Book Prospectus

"Professionals and Productivity
The Diffusion of Soft Technologies during and after WWII"

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Introduction

Economists have long puzzled over the large and persistent differences in productivity between firms and countries. For instance, within narrowly-defined US manufacturing industries, the most productive establishments make almost twice as much output with the same input as the least productive ones (Syverson, 2004). This ratio is even larger in developing countries: in India and China, for instance, it is close to five (Hsieh and Klenow, 2009). At the aggregate level, it has been estimated that differences in productivity account for at least 30 percent of the differences in average per capita income across countries (Hall and Jones, 1999; Jones and Romer, 2009).

What can explain such outstanding differences in productivity? One natural explanation is that they depend on "hard" technological innovations, as incorporated in patents, or in the adoption of new machinery and information and communication technologies (ICT). Another important factor, however, could be "soft" technologies, like management, which can be thought both as practices (the management systems that firms put in place) and people (the CEO and other managerial talent that firms acquire).

Management can affect firm productivity through three main channels: technology, efficiency, and human capital. Good management can identify and adopt new production techniques, shape the investment, financial and organizational practices, which, in turn, help firms to get as close as possible to the technological frontier. In this sense, management can be seen as a *technology* as it raises productivity. However, even in the absence of technological progress, better management can allocate the *existing* resources more efficiently, for instance, through production planning, inventory control and by making fewer mistakes in the employment of physical capital. Finally, good management may make firm human capital more productive, by hiring and retaining the best workers, by providing performance-based incentives, as well by allocating them to the most

appropriate “tasks”. The interaction between these channels allows firms to remain on and push forward the technological frontier.

Despite their centrality in modern world, the concepts of “management” and “managers” developed fairly recently. Only with the Industrial Revolution, due to the increase of firm size, owners needed new professional “agents”, commonly called “managers”, who could put in place specific practices related to labor management, quality control, workflow planning, and accounting. More specifically, middle managers focused on the day-to-day factory operations to run the firms, while top managers were responsible to make long-term decision of capital and personnel allocation. In this respect, managers were inherently different from another important category at the rise during the Industrial Revolution, the entrepreneurs. While the latter took the risk of thinking outside the box to find innovative ideas and new products, the former innovated inside the box by improving firm operations and worker management.

Since the end of the 19th century, as firms realized the importance of professional managers, business owners, industrial engineers, business school professors, and sociologists started numerous studies to better understand the relationship between management and productivity. In Economics the idea that ‘‘managerial technology’’ affects the productivity of inputs goes back at least to Walker (1887), who argued for the primacy of managerial ability 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 empirical research has focused on the variations in firm productivity determined by differences in inputs usage and technology adoption. The unexplained part of such differentials was attributed to managerial quality, a fact that indicates our ignorance about its origins and persistence.

There are two main reasons that explain why systematic empirical evidence on management has been scant until recently. First, management is a fairly complex phenomenon, hard to be defined and measured. However, works focusing on specific measurable practices have documented a strong correlation between their adoption and firm productivity (Bloom and Van Reenen, 2007). Second, establishing a causal relationship between management and firm performance is challenging: more productive firms may simply adopt better management practices. Recent studies have overcome this issue by randomly providing free managerial consulting to companies through randomized control trials (RTCs). The results indicate that

adopting managerial practices causes positive and sizeable effects on the outcomes of medium and large firms (Bloom et al., 2013; Bruhn, Karlan and Schoar, 2018).

In face of the advancement of the empirical research, fundament questions about the links between firm management, technology adoption and productivity remain open. What drives the early adoption of management practices? Does such adoption permanently raise firm productivity? Does good management diffuse to low-productivity firms and across countries?

My book will embrace a long-term approach to investigate management's early rise, its transformation over decades into a set of codified practices, and its diffusion within the United States during WWII and in Europe and Japan in the war aftermath. More specifically, the book will be centered around three themes, corresponding to its three parts. Part I will contain a brief history of management from the mid-19th century to the eve of WWII. It will describe how the concept of management moved from solving a coordination problem *across* firms and plants at the time of the Industrial Revolution to developing specific practices *within* firms and plants to boost productivity, as intended in modern times. Part II will argue that WWII was a major inflection point in the history of American business. The large-scale diffusion of management practices sponsored under the Training Within Industry (TWI) program not only put trained firms on a higher growth path for decades but also helped creating the "American Way" of business. This method, based on management rather than on technological innovation, was exported around the world after WWII, and despite a few changes, has persisted until today. Part III will focus on the export of the "American Way" of business to Europe and Japan after WWII and will show that the transfer of managerial knowledge revolutionized production in war-torn Western economies, with positive, long-lasting effects on the productivity of those adopting companies.

The historical context will offer key advantages compared to a modern setting. First, it allows to study in which context managerial practices early developed and offers a long-time span to evaluate their effects. Second, the implementation of the TWI-related policies encountered many idiosyncrasies, that determined a natural variation in firm management adoption. While modern randomized control trials can provide an exogenous variation in practices implementation, they could hardly replicate the large scale of these two interventions, as well as the variety of firm size and sectors involved. Finally, for evaluating the effectiveness of these programs, US experts recorded detailed information about participating firms and practices adoption, usually not collected or released due to confidentiality issues.

My book will make two major contributions. First, from an economic perspective, it will speak about the relationship between management and productivity. By using a long-run historical approach, I will shed new light on how early managerial practices developed and evolved, evaluating their effects on the productivity of firms across different countries over a long-time span. Second, from a historical point of view, the book will complement the literature that studies the effects of WWII on technology development. It will argue that the early 1940s represented a major inflection point in American business due to the rise of management practices, creating the seeds for exporting the "American way" of business to Western Europe and Japan in the following 15 years. Moreover, it will bridge the gap between the literature that sees management as the solution to a coordination problem *across* firms and plants at the time of the Industrial Revolution (Chandler, 1977) and the modern idea of management as a set of practices that have a direct effect on firm performance and productivity (Bloom and Van Reneen, 2007; Bloom et al., 2013).

Book Outline

Part I: The Role of Management in Modern American Business

Chapter 1: The Early Rise of Management

Chapter 2: Management and the Productivity Drive

Part II: Creating the "American Way" of Business

Chapter 3: The Origin of the TWI Program

Chapter 4: Setting the TWI in Motion

Chapter 5: Quantifying the Effects of the TWI Program

Part III: Exporting the "American Way" of Business

Chapter 6: The Diffusion of the TWI Principles in Europe

Chapter 7: Were the TWI Principles Effective Overseas?

Chapter 8: The Diffusion of the TWI Principles in Japan and the Origin of the Japanese Management Style

Conclusion: What Can We Learn From Economic History?

Part I: The Role of Management and Managers in Modern Capitalism will contain a brief history of management since 1850, focusing on how the concept of "management" moved from solving a coordination problem *across* firms and plants, as described in Chandler (1977), to developing specific practices *within* firms and plants in a modern sense, as described in Bloom et al. (2013). In chapter 1, **"The Early Rise of Management,"** I will argue that "management technology" has been far more central in the rise of modern capitalism since 1850 than economists have given it credit for, building on the works of Chandler (1977) and Pollard (1965). Prior to the Industrial Revolution, there was no concept of "management" as we think of it today. Most businesses were small operations, averaging three or four people. Owners frequently labored next to employees, knew what they were capable of, and closely directed their work. The dynamics of the workplace changed dramatically with the Industrial Revolution. In the 1840s, the large new railways and telegraph companies in the United States created the need for a managerial hierarchy

to supervise several operating units in different parts of the country and to coordinate and monitor their activities (Chandler, 1977). As underscored by Pollard (1965) in the English context, to coordinate the newly formed organizations, owners needed the help of "agents," commonly called "managers," who were alternatives to markets in managing the flow of inputs and outputs more efficiently than under the price mechanism across firms and plants. Over the years, the visible hand of corporate enterprise supplanted the invisible hand of markets in coordinating production (Chandler, 1977). As the new companies faced numerous economic, political, and technological changes, some organizational and management arrangements proved to be better than others in coping with a changing environment (Voich and Wren, 1976), which in turn allowed firm performance to thrive.

However, since the late 19th century, management of resources within firms started being proposed as an important determinant of productivity (Walker, 1887) and numerous studies proposed methods to maximize labor productivity. Industrial engineers such as Frederick Winslow Taylor and Frank and Lillian Gilbreth developed theories to optimize the outputs obtained from a specific set of inputs. As Brech and Urwick (1954) argue, their works were crucial for transforming the art of "people management" into a science. At the same time, Henry Ford, who founded the Ford Motor Company, was working to mass-produce automobiles at affordable price. Implementing Taylor's theory during the assembly stage, he was able to reduce the time to build a car from 12 hours to two hours and 30 minutes, ushering in the era of automobile mass-production.

Chapter 2, **"Management and the Productivity Drive,"** will argue that during the 1920s and 1930s management science was influenced by other fields and became the center of the productivity studies sponsored by the BLS. On the one hand, sociologists and psychologists examined the interaction between working conditions and worker productivity. Remarkably, between 1924 and 1933, Elton Mayo and his colleagues at Harvard Busines School conducted six experiments at the Hawthorne plant of the Western Electric Company in Cicero, Illinois studying the effects of working environment on worker productivity, workplace organization, and job satisfaction.

On the other hand, throughout the 1920s the BLS became increasingly interested in measuring and quantifying how the widespread technological innovation affected firm productivity, and the agency promoted new methodological approaches to do so. In particular, Isador Lubin, Commissioner of BLS from 1933 until 1946, "provided the impetus for the Bureau's development

into a modern, professionally staffed organization," recognized the importance of data analysis, and worked to improve BLS statistical programs. Under his guidance, the BLS promoted several experimental studies in selected firms in the brick sector. These studies underscored that productivity increases could be driven not only by technological innovation but also by management innovation, such as new production techniques, new factory operations, and assigning specific tasks to workers. For the first time, management was considered an innovation with the same dignity accorded to technology. In the final part of the chapter, I plan to reexamine the results of the BLS studies using data from their reports to assess whether they were consistent with the new data-based measures and if their conclusion—that management innovation increased firm productivity—was accurate.

Part I will conclude with two considerations. First, good management developed as fundamentally different from good entrepreneurship. While entrepreneurs, who dominated the First Industrial Revolution, sought innovative ideas and new production options, and bore the risk of these initiatives, managers operated *within* the firm with the task of optimizing *existing* operations and managing workers. Second, on the eve of WWII, the BLS studies had concluded that good management affected productivity through three channels: by identifying and adopting new production techniques, by allocating *existing* resources more efficiently through specific factory operations, and by making human capital more productive by assigning workers appropriate tasks. During WWII, when increasing firm productivity became a national priority, the US government sponsored a large-scale management training, the TWI program, that heavily built on BLS studies.

Part II: Creating the "American Way" of Business will argue that WWII was a major inflection point in the history of American business. The large-scale diffusion of management practices sponsored under the TWI program not only put trained firms on a higher growth path for decades, but also helped create the "American Way" of business. This method, based on management rather than technological innovation, was widely exported after WWII, and despite a few changes, has persisted until today. Chapter 3, **"The Origin of the TWI Program,"** will examine why a management training program was considered essential in the context of WWII and how the management studies of the 1930s laid the groundwork for such interventions. On June 7, 1940, Congress passed an act authorizing BLS "to make continuing studies of productivity" and

appropriated funds to establish the Productivity and Technological Development Division. I will analyze the intense correspondence between this division and the NWLB to show how the former considered diffusing management practices important for winning the war. In fact, even though the United States was not officially at war until late 1941, the Allies' demand for its military products was already exceeding American production capacity, and BLS studies considered U.S. firms unprepared to face a war effort. As such, the Training Within Industry Service was one of the first emergency services to be organized. The goal of this program was to offer management training to U.S. war contractors in three different 10-hour training sessions, labeled J-modules. The Job-Instructions (J-I) module trained firms in establishing standard procedures for operations, performing regular maintenance of the machines, and enhancing job safety measures, and was derived from the BLS experiments on factory operations in the 1930s. The Job-Methods (J-M) module taught firms how to rely more heavily on performance-based incentive systems for workers and managers, invest more in on-the-job training, and more precisely define job descriptions and responsibilities. While this module was closely related to the scientific management principles, it was also building on the sociological studies that suggested considering workers as human beings and aimed at reducing conflicts between management and the rest of the workforce. Finally, the Job-Relations (J-R) module taught firms how to improve their methods with inventory control, production planning, and prioritizing orders and was derived from the industrial engineering studies of the 1930s. The innovative aspect of the TWI was to promote constant innovation in firm processes, with the goal of achieving a continuous cycle of improvements with long-lasting effects. Before being taught, each method was tested on a sample of firms to test its effectiveness. The rest of the chapter will analyze the data from this pivot phase and will combine it with the correspondence between the TWI directors and the NWLB to study which issues emerged in this phase, how they were solved, and how the NWLB influenced the TWI directors for setting up the later stages of the program. Overall, two major conclusions were drawn: the cooperation of management was essential for the program to succeed (while, perhaps surprisingly, unions viewed this program positively) and the resources to train all the contractors were hard to find, not just in terms of money, but in terms of instructors to teach the TWI principles. It was therefore decided to run the program on a voluntary basis directly at the plants and to set up specific training for the instructors.

Chapter 4, **"Setting the TWI Program in Motion,"** will analyze the organizational challenges TWI faced and how the training was delivered to firms. First, the TWI had to select instructors who delivered the program. Most instructors were men and women with extensive business experience who were sent by their employers to volunteer for the TWI program either part-time or full-time. Others were paid staff already working for a government agency. Upon recruitment, candidates had to attend a "TWI institute," a 50-hour course, to become an instructor; they were taught by a TWI staff member either in their district of residence or in Washington, D.C. During the first part, candidates had to attend a full J-module. The second part was divided between lectures on the fundamental concepts of a J-module and practice in teaching the course. For organizational purposes, applicant firms were divided into geographical groups, called districts, in turn divided into subdistricts. The in-plant training was then carried out by TWI instructors, whom the TWI administration trained to teach one J-module before assigning them to a given subdistrict. The correspondence between the local TWI directors and the TWI headquarters will show that lack of instructors and the inability of TWI instructors to teach in multiple subdistricts or to teach more than one module created imbalances in the composition of instructors across subdistricts and over time. The decentralized nature of the TWI made it difficult to solve this problem. As a result, some applicants received training only in some J-modules, while others received no training at all.

The rest of the chapter will investigate how the program worked on the ground. The memoirs and recollections of Lowell Mellen, who was the director of the TWI's Northern Ohio District and who also served in Japan after WWII, will shed new light on how the program worked at the local level, which issues instructors faced while visiting the firms, how they cooperated with management, and how the managers implemented the TWI practices. This first-hand information will be complemented by the minutes of the conferences TWI organized over its years of operation among its directors to check up on how the program was unfolding. They will provide insights on which aspects of the TWI were particularly successful, which ones were changed, and the perceived results of the program.

How successful was the TWI program in the short run and the long run? Chapter 5, **"Quantifying the Effects of the TWI Program,"** will quantify the extent to which the TWI program affected the productivity of trained firms. It will rely on the Manpower Utilization Survey Reports collected by the Bureau of Manpower Utilization's regional offices between 1942 and 1945, which contain information on organization size, employee force, war contracts, productivity,

personnel policy, management relations, absenteeism, labor turnover, and in-plant and out-plant working conditions at the plant-level for all U.S. war contractors. Because the TWI program operated under a limited budget and encountered some idiosyncrasies in its implementation, as explained in chapter 4, not all firms initially intended to be part of the program received the training. To estimate the effects of the TWI service, I'll compare trained firms with the firms intended to be trained but eventually not part of the program.

The data collected by the Bureau Manpower Utilization will provide a detailed picture of what changed within plants upon receiving the training. Specifically, trained plants adopted the practices they were taught, which had positive effects on their performance, and diffused these techniques to other plants within the same firm, favoring convergence in productivity. To look at the long-term implications of the TWI, I will rely on the firm-level data that follows firms until 10 years after the training.[1] Over the years, trained firms continued to improve their performance and undertook several structural changes that transformed them into larger, more complex organizations, without dismissing practice implementation. With this respect, management actually acted as a technology by putting trained firms on a higher growth path.

Part II will conclude with my discussing how the TWI program's success was due to two distinctive characteristics. One, the TWI intervention not only diffused management principles but also developed an effective way to make them used by firms. The TWI, in fact, was a precursor of the "learning by doing" method, in which firms learned their own "best management way" by implementing and improving the practices. Two, the TWI was based on a "multiplier effect," which consisted of "develop a standard method, then train people who will train other people who will train groups of people to use the method." For the multiplier effect to work, it was necessary to design the training to be effective in all the situations it may have taught. Not surprisingly, the program was successful on an heterogenous group of firms in terms of size, industries, productivity, and, as shown in Part III, countries.

Part III: Exporting the "American Way" of Business will focus on the export of the "American Way" of business in Europe and Japan after WWII and will argue that the transfer of managerial knowledge revolutionized production in war-torn economies with positive, long-lasting effects on firm productivity. Chapter 6, **"The Diffusion of the TWI Principles in**

[1] Part of the data in this chapter will be based on Bianchi and Giorcelli (2020).

Europe," will analyze the U.S. management interventions in Europe in the aftermath of WWII. Despite the United States providing economic and financial aid to Western Europe, the productivity gap between European and U.S. firms was increasing. To understand why, BLS members visited several European plants; they concluded that their management inefficiencies were a more severe problem than war damages (Silberman, Weiss, and Dutz, 1996). To improve the productivity of European firms, the U.S. government introduced the United States Technical Assistance and Productivity Program. Between 1952 and 1958, the program organized study trips for European managers to U.S. plants, followed by consulting sessions with U.S. experts at European firms. Managers were taught the TWI principles, and they were subject to a three-year follow up period upon returning to their companies.

To depict how the Productivity Program worked, I will rely on the richly detailed Study Tour Reports on all 270 study trips organized by the United States between 1952 and 1958, the 19,000 managers coming from the 17 participating European countries who visited the United States, and the TWI-trained U.S. firms that hosted them. These reports contain many first-hand accounts from the people involved in the program, from both the U.S. and the European sides. They will therefore elucidate the enthusiasm of U.S. managers who received the training during WWII who diffused the principles to their European counterparts, as well as the aspects of the U.S. production that most enthused the European managers. Most reports, for instance, indicate how European managers were surprised to see how U.S. workers produced double their European counterparts in half the time. I'll close the chapter by analyzing whether the Productivity Program succeeded in closing the gap between U.S. and European firms. The factory performance reports will show that the productivity gap was 0.52% in 1952 and narrowed down to 0.86% in 1958.

While European firms that participated in the Productivity Program reduced the gap with the United States, chapter 7, **"Were the TWI Principles Effective Overseas?",** will investigate how the performance of trained firms changed compared to the other similar companies in their origin country.[2] I'll focus on the Italian case, which had some specific features. In fact, the U.S. authorities originally intended to roll out the Productivity Program in Italy in two phases: first, a pilot program, which, if deemed effective, would be followed by nationwide implementation. However, after all firms eligible to participate in the pilot phase applied to the program, the U.S. program budget was

[2] Part of the data in this chapter will be based on Giorcelli (2019).

cut, and thus only a subset of firms (from narrowly defined Italian geographical areas) participated. A comparison between eligible firms that eventually were part of the program and eligible ones that were excluded due to the budget cut allows me to explore whether and how the Productivity Program boosted the performance of participating firms compared to other similar Italian companies.

The analysis based on newly assembled panel data from Giorcelli (2019) will show that the adoption of U.S. managerial practices had long-lasting effects on the performance of these small and medium-sized firms and that most trained firms successfully adopted the new American managerial practices. In the longer run, changes in firm organization and access to the credit market amplified the initial effects of the program, which persisted until 15 years after the program. By contrast, firms that received U.S. loans to buy technologically advanced U.S. machinery improved their performance, but the effects were short-lived. This result will show that the impact of technologically advanced capital goods on firm performance does not persist over time if it is not accompanied by proper managerial training.

Chapter 8, **"The Diffusion of the TWI Principles in Japan and the Origin of the Japanese Management Style",** will focus on the export of the "American Way" of business to Japan, arguing that it constituted the roots of lean production. After WWII, the U.S. Occupation authorities, led by General MacArthur, quickly realized that due to the near complete destruction of the Japanese industrial base, civil unrest was very likely. Instead of punishing Japan, they recognized that rebuilding Japanese industry was critical. The members of MacArthur's leadership were aware of the TWI Service and its success in the United States. They felt that this program was exactly the type of initiative that would help support the rebuilding and infuse democratic principles in Japan.

Based on the reports of the study trips of Japanese managers in the United States, of the U.S. experts in Japan, and on the memories of former TWI district director Lowell Mellen, I will investigate how the TWI was exported to Japan and how its content changed to meld with Japanese production culture. For instance, given the difficulties in communication between U.S. and Japanese managers and engineers, the learning-by-doing component of the TWI methods became particularly important. However, part of the successful adaptation was due to specific conditions of Japanese firms. Japanese managers soon realized their own goods were shoddy by international comparison. Moreover, after the war, they could not afford to waste raw materials, which

postproduction inspection processes brought to light, and they consequently sought techniques to help them address these problems. Instead of encouraging large, radical changes to achieve desired goals, the TWI methods recommended that organizations introduce small, incremental improvements, preferably ones that could be implemented on the same day. The major reason was that during WWII, there was neither time nor resources for large, innovative changes in the production of war equipment. The essence of the approach came down to continuously improving the use of the existing workforce and technologies. The idea of finding the optimal process through continuous improvements generated the “kaizen" form of Japanese management; the term, in fact, means “*continuous improvement*.”

Finally, it is widely thought that the revolution in Japanese manufacturing management was key to the Japanese economic miracle of the 1970s and 1980s. Until the late 1970s, despite the success of U.S. management techniques in Japan, few American companies were systematically using them. Only in the late 1970s did the United States become aware of Japan's achievements; during the 1980s, Japanese managers were invited to the United States to share their managerial techniques, and U.S. managers visited Japanese firms to learn the “Japanese management way.” Ford Motor Co. was among the first to benefit from these exchanges, and it reshaped its manufacturing operations as a result of these visits. One result of that collaboration was Ford’s revolutionary Ford Taurus, which became one of the best-selling cars of all time. Soon after, other U.S. firms adopted the Japanese principles, including Xerox, Procter & Gamble, and AT&T, all of which improved their performance.

Part III will conclude by comparing the results of the TWI in United States with the program's results in Europe and Japan. The TWI produced long-lasting effects on outcomes for firms of all size. These findings do not appear determined by historical or geographical context, indicating that the standardized management principles can be easily exported across countries. Moreover, allowing managers to develop their own “best management way” allows these techniques to adapt to different production environments, as in the Japanese case.

The conclusion, **“What Can We Learn From Economic History,”** will summarize how history speaks to the relationship between management practices and firm performance, and how it evolved over time. I will underscore that the TWI principles are still taught today in the manufacturing, healthcare, and service industries in 27 countries around the world, and that they

look like the management principles advised by modern business training programs and consulting services. The large effects of management interventions and their adaptability to different countries and historical periods suggest that management should play a central role in crafting industrial policies. The diffusion of management principles can put adopting firms on a higher growth path for decades while also generating substantial spillover effects for both workers and economically related firms, with a potential overall increase of country aggregate productivity.

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