Review Essay

China's Techno-Warriors, Another View

Richard P. Suttmeier

Review of *Chinese Techno-Warriors: National Security and Strategic Competition from the Nuclear Age to the Information Age*. By EVAN FEIGENBAUM. [Stanford: Stanford University Press, 2003. 339 pp. US$ 55.00. ISBN 0-8047-4601-X.]

China's growing technological capability has become the topic of the day among Western officials concerned with the national security and economic competitiveness implications of China's growing prominence. The publication of a study which attempts to explain how security and competitiveness have been linked in the evolution of Chinese technology policies is therefore quite timely. The effort to locate this linkage in the development of an ideology of techno-nationalism resonates nicely with perceptions – held by many in Western capitals – of a China with a special passion for the acquisition of dual use technology and a determination to use political means to secure economic advantage. The appearance of Evan Feigenbaum's book, which rightly locates China's technological trajectory at the centre of many of the more important questions about the Chinese future, is thus to be welcomed.

The book is organized chronologically, beginning with a long discussion of the militarization of science and technology (S&T) in the Maoist era. This is followed by chapters covering the early reform period, and the new challenges faced in the 1990s. The focus throughout is on the contribution of a group of individuals – referred to by the author as China's "weaponeers" – who were responsible for the development and execution of China's strategic weapons programmes. With Marshall Nie Rongzhen as their guiding force, the weaponeers are said to have developed a distinctive technical community and administrative style from the late 1950s to the late 1970s which were key to the success of those programmes. Furthermore, argues the author, if one wants to understand where Chinese high technology is going in the 21st century, it is imperative to understand the contributions of the weaponeers to the redirection of Chinese science and technology in the post Mao era. The book relies very heavily – perhaps too heavily, as suggested below – on the memoirs and official histories featuring the weaponeers which began to appear in the 1980s. The exploitation of these new primary sources provides additional insight into the once secret world of military research and development (R&D) during the Maoist period and is one of the strengths of the book.

One of the central puzzles about *China's Techno-Warriors*, though, is whether the insight gained from the new sources requires us to adjust our interpretations of this secret world and its significance. We have long known, after all, that under Mao's leadership, the decision to build

© The China Quarterly, 2004

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

nuclear weapons (and subsequently programmes in missiles and nuclear submarines) resulted in major commitments of financial resources, and the best and brightest of China's physical scientists and engineers, to these programmes. China's achievements in the strategic weapons programmes certainly were remarkable, and required the solution of many technical, organizational and political problems. But much of this story has already been documented by others, especially in the path-breaking studies of John Lewis and Xue Litai. We are thus led to expect that the original contributions of *China's Techno-Warriors* will be found more in its account of the distinctive organizational, administrative and professional styles developed during this pre-1975 era, and the significance of these for the post-Mao drive for high technology. These allegedly original innovations – first, strategies for resource mobilization and the proper uses of technical expertise, secondly, mechanisms for horizontal co-ordination across vertically oriented bureaucracies and a flattening of project hierarchies, and thirdly, careful benchmarking of Chinese work against international standards (pp. 39 ff) – are said to be distinctive contributions which help account for the "success" of the strategic weapons programmes and serve as a model for high tech initiatives after the mid-1980s.

Conceptually, this thesis prompts a number of questions. First, we know that the weapons programmes faced a variety of significant challenges and changing conditions (*including* the Cultural Revolution) over the period covered, and certainly did not escape disruptions. Why would one assume, then, that coherent policy and project management styles would emerge through all the twists and turns of politics during this period when, plausibly, events would have challenged the consistent implementation of a single programme management model? One wonders, therefore, whether the organizational and administrative achievements attributed to the weaponeers (based on sources intended, officially, to chronicle these achievements) don't look more effective and coherent in retrospect than they did at the time.

Secondly, when the argument is extended to the post-Mao period, the author seems a bit insensitive to the fact that the pursuit of clear, high priority, weapons programmes objectives, with relatively clear authority to command resources (characteristic of the Maoist period), is a very different kind of institutional challenge from developing a broad-based high technology industrial strategy in the face of many other competing demands (the condition of the post-Mao era). Why would we assume that the former would be a model for the latter? This second question warrants reiteration when the long-term costs of the "successful" weapons programmes are considered. By the late 1970s, in spite of the very substantial investments of the country's scarce resources, China was still left with a second-rate strategic weapons capability, conventional forces with hopelessly obsolete technology and, most importantly, civilian industrial technology which was also generally antiquated. While the author recognizes this situation, he fails to ask some of the hard questions about how and why these costs were incurred and, more importantly for the second

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

half of the book, what they implied for reconstructing the S&T system in the post-Mao era.

The conceptual questions are not put to rest by the empirical account provided, due largely to recurring problems of contextualization in the narrative. First, there are frustrating liberties taken with chronology in the story. While the chapters themselves are arranged chronologically, the discussion *within* individual chapters often skips back and forth through the years with a bit too much plasticity; thus, it is sometimes difficult to anchor the author's claims to a clear point in time even though the timing is often key to the accuracy of the claim. The scope of the study also contributes to the contextualization problem. Quite broad, it encompasses Chinese national security policy, military politics, science and technology policy, industrial policy, and the development of Chinese techno-nationalism, and it is not unusual to find oneself asking exactly what the author is claiming about these different topics and what he is attempting to explain. These various subjects all have established secondary literatures but these are used rather unevenly. The resulting narrative, relying as it does more on the memoirs and official histories, often turns out to be long on celebrating the weaponeers but a bit incomplete in the history it presents, and in the conceptualization of the underlying problems to be explained.

For instance, we have long known of the significance of the strategic weapons programmes for Chinese scientific and technological development after the late 1950s. However, the development of policies and programmes in civilian science and technology throughout the 1950s must also be considered if the significance of the military story is to be appreciated. In attempting to locate the roots of Chinese high technology exclusively in defence policy debates and military programmes, the author overlooks important developments in national science and technology policies during the 1950s which involved identifying a series of then internationally leading edge technologies for priority attention (the key forum for this was the preparation of the 12-year S&T Plan, an important policy undertaking which gets one sentence in the book). A look at this planning process would indicate that China was already doing the "benchmarking" which Feigenbaum considers to be one of the administrative achievements of the weaponeers. Research centres in the Academy of Sciences and the industrial ministries were being established to pursue these priority fields, universities were gearing up programmes to produce the research personnel needed for them, and much attention was being given to the "proper uses of technical expertise" and to "mechanisms of horizontal co-ordination" well before the full unfolding of the strategic programmes. However, the militarization of research associated with the strategic weapons programmes, combined with the radical politics that affected most scientists not protected by these programmes, led to the attenuation of what was more clearly a broad-based science and industry development programme, one which, arguably, would have left China in a much better security position in the late 1970s than the strategic programmes.

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

Getting this early context right, therefore, is quite important for how we see the unfolding of policies for high technology in the post-Mao period. Science policy officials in the 1980s looked back on those years and bemoaned the terrible waste of time, talent and opportunities missed as a result of militarization and radical politics – Chinese potential for the development of an electronics industry in 1956, for instance, was seen as not all that much worse than Japan's at the time. But whereas techno-nationalism in Japan led to policies of "indigenization," "nurturance" and "diffusion" (Richard Samuels' terms, cited by Feigenbaum) and to the creation of a world-class electronics industry, the Chinese techno-nationalism associated with the work of the weaponeers led to military work on microelectronics being insulated from the civilian economy, thus limiting the efforts at "nurturance" and preventing its "diffusion" to broader societal applications. Quite plausibly, therefore, one might argue that the industrial policy and administrative arrangements associated with the work of the weaponeers, whose virtues Feigenbaum extols, should be held responsible for the technological backwardness which became so evident to Deng Xiaoping and other members of the political and technical elites by the end of the 1970s. The weaponeers could indeed legitimately take credit for significant achievements in the strategic weapons programmes under difficult conditions. But, as a broad-based approach to *national technology policy*, the approach of the weaponeers could hardly be considered a success. This is precisely why science and technology policies required the major redirection they began to receive under Deng in 1978 and why, on the face of it, we would *not* expect the strategic weapons programmes to be a model for post-Mao high technology development.

Problems of contextualization become more serious in the author's post-1975 story. The latter is the part of the book which is likely to be read by policy analysts and policy makers in today's world capitals as they try to decide just how large a high tech threat China is becoming. It is therefore especially important that the context be explicated as fully as possible.

Feigenbaum's account of events in the post-1978 era emphasizes the weaponeers reinventing themselves in the face of a Deng Xiaoping programme radically to de-emphasize strategic weapons (and military modernization more generally), even as Deng elevated the importance of science and technology in national policy. The key to this reinvention, in the author's account, was the now famous 1986 initiative from four senior scientists who had been active in the weapons programmes to start China's National High Technology Development Programme (or as it is now usually referred to, the "863" Programme) by appealing to the spirit and instrumentalities which characterized the work of the weaponeers in the Maoist years. But, again, insensitivity to what was going on in the wider national context of S&T policy produces a picture which is at least incomplete and, arguably, misleading.

For instance, the author rightly notes the importance of the 1978 Conference on Science and Technology where Deng enunciated his

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

vision of the importance of science and technology for post-Mao China. But he then overlooks the consequences of this meeting – the initial priorities coming out of the conference which were intended to be supportive of a high tech future – and the prompt abandonment of these priorities in the name of making "science and technology serve economic construction." More importantly, the daunting challenges of reconstructing the nation's R&D system (*including* the weapons programmes) following the Cultural Revolution are largely ignored by the author even though they strongly influenced the science agenda in the early post-Conference years. From this larger perspective, the issue was not so much that the weaponeers were initially ignored by the new policies, as the author suggests (indeed, they were being recruited into important positions, as he *also* recognizes), it was more that the organizational and human resource bases for *all* forms of R&D needed serious attention. This led to an initial effort to reconstitute the pre-Cultural Revolution system, an attempt which soon gave way to the realization – paralleling thinking about the economic system more generally – that more fundamental reforms in the science and technology system were needed.

The subsequent reform experience is also largely ignored by the author in spite of its considerable importance for understanding post-Mao technology policy and high-tech development. Reform thinking in China was strongly influenced by encounters with the outside world, as the author acknowledges, but by focusing mainly on just one of these – the mission led by then US Secretary of Defense William Perry (later one of Feigenbaum's mentors at Stanford) – the author misses the breadth and variety of these interactions. The narrow focus on the Perry mission leads Feigenbaum to conclude that "… strategic weaponeers were the main point of contact with foreign administrative innovators who had themselves wrestled with new patterns in modes of innovation" (p.131). But, in light of the number and range of Chinese interactions with international science and technology at the time – through multiple academic, industrial and governmental channels – this conclusion is rather misleading; it again exalts the weaponeers at the expense of a more accurate account of the historical situation. Quite apart from the Perry mission and the discussions with the weaponeers during it, *many* members of the Chinese technical community had contacts with *many* "foreign administrative innovators"; it would have been exceedingly difficult for Chinese decision makers to miss the facts that a high technology revolution was occurring in the capitalist world, and that China was institutionally ill-prepared to join it without reform and new programme initiatives, whether the Perry mission occurred or not.

Thus, by the early 1980s, Chinese research policy leaders were already studying the organization and funding schemes of industrial, academic and defence research found in the West which were so different from those of China and the other centrally planned economies; this is the context in which the initiation of the 863 Programme should be seen. As noted above, high technology *had* been de-emphasized in the early 1980s, but as China's international exposure broadened and deepened in the

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

course of the decade, the Chinese technical community began to realize that countries around the world were giving attention and resources to national programmes in support of certain strategic technologies (information and communications technologies, biotechnology, robotics, materials, lasers, energy, and so on). This was true not only for the US (and its Strategic Defense Initiative) and the other OECD countries, but also for the Asian tigers in China's neighbourhood as they began to plan for their high tech futures.

Understandably, China would want to at least monitor the developmental trajectories of these technologies and ensure that a new generation of scientists and engineers had the training to master them. This is what the four senior scientists who first proposed the Chinese national high technology programme were suggesting. That the proposal should come from scientists who had been active in the weapons programmes should not be a surprise, since virtually all high quality physical scientists and engineers in the country who would be in a position to understand international high technology trends had been associated with the programmes. Thus, while the origins of "863" *can* in this sense be linked to the strategic weapons programme, as the author argues, when the broader context is considered, it would be more accurate to portray its birth not so much as an exotic effort by the weaponeers to reinvent themselves than as a product of the times, in which multiple diverse influences – perceptions of international trends, more intimate interactions with MNCs, the rapid growth of Chinese students and scholars studying abroad, increasingly ambitious domestic reforms, and so on, *as well as* influences from the strategic weapons community – led to the initiation of what was for China a number of fairly innovative approaches to the organization and funding of research, of which 863 was one.

Curiously, after spending most of the book building a case for the importance of national strategic technology programmes, Feigenbaum concludes his study with the observation that we are now in an era when the importance of targeted national R&D programmes has declined significantly and where the key to China's high tech future lies in market forces, the activities of MNCs in China, and China's new high technology companies. While there is more than a little to be said for this conclusion, as a number of other observers have already noted, the author's argument in advancing it is somewhat *ad hoc*. Empirically, because the broader S&T reform context of the 1980s and 1990s is generally overlooked in the preceding chapters, we lack an account of the institutional evolution and experiences with foreign technology which would help justify such a conclusion. Conceptually, the argument would have more force if assumptions about the relative strengths of state directed programmes versus market-driven approaches to innovation, about the relationships between civilian and military technologies (involving "dual use" and "spin on" versus "spin off" issues, for example), and about the ways in which foreign technologies relate to indigenous technological capabilities in a globalized world, had been clarified. By dismissing the importance of national programmes in the final chapter after building up their

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press

significance in the preceding chapter, the coherence of the overall argument begins to fray. If Feigenbaum's conclusion is accepted by today's policy makers, we may find them underestimating Chinese national R&D programmes in the early years of the 21st century just as, in the 1990s, some of them (such as the Cox Committee) tended to overestimate these programmes as strategic elements of a Chinese technological juggernaut.

Finally, the author's treatment of the important issue of Chinese techno-nationalism warrants comment. Throughout, techno-nationalism in China is treated as both guiding beacon and product of the work of the weaponeers. Yet the book concludes, oddly, almost as an afterthought, with some reflections on China's experiences with technological development during the 19th century and the Republican era. One might have thought that a thesis on techno-nationalism should have begun with this pre-1949 experience; most students of China's technological development, after all, would be inclined to seek the origins of techno-nationalism in Chinese humiliations in the face of superior Western and Japanese technological capabilities from these earlier periods not, in the first instance, in the weapons programmes of the People's Republic. While the latter were certainly among the 20th century's most important manifestation of techno-nationalism, as Feigenbaum convincingly argues, we would get a more accurate picture of the play of forces in today's techno-nationalism by recognizing that the historical roots are deeper – and the political, economic, and cultural implications of Chinese techno-nationalism are far more nuanced – than the story of the weaponeers by itself provides.

China's Techno-Warriors is an important study reflecting a great deal of original research in new primary materials. Too often, though, the reach of its argument seems to exceed what the sources will sustain. A more carefully crafted and focused discussion of the weapons programmes, and what the new sources might tell us about them, would have been a credible project. The attempt to develop the more ambitious argument about the origins of, and prospects for, high technology and techno-nationalism in today's China ultimately doesn't work. For it to, far more attention to the broader context of Chinese scientific and technological development, especially the complex dynamics of the S&T reforms and consequences of the open door policy, would be required. There is a fairly large literature which treats these subjects which the author might have consulted but, apparently, chose not to. The result is an argument which, however timely, is misleading at times and, in the end, is a less than compelling guide to the security-competitiveness implications of China's growing technological capabilities.

https://doi.org/10.1017/S0305741004000591 Published online by Cambridge University Press