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Closing the productivity gap with the US: Causes and consequences of the productivity program in Western Europe

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Abstract

This paper studies to what extent the transfer of US managerial technologies to Europe after World War II contributed to closing the gap with US businesses. Between 1952 and 1958, the US government sponsored the Productivity Program, which promoted management training trips for European managers at US firms. Through the analysis of reports compiled by UK, France, Germany, and Italian participating firms, I first document that these companies claimed between 5% and 10% yearly productivity increase thanks to the program. The fact that European businesses were not forced to adopt the American management model, but could adapt it to their firm needs and existing business practices was a key aspect of the program's success. Second, using data on US and Italian participating firms' performance I show that Italian firms grew on average 7.8 percent faster than that of US companies in the 10 years after the start of the program. Moreover, the distribution of productivity of Italian and US firms became more similar over years, confirming a performance convergence between these companies.

KEYWORDS
management, productivity, WORLD WAR II

JEL CLASSIFICATION
F23, L25, M16, M54, N34, N64, O33

1 | INTRODUCTION

Since the end of WWII, many developing countries have relied on the transfer of technologies and managerial models from the more developed states to promote economic growth (Giorcelli, 2019; Giorcelli & Li, 2023; Hoekman et al., 2004; Robinson, 2009; Womack et al., 1990). While such transfers have triggered the attention of policy makers in the last few decades, only recently economists have focused on careful empirical evaluation of the effects on industrial policy. Several papers have analyzed the role of government investments in strategic industries to foster early-stage economic development and documented a large and positive impact on industrialization, targeted industries, and individual long-term outcomes (Bianchi & Giorcelli, 2023; Choi & Levchenko, 2021; Kim et al., 2021; Lane, 2023; Liu, 2019; Mitrunen, 2020; Wade, 1990).

Studying the effects of these transfers on the productivity of recipient economies and on the productivity gap between sending and receiving countries over time, however, remains challenging. Most policy evaluations lack crucial data on the performance of targeted firms and are not able to follow them for several years in order to see if and when the effects of management transfer materialize. Moreover, there is still limited evidence on which features of technology transfer programs make them successful and which do not.

In this paper, I shed new light on this topic using evidence from the US Technical Assistance and Productivity Program (hereafter, Productivity Program). Between 1952 and 1958, this program promoted training trips for European managers to learn modern management practices at US firms to increase European firms' productivity and performance. Because of its unmatched scope and scale as well as the wealth of available information, the Productivity Program represents a unique setting to study the transfer of management models across countries.

Analyzing reports compiled by UK, France, Germany, and Italian participant firms, I first document that these companies claimed between 5% and 10% productivity increase thanks to the program. Notably, such businesses were not forced to adopt the "American Way" of doing business, based on large company management. Instead, they had a large autonomy in selecting specific techniques and managerial practices and adapting them to their firm needs and business practices. This appears to be the key mechanism through which the Productivity Program worked.

A limitation in interpreting these results is that they lacked a carefully designed evaluation at the time, with representative comparison groups, which prevents from estimating if the Productivity Program helped to close the productivity gap between US and European firms. To solve this issue, I compare performance of Italian firms that sent their managers to the US and the American firms that hosted them, which I follow from 5 years before to 10 years after the program, using a difference-in-differences estimation framework.

The results indicate that the Productivity Program was successful in reducing the performance gap between US and Italian firms. More specifically, productivity of Italian firms grew on average 7.8% faster than that of US companies in the 10 years after the start of the program. I observe a similar pattern in firm employment and profitability.

I next investigate to what extent participating in the Productivity Program changed the productivity distribution of Italian firms. In 1951, the year before the start of the Productivity Program the productivity distribution shows a heavy left tail. By contrast, in 1960, after the end of the program, not only did the entire distribution move to the right, but the left tail became much thinner, while the right tail becomes heavier. Moreover, in 1960 productivity distribution of Italian firms look fairly similar to that of US companies, confirming a substantial convergence between the two types of companies.

This paper contributes to three strands of the existing literature. First, several papers have shown enormous heterogeneity in management practices and CEO styles across firms (Bertrand & Schoar, 2003; Bloom & Van Reenen, 2007, 2010). However, a central question remained answered: is this observed heterogeneity a reflection of an optimal match between the underlying fundamentals of different firms and the type of management that is needed given the firm's state of development? Or is lack of managerial capital a first-order impediment to firm growth and profitability? To solve this puzzle more recent works have provided causal evidence that the adoption of better managerial practices has large and positive effects on firm outcomes, mostly relying on randomized control trials or natural variations (e.g., Bloom et al., 2013; Bruhn et al., 2018; Giorcelli, 2023; Gosnell et al., 2020; Iacovone et al., 2022; Macchiavello & Morjaria, 2022; Manaresi et al., 2022). Taking a long-run perspective, Giorcelli (2019), Bloom et al. (2020), and Bianchi and Giorcelli (2022) have shown that the impact of management interventions can be long-lasting. This paper adds to this literature new insights on how managerial interventions can reduce performance differences among firms from *different* countries, size, and with different levels of economic development.

Second, this paper contributes to the historical and economic debate about the effectiveness of US aid in helping European recovery after WWII. Previous papers have argued that such interventions created an environment in which democratic institutions could grow (as opposed to the communist system), but that its impact on investments in industrial capacity and infrastructure repairs was modest overall (De Long and Eichengreen, 1993). More recently, using micro-level data and exploiting natural variation in the aid allocation across provinces, Bianchi and Giorcelli (2023) have documented that provinces that got more Marshall Plan funds recovered faster from WWII, but also experienced a large economic expansion that lasted until the 2000s. Focusing on the Productivity Program specifically, Giorcelli (2019) has shown that the program generated long-run effects on the performance of Italian firms that participated in it. This paper contributes to this strand of the literature by showing that the Productivity Program was also successful in closing the productivity gap with US firms, which had increased since the 1920s and was exacerbated by the Second World conflict.

Finally, this paper contributes to the business history literature studying the origin and diffusion of managerial practices. Giorcelli (2021) has discussed how the rise of a modern concept of "management" only arose with 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). While studies on how to maximize productivity exploded during the 1920s and 1930s, only the 1940s were 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 create the "American Way" of business (Giorcelli, 2024). 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. This work contributes to this literature by focusing on the role of the export of managerial practices from the US to Europe and providing to the best of my knowledge the first quantification of the extent to which the

Productivity Program helped Italian businesses to catch up with the US ones using firm-level data for 15 years from both countries.

The rest of the paper is organized as follows. Section 2 discusses the historical background. Section 3 analyses European firms' reports to assess the effects of the Productivity Program on their performance. Section 4 focuses on the Italian case. Finally, Section 5 concludes.

2 | THE AFTERMATH OF WWII AND THE BEGINNING OF U.S. ASSISTANCE IN WESTERN EUROPE

When WWII came to an end, on May 8, 1945, Europe was strongly ravaged by a conflict that had lasted almost 6 years. European GDP was between 32 and 41% lower than in 1938, and industrial production ranged between 29 and 37% of that in 1938 (Boel, 2003). According to estimates, over 60 million people were killed and bombing and fighting had determined a widespread destruction of buildings and infrastructure. For instance, 74% of the roads and 51% of the railroads were no longer useable, and the vast majority of factories could not produce due to damages to their physical capital.

Between 1946 and 1947, Europe's needs for imported commodities, especially food, were much greater than its current ability to pay. There was an account balance of payments deficit of $9 billion per year, that could not be paid through borrowing from private capital markets because international capital mobility was heavily restricted, and currencies were inconvertible (Lombardo, 2000). During the winter of 1946-47, the situation even worsened. Hunger was accompanied by economic stagnation, inflation, and political unrest. A series of communist-led strikes spread across the continent (Fauri, 2006).

For these reasons, the US Secretary of State George C. Marshall, in the commencement speech at Harvard University on June 5, 1947, announced a comprehensive program of assistance to Europe in the form of capital transfers as well as financing for investment and import purposes.

This program was formally passed by the US Congress on March 1948 through the approval of the Economic Cooperation Act and was named the European Recovery Program (E.R.P.), or the Marshall Plan. The E.R.P., in operation between March 1948 and June 1952, granted $130 billion to 17 Western and Southern European countries: Austria, Belgium and Luxembourg, Denmark, France, West Germany, Greece, Iceland, Ireland, Italy and Trieste, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, and United Kingdom. Countries that received more money from the program were France (20%), Germany (11%), and Italy (10%). The declared goal of the E.R.P. was to reduce shortages in participating countries and provide means for reconstruction. However, it also had a strong political motivation: preventing the spread of Communism, especially after the Soviet Union forced its satellite countries not to participate in it (Kipping & Bjarnar, 2002).

The E.R.P. aid was proven successful (Bianchi & Giorcelli, 2023; Boel, 2003; DeLong and Eichengreen, 1993). By 1951, almost all the 17 recipient countries had already reached the GDP level of 1938 and were close to a full production recovery. The U.S. experts were hopeful that European productivity would quickly rise to US levels once infrastructure had been restored through infusions of capital from the Marshall Plan, even though between the two World Wars Western European industry had been protected from competition and focused on small production mostly for small domestic markets. This idea was, however, disproved by a US Bureau of Labor Statistics techno-economic study of more than 200 factories in five European countries. This report outlined that European industries were in critical need of technology upgrading.

Production technology and management practices were still associated with small-scale production or relatively unrefined mass production, common in the United States in the 1920s. Many Western European engineers were unfamiliar even with such basic innovations as materials handling, standardization, power hand tools, and time-and-motion study. European managers were implementing little to no managerial practices, resulting in old-fashioned distribution channels and undeveloped modern mass marketing.

While WWII exacerbated differences in productivity between European and US firms, the increasing productivity gap between them dated back to the 1920s and 1930s. In these 2 decades, the U.S. started a number of studies on management to increase productivity, while Europe only focused on investment in physical capital to boost production (Giorcelli, 2021). A comparison of productivity growth rates between US and European businesses confirms this view. US and European firms' productivity was roughly comparable until the mid-1920s but then started diverging, except for the years around the Great Depression (Figure 1). This increasing gap increased during WWII and persisted during the war aftermath. Despite productivity growth in Europe had already reached the pre-WWII values by 1950, it remained significantly lower than that in the US.

U.S. experts soon realized that "no program of studies, foreign consultants, training programs, or private investment could bridge the productivity gap." In 1949, after visiting several factories all over Europe, James Silberman, the BLS Chief of Productivity and Technology Development, claimed that inefficiencies in management were a more severe problem than war damages (Silberman et al., 1996).

For this reason, starting in 1950, the US government introduced the United States Technical Assistance and Productivity Program (hereafter, Productivity Program). This program aimed at closing the productivity gap with the United States by organizing study trips for European

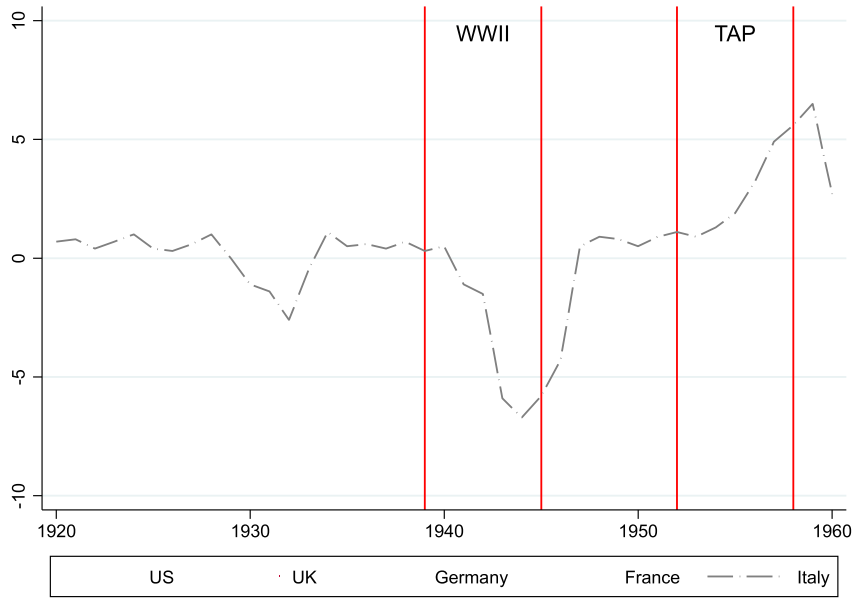

FIGURE 1 Productivity Gap between US and European Firms between 1920 and 1950. TFP growth rate in the US and five European Countries between 1920 and 1960. The first two red lines correspond to WWII (1939–1945). The second two red lines correspond to the Productivity Program (1952–1958). *Source:* Author's calculation based on US Bureau of Labor Studies, 1992.

managers at US firms to learn how to reorganize industrial plants, production methods, and management, to lower costs, raise quality, increase production volume, and design a product and distribution system aimed at mass markets. Between 1952 and 1958, 1500 productivity study tours brought about 24,000 Europeans to the United States, where they observed new concepts of marketing, business organization, and organization of the workplace; new products, designs, and engineering functions; and new equipment. The program cost $300 million dollars (in 2020 figures), amounting to a mere 1.5% of the overall Marshall Plan expenditures (Silberman et al., 1996).

2.1 | Implementation of the productivity program

In order to assess the impact of the Productivity Program on Western European economies, it is crucial to understand how it was implemented. First of all, European governments' full support to the national "productivity drives". Except for brief resistance in the UK when the program was first proposed, all Western European participants launched their national productivity drives with great enthusiasm and commitment. Each country set up a national productivity commission composed of top representatives of government, business, and labor. Members of the commissions were selected locally for their awareness of the productivity gap between the United States and their country, and for their understanding of their country's need for restructuring for productivity. The staff of both national and regional productivity centers included local managers, economists, statisticians, and engineers, with varied backgrounds in manufacturing, engineering, agriculture, business, office administration, training, and public relations. The United States administered its side of the program through small staffs in Paris and Washington. Therefore, close cooperation but also the adaptation of US business models to local needs was a key factor in the implementation of the Productivity Program.

On the ground, the study tours (also known as productivity teams) were numerous enough to achieve a critical mass in each country. The study tours, also known as productivity teams, were composed of 15 to 20 managers from different countries and different plants within a narrowly defined industrial sector. Many of the study tours were preceded by an orientation period, lasting about a week, during which the team members could get to know and work with one another and learn basic English. The study tours lasted from 4 to 6 weeks. Managers visited plants chosen to have product lines similar to those that could be sold in Europe, and a scale of operation and level of managerial that European plants could reach in 10 years. A typical week consisted of three working days of plant visits; 3 days of writing reports and traveling; and one free day. The project manager accompanied the tour, along with a secretary and an interpreter. US companies showed the tour members their current technology and management methods, although sometimes not their latest developments. After the tour, each team prepared a comprehensive technical report, covering plant layout, process flow, materials handling, output per workstation, machine downtime, and product design, together with photographs, blueprints, drawings, plant documentation, process flow diagrams, training films, and statistics on plant operations and output.

In the US European managers were taught modern management practices, based on the Training Within Industry (TWI) method, developed in the US during WWII (Dinero, 2005). More specifically, between 1940 and 1945, the U.S. government sponsored free in-plant management training for war contractors, and U.S. firms involved in war production. It encompassed interventions in a "bundle of managerial practices" called J-modules (Dooley, 1945). The Job-Instructions (J-I) module taught supervisors and managers how to establish standard

procedures for operations, the Job-Relations (J-R) module how to manage and motivate workers, and the Job-Methods (J-M) module how to introduce improvements to current production processes. The TWI substantially increased the productivity and profitability of war contractors (Bianchi & Giorcelli, 2022).

The Productivity Program's main focus was management training, but the United States also introduced a loan program to help firms renew their capital stock. These loans were restricted to the purchase of technologically advanced machines produced in the United States (ICA, 1958) and not sold in Europe. US machines were more productive than European ones. For example, in the beverage industry, US bottle-washing machines were able to wash and sterilize up to 200 bottles per minute. European machines took 3 min to wash 50 bottles and did not provide sterilization (Dunning, 1998). Similarly, in US steel manufacturing, the roof temperature of an open-hearth furnace was controlled by an electronic potentiometer, which increased roof life four-to-five-fold (Dunning, 1998).

Another key feature of the Productivity Program was that participating countries received a wide range of follow-up technical services, including loans at favorable interest rates, substantial grants for education, training, and economic and engineering research at universities and research institutes, as well as digests of US technical information on productivity, intended for middle management, supervisors, and workers, who normally lacked university training. US experts visited European firms that participated in the study trips offering technical assistance up to 3 years after the end of the program.

3 | EVALUATING THE IMPACT OF MARSHALL PLAN PRODUCTIVITY ASSISTANCE ON EUROPEAN PARTICIPATING FIRMS

According to the reports compiled after the end of the study trips, the results of the Productivity Program "were immediate and dramatic" (Silbermann et al., 1996). Within a year of the return of a study tour, a significant number of firms typically registered productivity increases of 25%, with virtually no increase in fixed assets. More specifically, a comprehensive report of 1958 by the French *Commissariat General a la Productivite* described substantial increases in productivity on the return of study tours from 1% annually between 1946 and 1951 to 5%–6% between 1952 and 1958. The report further argued that "the productivity program in France has become a major tool in efforts to achieve a viable economy in France". In 1957, after evaluating a series of economic studies and industrial surveys, the Commissariat predicted that continued progress in the productivity program and in the modernization of machines and methods could lead to a 100% increase in the French standard of living within 12 or 15 years."

Reports compiled in Germany stated that "the technical assistance elements provided a form of help which could create lasting conditions to enable the national economy to proceed entirely under its own powers without continued economic aid from abroad. The granting of merely economic help would probably have been accompanied by considerable risks, so technical assistance was its necessary complement". Italian reports outlined how "the technical assistance program has been the most efficient method of American help in proportion to the yield it has raised in the field of increasing productivity. In this way, indeed, it probably exceeds in importance the direct economic assistance we received."

The results described in the reports are consistent with data on productivity growth rates (Figure 1). Between 1948 and 1952, European productivity grew on average by 0.85% per year,

while the US one by 2.6%. However, between 1952 and 1958, European productivity jumped to an average growth of 3% per year, with peaks of annual growth 7.3%, while the US one only at 2.5% (Figure 1).

While this evidence suggests a strong correlation between participation in the Productivity Program and European productivity growth, it presents two major empirical forthcomings. First, it is hard to estimate the contribution of the Productivity Program to aggregate productivity growth, as many other factors, including war recovery influence the latter. Second, the absence of a carefully designed evaluation at the time, with representative comparison groups, prevents from calculating to what extent the program contributed to closing the gap between US and European firms. In the rest of the paper, I propose an empirical framework to solve this issue, focusing on U.S. and Italian firms.

4 | THE ITALIAN CASE

4.1 | The productivity program in Italy

In Italy, 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 (Giorcelli, 2019). The pilot program would be run in five regions, labeled pilot regions: Lombardia, Veneto, Toscana, Campania, and Sicilia (Figure 2a). The US observers

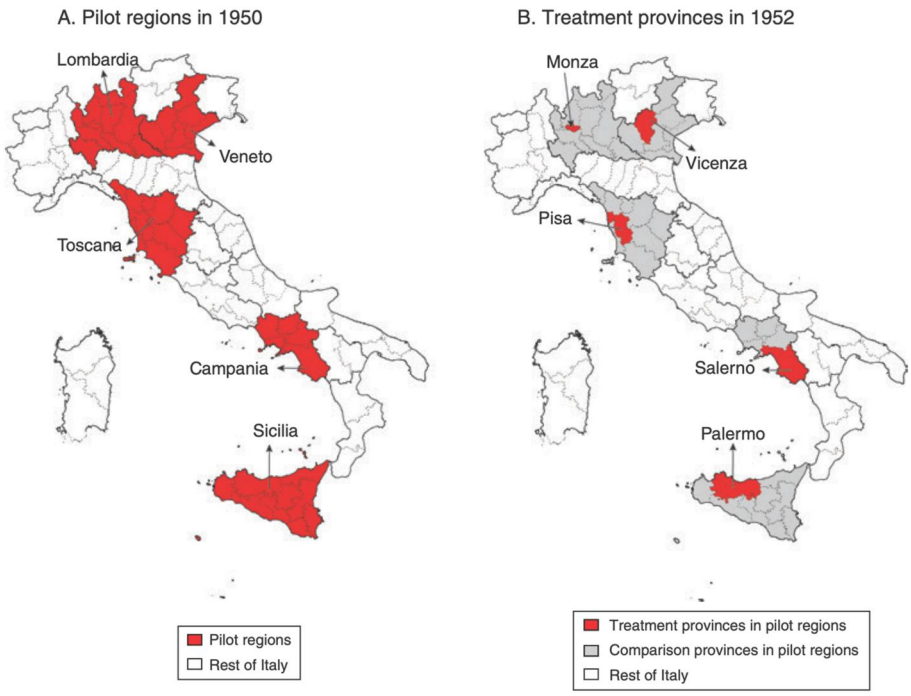

FIGURE 2 Pilot Regions and Treatment Provinces Selected for the Productivity Program, 1950–1952. Pilot regions chosen for the pilot phase of the Productivity Program in 1950 Panel (a) and treatment provinces selected after the US budget cut in 1952 Panel (b). Only firms located in treatment provinces eventually received US transfers, conditional on having applied for the program. *Source*: Giorcelli (2019).

chose each pilot region to be representative of an Italian macroarea: northwest, northeast, center, south, and islands (CNP, 1960). Firms had to meet four criteria to be eligible to participate in the pilot program. From 1949 to 1951, they had to (i) be located in one of the five pilot regions, (ii) operate in the manufacturing sector, (iii) have between 10 and 250 employees, and (iv) compile a balance sheet (required by Italian law for all firms with at least 2010 $150,000 in annual revenues). Eligible firms had to submit an application between January and June 1951 (ICA, 1958), indicating whether they wanted to send their managers to US firms, to purchase new US machines, or to do both. Out of 6065 eligible firms, 3624 applied for US assistance. Applications were reviewed by a committee composed of Italian and US specialists; fewer than 1% were rejected (ICA, 1958).

However, on December 12, 1951, after all firm applications had been submitted and reviewed, the United States cut the budget for the pilot phase. The main motivation for the cut was the deepening of US involvement in the Korean War, which reduced money available for the Productivity Program (Chillè, 1993). When applying for the program, firms were unaware of a potential future budget cut. As a result, the United States reduced the scope of the program from the regional to the provincial level and implemented it in only five provinces: one in each of the original pilot regions (Figure 2b).

Even after the budget cut, the goal of the pilot phase remained to test the program's effectiveness before the nationwide implementation. Therefore, US observers selected provinces that were representative of each pilot region. These provinces "[had] the average economic characteristics of the pilot region where they were located. They were not the most or the least developed areas" (CNP, 1960). For instance, in the pilot region of Veneto, the province of Vicenza was selected because "its structure reproduces Veneto's structure very well" (Bianchi, 1993). The five selected provinces were Monza for Lombardia, 6 Vicenza for Veneto, Pisa for Toscana, Salerno for Campania, and Palermo for Sicilia (Figure 2b). Ultimately, the Productivity Program was never expanded.

The decision to aim the Productivity Program at small and medium-sized firms was motivated by the fact that they got no other aid via the Marshall Plan (Boel, 2003). Moreover, no other public programs were implemented by either the US or the Italian government, for which such firms were eligible at that time (Bianchi & Giorcelli, 2020; Boel, 2003; Fauri, 2010).

All firms that participated in the Productivity Program were subject to a three-year monitoring period by US experts, who periodically visited them, consulted with them on carrying out the program, and observed whether the new management practices were in use (ICA, 1958).

4.2 | Data

In this section, I document the data collection process and describe the data collected.

4.2.1 | Data on Italian firms

The first step of the data collection aimed at retrieving the list of Italian companies eligible to apply for the Productivity Program. Giorcelli (2019) identified eligible firms through firm registries stored at the Historical Archive of Confindustria. For each eligible company, balance sheets from 1946 to 1973 were collected and digitized. Next, applications submitted by eligible firms in 1951 have been collected from two historical archives: the Italian Central Archives of

the State (ACS) for firms that applied for management transfers and the Historical Archive of the Istituto Mobiliare Italiano (ASIMI) for firms that applied for technology transfers.

The analysis of this data indicates that out of 6065 eligible firms, 3624 (59.8%) applied for the Productivity Program. 809 of such firms (13.3%) applied to receive the managerial transfer and 1625 (26.8%) to receive both the managerial transfer and technology transfer from the US. However, due to the budget cut, only 146 firms in experimental provinces received the managerial transfer, and 386 both the managerial and technology transfers.

Firms that received either the managerial or the managerial and technology transfers were, on average, multi-plant businesses, employing 53.2 workers, and in operation since 1937. They had on average 1 million USD in annual sales, a total factor productivity of 2.69, and a ROA of 3% (Table 1, Panel A, column 1). They were all operating in the manufacturing industry and almost all were family-owned.

4.2.2 | Data on US firms

I next identified the population of US firms that hosted Italian firms during the years of the Productivity Program. Specifically, for each applicant firm that eventually sent its managers to

TABLE 1 Summary statistics.

	Mean	St. Dev.	Min	Max
Panel A: Italian firms that sent managers in the US				
Plants	1.44	0.33	1	5
Employees	53.21	21.72	15	250
Foundation year	1937	3.38	1931	1942
Sales	1.04	0.71	0.21	7.42
TFP	2.69	0.45	1.99	3.68
ROA	0.03	0.02	0.01	0.07
Observations	532	532	532	532
Panel B: US firms that hosted Italian managers				
Plants	2.61	0.73	1	4
Employees	118.26	8.90	65	170
Foundation year	1923	2.03	1916	1930
Sales	10.05	3.41	8.95	24.15
TFP	4.09	0.37	3.30	4.74
ROA	0.07	0.01	0.05	0.09
N	2638	2638	2638	2638

Note: Summary statistics in 1951 for 523 Italian firms (Panel A) that sent their managers to the US and 2638 US firms that hosted Italian managers (Panel B). *Plants* is firm number of plants; *Employees* is total number of employees; *Foundation Year* is the average year of firm foundation; *Sales* are firm annual sales expressed in 2020 dollars; *TFP* is TFP is the log of total factor productivity revenue, estimated using the method proposed by Gandhi et al. (2020); *ROA* is returns on assets, measured as profits over total assets. Data are provided by the Italian Central Archives of the State in Panel A and from the US NARA archives in Panel B.

the US, the Italian Central Archives of the State (ACS) also provides additional information on the US firms that such managers visited as well as technical reports compiled by the US experts who visited these companies for 3 years after the study trips.

After retrieving the list of such plants, I collected data on their performance between 1946 and 1960 from the annual surveys conducted by the Productivity Program Agency, stored at US National Archives (NARA). For each hosting firm, data on sales, employment, number of plants, assets, and profits have been collected and digitized.

This data, used for the first time in the current paper, indicates that between 1952 and 1958, 2638 US firms hosted Italian managers. In 1951, the year before the start of the Productivity Program, such factories had on average 2.6 plants, 138.26 employees, and sales of 10 million dollars (in 2020 figures), as shown in Table 1, Panel B, column 1.

A comparison between Italian and US firms shows that the former was substantially smaller in size and had lower sales. Moreover, differences in productivity and profitability were striking. US firms were 52% more productive than Italian ones, and twice more profitable. The productivity distribution of US and Italian firms indicates that not only the average productivity of Italian firms was lower than that of the US counterpart, but also that the left tail of Italian firms' distribution is heavier than that of US companies (Figure 3a,b). This fact shows that a higher fraction of Italian firms was characterized by low productivity levels.

Since US firms chosen to host the Italian counterpart operated in the same industries and had a scale of operation that the Italian companies could reach in 10 years, it is interesting to study whether the Productivity Program reduced their performance gap.

4.3 | Empirical specification

To study to what extent the Productivity Program helped Italian firms to catch up with the US ones, I estimate the following event study difference-in-differences regression:

$$outcome_{it} = \beta\, Productivity\ Program_{it} \cdot Post_t + \varphi_{s \cdot t} + \varepsilon_{it} \quad (1)$$

where $outcome_{it}$ is one of the key performance outcomes of productivity, employment and profitability of US and Italian firms from 5 years before to 10 years after the Productivity Program; $Productivity\ Program_{it}$ is an indicator for Italian firms that participated into the Productivity Program; $Post_t$ is an indicator for years after the Productivity Program participation; $\varphi_{s \cdot t}$ are sector-year fixed effects; δ_t are year fixed effects; and ε_{it} is the error term. The coefficient of interest β estimates the difference in performance between Italian and US firms. Since US firms that hosted Italian companies were not randomly selected, these results should be interpreted as correlations.

4.4 | Estimation results

The results of estimating Equation (1) indicate that the Productivity Program helped Italian firms that sent their managers to the US close the gap with American hosting companies. In the 5 years before the start of the Productivity Program, Italian firms were losing ground relative to their US counterparts. However, since the first year after the start of the program, Italian firms started closing the gap with US companies. In the 10 years after the program, the productivity of Italian

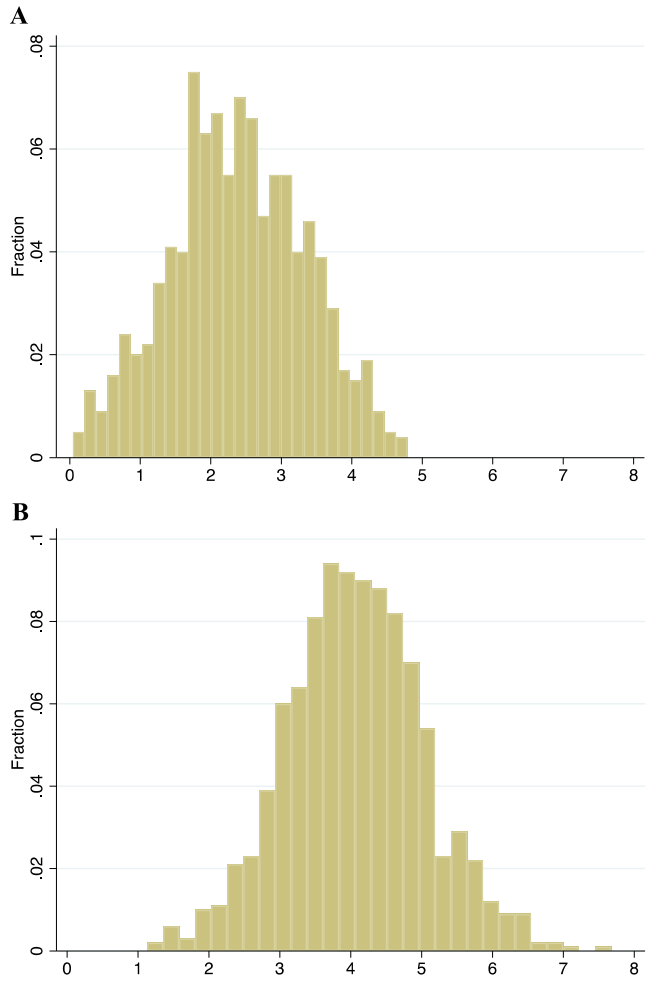

FIGURE 3 Distribution of Italian and US Firms Productivity in 1951. Panel (a) Italian Firms that Sent Managers in the US. Panel (b) US Firms that Hosted Italian Managers. Productivity is logged TFPR computed with the Gandhi et al. (2020)'s method.

firms grew 7.8% more than that of US firms (Figure 2 and Table 2, column 1).[1] A similar pattern is observed for employment and for profitability. Employment of Italian firms grew 6.1% and return-on-assets by 6.8% more per year, relative to US companies (Table 2, columns 2 and 3).

I next investigate to what extent participating in the Productivity Program changed the productivity distribution of Italian firms. In 1951, the year before the start of the Productivity Program the productivity distribution shows a heavy left tail (Figure 4a). This means that a fairly high percentage of firms were characterized by low productivity. By contrast, in 1960, after the end of the program, not only did the entire distribution move to the right, but the left tail became much thinner, while the right tail became heavier. Moreover, the distribution of productivity of Italian firms became more similar to that of US firms, further confirming a productivity convergence. These results are consistent with Bloom and Van Reenen (2007) who

[1]Table 4 shows that productivity estimates are robust to the use of alternative calculation methods.

TABLE 2 The effects of the productivity program on performance gap of US and Italian firms.

	Productivity (1)	Employment (2)	Profitability (3)
Productivity program × post	0.075***	0.059***	0.066***
	(0.025)	(0.019)	(0.018)
Observations	7980	7980	7980

Note: *Productivity* is measured by TFPR computed with the Gandhi et al. (2020)'s method. *Employment* is firm total number of employees. *Profitability* is measured by ROA, computed as the ratio between profits and assets. The sample includes 523 Italian firms that participated in the Productivity Program between 1952 and 1958 and 2638 US firms that hosted them.

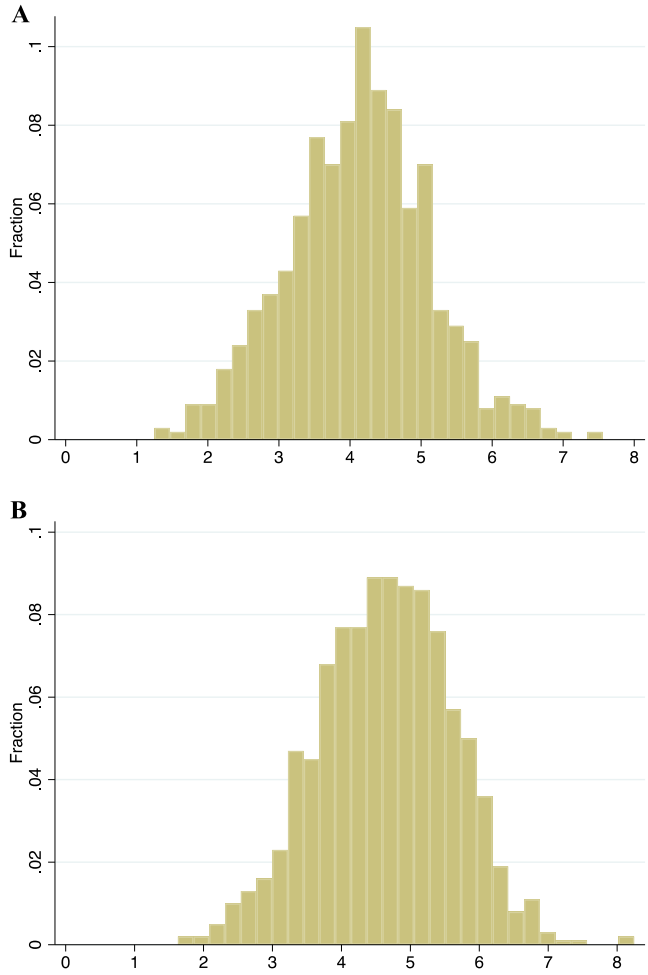

FIGURE 4 Distribution of Italian and US Firms Productivity in 1960. Panel (a) Italian Firms that Sent Managers in the US. Panel (b) US Firms that Hosted Italian Managers. Productivity is logged TFPR computed with the Gandhi et al. (2020)'s method.

show that a key difference in productivity across countries comes from a high number of low-productivity firms in developing countries and a large number of high-productivity firms in the most developed countries (Figure 5).

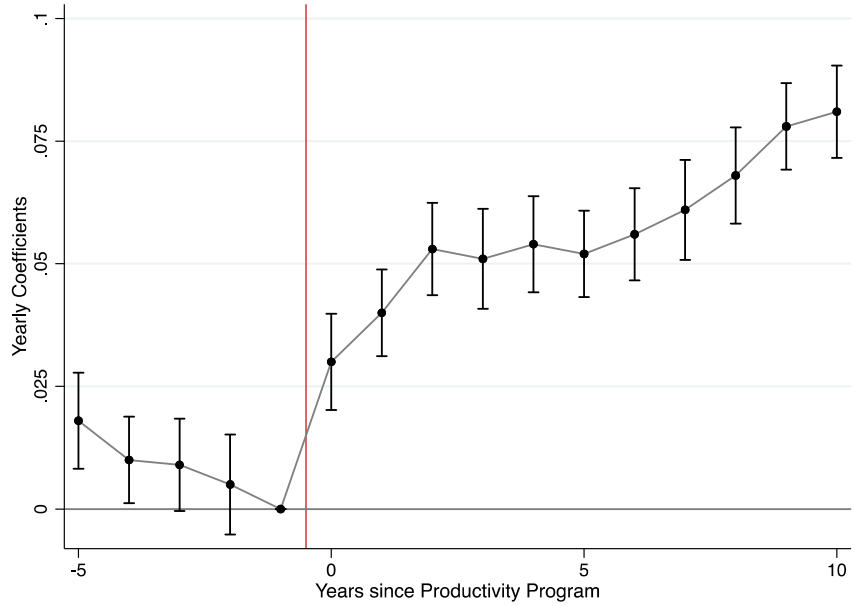

FIGURE 5 The Effects of the Productivity Program in Reducing Performance Gap between US and Italian Firms. Productivity is measured by logged TFPR, estimated with the Gandhi et al. (2020)'s method. The sample includes Italian firms that participated to the Productivity Program between 1952 and 1958 and US firms that hosted them.

4.5 | Robustness checks

4.5.1 | Matching estimation

US and Italian firms were very different in terms of characteristics and outcomes at the baseline, as shown in Table 1. Moreover, since the allocation of Italian firms to US hosts was not random, these findings do not have a causal interpretation.

It is therefore possible that some of the results are driven by such differences rather than by the Productivity Program. First, it is worth noting that if this was the case, we should expect US firms to grow more than Italian firms, since they were larger in size and more productive. However, to deal with this potential issue, I also use an inverse probability of treatment weighting (IPTW) method. More specifically, I first compute the firm propensity score given the following covariates: sales, assets, and sector. Second, I re-weight each observation by the inverse of its propensity score to create a synthetic sample in which the distribution of these covariates is the same across US and Italian firms. On this synthetic sample, I estimate Equation (1). The results appear even larger in magnitude than those estimated in the baseline, confirming the key role of the productivity program in closing the gap with the US (Table 3).

4.5.2 | Triple difference

Another potential issue in interpreting these findings is that Italian firms, damaged by WWII, were reverting to the pre-war mean. To address this issue, I propose a triple difference estimator, in which I use a third difference in the performance of Italian firms that applied but did

TABLE 3 The effects of the productivity program on performance gap of US and Italian firms – matching estimates.

	Productivity (1)	Employment (2)	Profitability (3)
Productivity program × post	0.081***	0.063***	0.072***
	(0.026)	(0.020)	(0.022)
Observations	3918	3918	3918

Note: *Productivity* is measured by TFPR computed with the Gandhi et al. (2020)'s method. Employment is firm total number of employees. Profitability is measured by ROA, computed as the ratio between profits and assets. The sample includes 523 Italian firms that participated in the Productivity Program between 1952 and 1958 and 2638 US firms that hosted them.

TABLE 4 Robustness checks on productivity estimation.

	ACF (1)	LP (2)	OP (3)
Productivity program × post	0.075***	0.072***	0.078***
	(0.025)	(0.016)	(0.021)
Observations	7980	7980	7980

Note: *Productivity* TFP is computed using methodologies by Ackerberg et al. (2015, ACF, column 1), Levinsohn and Petrin (2003, LP, column 2), and Olley and Pakes (1996, OP, column 3). The sample includes 523 Italian firms that participated in the Productivity Program between 1952 and 1958 and 2638 US firms that hosted them.

not receive the Productivity Program management training. These findings are virtually identical to the baseline specification, suggesting that the results are driven by the Productivity Program and not by the recovery of the Italian economy (Table 4).

5 | CONCLUSIONS

This paper studies to what extent the Productivity Program, sponsored by the US between 1952 and 1958, contributed to close the productivity gap between US and Italian firms. Using data on the Italian companies that sent their managers to the US and on the American companies that hosted them, it shows that the diffusion of the American Way of doing management reduced the productivity gap by 7.8% per year between 1952 and 1958.

Evidence from economic history suggests that management practices may have positive effects within and across countries. Within countries, the adoption of managerial practices may have large and long-lasting effects on firm productivity, which contributes to explaining the huge productivity spreads among firms operating in the same country or even in the same sector. Across countries, management practices appear easily transferable to different contexts, historical periods, and firm size, and contribute to reducing the performance gap of firms operating in different states.

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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