like few unlicensed drivers everywhere are afraid of being caught, unlicensed EVs in BoP markets in China are institutionally vulnerable—they may be declared illegal and ordered off the streets (for example, for creating traffic jams) if the political winds blow against them.

To prevent that unfortunate fate from happening, some local and provincial governments have passed city, county, and provincial regulations to legalize and protect the BoP EV producers and owners. This localized rule-making has typically taken place in regions that house such BoP automakers, such as Liaocheng and Zibo in Shandong province, Dafeng in Jiangsu province, and Fuyang in Anhui province. To facilitate further development of the EV industry, Shandong has become the first province to explicitly legalize low-speed EVs and allow them to hit the roads.

In the community of Chinese policymakers, executives, and scholars, supporters of low-speed BoP EVs have urged for tolerance and nurturing given these vehicles’ upside potential and environmental attractiveness. Critics argue that with little regulation, safety features, and insurance protection, low-speed EVs are likely to proliferate to create more traffic jams and safety hazards. Critics claim that local rules protecting locally produced EVs are “unconstitutional” because they violate the central government’s power in making and enforcing nationwide traffic and vehicle registration laws. While debates continue to rage, one thing for sure is that such indigenous reverse innovation has a hard time breaking into the top tier, urban market in its own home country.

**Go Global from BoP Markets**

Since going from the BoP to the top tier market in their own country is so tough, a number of Chinese EV makers have gone global. At least two of them have cracked the US market.

In 2007, Hebei-based Shuanghuan Auto developed its first EV, the two-door, two-passenger Noble. Unfortunately, the Noble was not allowed to be marketed as a “car” in China (as noted earlier). In 2009, Shuanghuan Auto joined hands with Wheego, an Atlanta-based start-up specializing in all-electric cars. After considerable modification and enhancement in terms of control and safety features undertaken in Ontario, California, the Noble was marketed as the Wheego Whip EV in the United States starting in December 2009. With a top speed of 40–55 kilometers (25–35 miles) per hour, a range of 65 kilometer (40 miles), and 10 hours to fully charge its engine, the Wheego Whip retailed at $18,995. After adding options and taxes and then applying a $2,500 federal tax credit, the net price was $17,995.

After a year, a significantly improved Noble became the Wheego Life. With a top speed of 105 kilometers (65 miles) per hour, Wheego Life was fully highway capable (and “street legal”) in the United States. It had a range of 160 kilometers (100 miles) and only needed five hours to fully charge its engine. The Wheego Life retailed at $32,995. After adding options and taxes and then applying a $7,500 federal tax credit, the net price was $26,495. In addition, some US state and local tax credit can further bring down the price tag. For example, in California, the Wheego Life appeared on the state’s list of approved “green cars” for state subsidies—this is no small accomplishment, considering that the Noble (and all BoP EVs in China) *failed* to appear on China’s *Development Plan for the “New Energy” Car Industry* (*2011–2020*) that would make them eligible for subsidies. As a result, Wheego Life owners in California could enjoy an additional $2,000 off. In addition, Arizona, California, Florida, Georgia, Hawaii, Maryland, New Jersey, New York, North Carolina, Tennessee, Utah, and Virginia allowed EVs such as the Wheego Life to enjoy the privilege of using high-occupancy vehicle (HOV) lanes.

Another example is Hebei-based Great Wall Motors. In 2011, Great Wall signed an alliance agreement with Los Angeles-based CODA Automotive, which would export EVs to the United States. With a top speed of 136 kilometers (85 miles) per hour, the four-door, five-passenger CODA car was also fully “street legal” in the United States. It had a range of 240 kilometers (150 miles) and needed six hours to fully charge. It retailed at $44,900. After applying a $7,500 federal tax credit, the net price was $37,400.

As of this writing, 25 dealers in 18 states as well as Japan and the Cayman Islands signed up with Wheego. Five dealers in Southern California signed up with CODA. The diffusion of such indigenous reverse innovation is likely to proliferate.