Creating the “American Way” of Business: Evidence from WWII in the U.S.

By MICHELA GIORCELLI*

The Second World War II (WWII) was arguably one of the largest shocks to the U.S. economic and production system in history. Historians, business historians, and economists have largely discussed the stimulus that WWII had on U.S. technological advancements. For instance, Chandler (1977) noted how wartime created “an extraordinary surge of growth” referring to the development of new products. However, its effect on U.S. ‘‘managerial technology’’ innovations has been largely ignored, except for very few qualitative works (Armsby, 1946; Dinero, 2005).

In this paper, I argue that ‘‘managerial technology’’ played a key role in shaping U.S. WWII production and its capacity to defeat some of the most advanced economies in the world. The large-scale diffusion of innovative management practices to US firms involved in war production acted as a technology that put them on a higher growth path for decades. Moreover, it made U.S. managerial practices internationally distinctive and helped create the so-called “American Way” of business, which was exported to war-torn European and Japanese economies in the war aftermath (Womack, 1990; Giorcelli, 2021).

In Economics the idea that ‘‘managerial technology’’ affects firm productivity and performance goes back at least to Walker (1887), who argued for its centrality in explaining firm heterogeneity. Later on, differences in managerial talent were emphasized in the Leibenstein (1966) X-inefficiency theory and in the Lucas (1978) model of firm size. However, until recently managerial or “soft” inputs have been relegated to the residual of the production function, famously defined by Abramovitz (1956) as the “ignorance term”.

More recent works have incorporated ‘‘managerial technology’’ in the production function (Bruhn and Schoar, 2010; Bloom et al., 2015). Consider a production function where value added y is produced as: $y = Ak^{\alpha}l^{1-\alpha}$, where A is an efficiency term, k is

*Giorcelli: University of California, Los Angeles; NBER; CEPR; IZA; J-PAL. 9262 Bunche Hall, 315 Portola Plaza, Los Angeles CA, 90095. E-mail: mgiorcelli@econ.ucla.edu. I thank Robert Metcalfe for his insightful discussion at the 2024 ASSA meetings, as well as Ran Abramitzky, Martha Bailey, Dora Costa, and John Van Reenen for helpful comments and discussions.

non-managerial capital, and l is labor. Assuming that $A=f(M)$ is a function of managerial capital M, management acts as a technology in the sense that it raises productivity.

A major empirical challenge in quantifying M is that management is hard to define and measure. However, by surveying thousands of firms across the world, Bloom and Van Reenen (2007) codified a specific set of managerial practices that can be systematically and consistently measured across firms, countries, and years. This data has shown that managerial practices are strongly associated with firm-level productivity and profitability. Moreover, a few papers have employed randomized control trials (RTCs) that randomly provided free managerial consulting to firms to show that management has a causal effect on firm productivity and performance (Bloom et al., 2013; Bruhn, Karlan and Schoar, 2018).

Studying the development of "managerial technology" during WWII will not only shed new light on a new technology largely neglected so far, but that may have played a crucial role on US firm productivity. It will also improve our understanding of the long-term impact of the adoption of managerial practices. Moreover, it would be informative on to what extent managerial practices can be diffused across firms and countries.

I. U.S. Innovation During WWII

Even before the US officially entered WWII, military, politicians, scientists and businessmen became increasingly aware that "warfare had become a test of the relative total scientific, engineering, and management capacities of the belligerent nations" and the development of new technologies would have been essential to succeed (Armsby, 1946).

A notable step in this direction was to increase support for scientific research by financing R&D expenditures. Between 1940 and 1945, the U.S. government sponsored more than 2,200 R&D contracts in industry and academia, an investment that at its peak amounted to roughly 2% of the nation's annual total gross domestic product (Bush, 1946). While there is widespread consensus about the importance of such investments in shaping U.S. innovation and the interaction between government and science, empirical-grounded research has been scant until recently. Gruber and Johnson (2019) show that U.S. R&D investment not only allowed for many important breakthroughs in science and technology, the radar, digital computers, jet engines, and eventually the internet. It also expanded the U.S. middle class by creating jobs in newly-created industries. Gross and Sampat (2023) document how the R&D investment during the war years had a profound impact on the US innovation system, catalyzing technology clusters across the country, and increasing high-tech entrepreneurship until at least the 1970s.

However, the US government soon realized that too many firms were receiving an increasing number of war-related orders, that exceeded their productive capacity. To deal with these issues, expanding scientific research was not enough. It was necessary to efficiently organize, coordinate and supervise firm production and train the huge numbers of new workers that had to replace those gone to war as soon as possible (Khurana, 2010). For this reason, in 1940 the Training Within the Industry (TWI) Program was created.

The TWI aimed at offering free in-plant consulting to managers of around 11,000 U.S. war contractors. It was designed around three main training programs, called J-modules. The Job-Instructions (J-I) module taught managers how to reduce production disruptions, such as defective products, scrapped output, worker injuries and equipment breakdowns. The Job-Relations (J-R) module taught managers how to make improvements methodically by assigning workers to the most appropriate tasks, and making the best use of machines, and materials to produce greater quantities of quality products in less time. Job-Methods (J-M) module taught managers how to introduce improvements to current production processes, managing their inventory more efficiently, improving production planning, and tracking production to prioritize customer orders by delivery deadline.

Bianchi and Giorcelli (2022) show that the results of the TWI were impressive and long-lasting. Productivity of firms that received the training experienced a 6 percent jump in the year after the training and continued to increase, reaching a cumulative impact of 27 percent after ten years. The three J-modules complemented each other in boosting firm outcomes and the beneficial impact of the TWI was transmitted onto the supply chain of trained firms.

Indeed, the idea of increasing firm productivity through training was not new to WWII. During World War I, following a ten-fold demand increase in shipbuilding, the US Emergency Fleet Cooperation launched a training program, based on learning by doing, for its newly-hired workers that led to a dramatic production increase (Huntzinger, 2005). However, the TWI introduced a conceptual change relative to previous training programs. It did not train the workers but instructed the managers who in turn diffused new managerial knowledge in their firms. In doing so, the program could reach a higher number of workers and allowed managers to adapt the managerial principles to their companies, generating long-lasting effects.

II. (Re)-Educating High-Skilled Workers

The effort to increase U.S. managerial and technological advancements was somehow constrained by a not high enough number of highly educated and trained technical personnel who could be mobilized for war effort (Armsby, 1946). Under the auspices of the U.S. Office of Education, the U.S. government decided to launch one of the largest free educational programs in its history, only second to the G.I. Bill: the Engineering, Science, and Management War Training (ESMWT). The goal of the ESMWT was to "provide without charge college and postgraduate education to engineers, scientists, and managers" employed at war industrial facilities (Armsby, 1946). Despite accounting for only 0.025 percent of the entire WWII spending, the program trained almost 1.8 million workers in a mere six years, equivalent to 40 percent of the college population in 1940.

The ESMWT offered to engineers, physicists, and chemists three-month-long courses on specific war-related topics, such as war explosives, bombproof structures, and aircraft and tank design. Training for managers, by contrast, lasted 18 months and included comprehensive business education with a strong focus on analytic tools to systematically organize and measure production. Considered a prototype for the modern MBA program, the ESMWT was beneficial for both enrolled managers and their firms. Giorcelli (2023) shows that managers who took the ESMWT classes had a substantially higher probability of reaching both middle and top management positions during their career, and engaged systematically more in innovative entrepreneurial activities than similar managers who didn't pass an entry exam. At the same time, their firms increased their productivity by up to 7 percent in the 18 months after the training and adopted several managerial practices, reducing production bottlenecks.

While a careful evaluation of the ESMWT would need more evidence on the impact on innovation of its other components and its long-lasting effects on the U.S. management education system in peacetime, its role during WWII can be hardly overstated. The sustained production growth in the U.S. during WWII would have been difficult to achieve without a proper investment in high-skilled workers. This aspect represented a crucial difference between the US and other technologically comparable countries, like Germany, which focused on increasing production, but little invested in management and workforce education (Giorcelli, 2024). Finally, the impact of the

ESMWT was not confined to the war effort but also affected the workers, who were given the chance to return to school and update their education with state-of-the-art training.

While the end of WWII meant the end of both the TWI and the ESMWT, their influence continued outside the U.S. borders. Between 1952 and 1958, the U.S. sponsored the Productivity Program which offered management training trips for European managers at U.S. firms. This program helped European small and medium-sized firms to dramatically improve their productivity and reduce the gap with US competitors (Womack, 1990; Giorcelli, 2019; Giorcelli, 2024). In the same years, the U.S. Occupation Authority included the TWI principles in a wider program to rebuild Japanese industry and offered training to thousands of Japanese managers and engineers (Giorcelli, 2021). Ultimately, the diffusion of this managerial innovation contributed to creating the Toyota-inspired Lean Manufacturing System, which made Japanese firms the world's most productive during the 1980s (Appelbaum and Batt, 1994).

III. Conclusions

The papers described above indicate that U.S. government's massive investment in management in the early 1940s was pivotal for winning WWII and created a distinctive, "American Way" of doing business, worldwide exported in the war aftermath.

Moving forward, more research should be done to connect WWII managerial innovation with scientific and technological advancements. For instance, better managers may have put their workers in more favorable conditions to produce innovation, creating a valuable complementary between firm managerial and scientific capital. At the same time, R&D investments and engineers' training may have improved production methods, helping managers to increase productivity.

With more data on firms and personnel involved in the WWII effort becoming available, researchers should be able to study more in-depth such complementarities and understand whether and if they worked.

D. References

Abramovitz, Moses. 1956. "Resource and Output Trends in the US since 1870," *American Economic Review*, 46(2): 5-23.

Appelbaum, E., and Batt, R. 1994, *The New American Workplace: Transforming Work System in the United States*, ILR Press.

Armsby, Henry H. 1946. "Engineering Science and Management War Training: Final Report.," Technical Report, U.S. Office of Education, Washington, DC.

Bianchi, Nicola, and Michela Giorcelli. 2022 "The Dynamics and Spillovers of Management Interventions: Evidence from the TWI Program," *Journal of Political Economy,* 130(6): 1630-75.

Bloom, Nicholas, and John Van Reenen.

2007. “Measuring and Explaining Management Practices across Firms and Countries,” *Quarterly Journal of Economics*, 122(4): 1351-408.

Bloom, Nicholas, Raffaella Sadun, Rachel Schuh, and John Van Reenen. 2015. “Management as a Technology,” *Working Paper*.

Bloom, Nicholas, Benn Eifert, Aprajit Mahajan, David McKenzie, and John Roberts. 2013. “Does Management Matter? Evidence from India,” *Quarterly Journal of Economics*, 128(1):1-51.

Bruhn, Miriam, Dean Karlan, and Antoinette Schoar. 2010. “What Capital Is Missing in Developing Countries?” *American Economic Review*, 100(2): 629-33.

Bruhn, Miriam, Dean Karlan, and Antoinette Schoar. 2018. “The Impact of Consulting Services on Small and Medium Enterprises: Evidence from a Randomized Trial in Mexico,” *Journal of Political Economy*, 126(2): 635-87.

Bush, Vannevar. 1945. *Science, the Endless Frontier: A Report to the President.* Washington, DC: Government Printing Office.

Chandler, Alfred. 1977. “The Visible Hand: The Managerial Revolution in American Business,” *Harvard University Press*.

Giorcelli, Michela. 2019. “The Long-Term Effects of Management and Technology Transfers,” *American Economic Review*, 109(1): 121-55.

Giorcelli, Michela. 2021. “The Origin and Development of Firm Management,” *Oxford Review of Economic Policy*, 37(2): 259-75.

Giorcelli, Michela. 2023. “The Effects of Business School Education on Managers’ Career Outcomes,” *Working Paper*.

Giorcelli, Michela and Bo Li. 2023. “Technology Transfer and Early Industrial Development: Evidence from the Sino-Soviet Alliance,” NBER WP No. 29455.

Giorcelli, Michela. 2024. “Closing the Productivity Gap with the US: Causes and Consequences of the Productivity Program in Western Europe,” *Manchester School*, forthcoming.

Gross, Daniel, and Bhaven Sampat. 2023. “America, Jump-started: WWII R&D and the Takeoff of the U.S. Innovation System,” *American Economic Review*, 113(12): 3323-56.

Gruber, Jonathan, and Simon Johnson. 2019. *Jump-Starting America*. Public Affairs.

Khurana, Rakesh. 2010. *From Higher Aims to Hired Hands.* Princeton ed.

Huntzinger, Jim. 2005. *The Roots of Lean. Training Within Industry: The Origin of Japanese Management and Kaizen*. LeanFrontiers.

Leibenstein, Harvey. 1966. “Allocative Efficiency vs ‘X-Efficiency’,” *American Economic Review*, 56(3): 392-415.

Lucas, Robert E. 1978. “On the Size Distribution of Business Firms,” *The Bell Journal of Economics*, 508-23.

Womack, James, Daniel Jones, and Daniel Roos. 1990. “The Machine That Changed the World,” New York: Simon and Schuster.