The Long-Term Effects of Management and Technology Transfer: Evidence from the US Productivity Program*

Job Market Paper

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Michela Giorcelli, Stanford University

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Abstract

This paper uses a unique historical episode to assess the long-run effects of management and technology transfer on firm performance. During the 1950s, as part of the Marshall Plan, the US administration sponsored management-training trips for European managers to US firms and granted state-of-the-art machines to European firms. I use newly-assembled data on the population of Italian firms eligible to participate in this program, tracked over a twenty-year period. By exploiting an unexpected cut in the US budget, I compare firms that eventually participated in the program with firms that were initially eligible to participate, but were excluded after the budget cut. I find that management transfer significantly increased Italian firms' survivorship, sales, employment and productivity. These positive effects persisted for at least fifteen years after the program, a finding that can be explained by the increased investment rates, capital-to-labor ratio, more educated managers' hires, and employees training expenditures in such firms. Companies that received new machines also improved their performance, but the effects were short-lived.

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Empirical research has documented large and persistent differences in performance among firms and establishments, even within narrowly defined industries.[1] These productivity differences are strongly correlated with firm management practices[2] and technological level.[3] Randomized control trials (RTCs) have shown that better management practices have a causal impact on firm performance and organization (e.g. Bloom et al. (2013); Bruhn et al. (2013); Ichniowski et al. (1997)). Similarly, the access to new technologies embodied in intermediate or capital goods increases firm-level productivity (Goldberg et al. (2009); Pavcnik (2002)). However, whether these effects persist in the long run is an open question.

To examine the long-run effects of management practices and new technologies on firm performance, I study a unique historical episode, the US Productivity Program. During the 1950s, as part of the Marshall Plan, the US administration sponsored training trips for European managers to learn modern management practices at US firms (Silberman et al. (1996)) and granted state-of-the-art machines to European firms (Dunning (1998)).[4] Specifically, in the context of Italy, small and medium-sized manufacturing firms from five geographic regions were eligible to apply for this program and could choose whether to send their managers to study trips (hereafter, management transfer) and/or receive US machines (hereafter, technology transfer).[5] However, in 1952, when the program was about to start, the US unexpectedly cut the budget and only firms from five smaller Italian provinces - within each region originally selected - eventually participated in the program (Figure 2). As a result, some firms received the transfer they chose and some did not, based on their geographic location.

[1] Syverson (2004) finds an average 2:1 ratio between the 90th percentile and the 10th percentile of the total factor productivity distribution within four-digit SIC industries in the U.S. manufacturing sector. The productivity spread is even larger in other countries. For instance, Hsieh and Klenow (2009) find an average 5:1 ratio in China and India. Moreover, the productivity differences are highly persistent over time. Foster et al. (2008) document a producer-level annual productivity autocorrelation of 0.8.

[2] Researchers have long proposed that management practices and managers drive productivity differences (Womack et al. (1990); Walker (1887)). More recently, extensive surveys in Bloom and Van Reenen (2007) have documented a strong association between management practices and firm productivity and profitability, while Locke et al. (2007) have shown that better management practices are associated with improved worker treatment. Looking at managers instead of management practices, Bertrand and Schoar (2003) have found that manager fixed effects matter for a range of corporate decisions.

[3] The existing literature suggests that firm technology differences are correlated with their performance. For instance, Doms et al. (1997) find a positive relationship between the adoption of new automation technologies and plant-level productivity, wages, occupational mix, and workforce education.

[4] The management practices taught to visiting managers were based on the Training Within Industry (TWI) method, and included factory operations, production planning, human resources training and management, and marketing (Silberman et al. (1996)). The US machines that firms could purchase under the Productivity Program had more modern technology than that used in Europe and were able to produce the same amount of output in less than half time (Dunning (1998)).

[5] Firms eligible to apply for the Productivity Program had to meet four criteria: 1) to be located in one of the five Italian regions, as shown in Figure 2, Panel A; 2) to operate in manufacturing sector; 3) to have between 10 and 250 employees; 4) to compile a balance sheet (ICA (1958)).

To analyze the impact of the management and the technology transfers on firm outcomes, I use newly-assembled panel data, collected from numerous historical archives, on the population of Italian firms eligible to apply for the Productivity Program. For each eligible firm, I collected and digitized balance sheets from 1946 to 1973 that I linked to the Productivity Program applications' records. On average, such firms had 48 employees, assets of \$ 1.6 million and sales of \$ 1 million[6] and had been in operation for 12 years.

The identification strategy relies on the budget cut. I compare survivorship, employment and productivity of firms that applied for and eventually received either the management or the technology transfer with those of firms that applied for the same transfer, but were excluded from the program due to the budget cut. To capture the long-run effects of the transfers I follow firms up to 15 years after the start of the Productivity Program. I provide evidence that before the budget cut firms that eventually participated in the program were very similar in their observable characteristics to firms that were excluded and had the same pre-program levels and trends in employment, assets, sales, and productivity.

I find three key results. First, using a survival analysis framework, I document that firms that participated in the Productivity Program were 20 percentage points more likely to survive than firms that applied for the program but were excluded due to the budget cut. Second, using a difference-in-differences approach, I show that the management transfer led to a significant increase in sales and employment that persisted for at least 15 years after the program. I estimate that within the first year productivity increased by 16.5 percent and continued to grow, reaching a cumulative impact of 52.3 percent after 15 years. I explain these findings by documenting that better-managed companies increased their investment rates by 43.5 percent and their capital-to-labor ratio by 24.4 percent in the 15 years after the US intervention. Moreover, they were 29.1 percent more likely to hire managers with a college degree and increased the share of expenditures in employment training by 38.6 percent. Third, firms that received the technology transfer also increased their sales and employment, but the effects were short-lived. Productivity gradually rose by 8.7 percent within 5 years and by 19.8 percent within 10 years, but there was no additional increase 10 years after the US intervention.

The effects of the Productivity Program on firms that received both the management and the technology transfers were significantly larger than the sum of the impact on firms that received only the management or the technology transfer. This provides suggestive evidence of complementarity between management and technology. To make this comparison, while controlling for differences among firms that applied for the different US

[6] These values are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1.

transfers, I use a "nearest-neighbor" matching estimator. First, I match each firm that applied and received a given transfer with a "nearest-neighbor" firm that applied for the same transfer, but did not receive it. Second, for each firm-pair in the management-transfer sample, I find one "nearest-neighbor" pair in the technology-transfer sample and one in the both-transfer sample.

Examining the heterogeneous effects of the Productivity Program, the management transfer had a comparable impact on firms operating in different manufacturing industries. Moreover, while the largest firms benefited the most from the transfer, the smallest firms improved their performance more than firms in the middle of the size distribution. If relatively smaller firms were more credit constrained, this finding suggests that the injection of modern management practices might have relaxed such constraints. Among firms that received the technology transfer, the Productivity Program had a larger impact on companies operating in textile, machinery and chemicals industries. Finally, the effects of the technology transfer were larger for smaller firms.

The Productivity Program might have also generated general equilibrium effects. On the one hand, firms that did not receive the US transfers might have decided to adopt new management practices or new machines after observing their positive effects on receiving firm outcomes. On the other hand, information constraints might have prevented this adoption process. The program could have also generated negative spillovers. For instance, receiving firms might have captured market shares from non-receiving firms. To examine these effects, I compare firms that did not apply for the Productivity Program in selected and excluded provinces. I do not find significant differences in survivorship, size, and productivity between these two groups of firms. I also estimate whether spillover effects had an impact on non-receiving firms operating in the same sector of receiving firms. Firms closer to receiving firms had lower sales and productivity, but this effect is small and insignificant. The result is probably due to the fact that these firms, albeit relatively small, had a nation-wide product market as they mostly produced tradable goods.

I next analyze three potential channels through which the Productivity Program might have affected firm performance in the long run. These channels are: prices and market power, exports, and capital intensity and skills of labor force. I first examine whether the long-run effects could be explained by variation in prices and market power of receiving firms. Since the balance sheets do not provide price information, I estimate the firm-level markups using the method pioneered by De Loecker and Warzynski (2012). I find that after controlling for firm-level markups the estimates of the Productivity Program effects are smaller in magnitude than in the baseline model, but they follow the same pattern over time. Second, I analyze whether the Productivity Program affected firm exports.

I document that the probability of exporting increased for firms that received management transfer, however, restricting the sample to only firms that did not start exporting after the US intervention leads to smaller, but qualitatively equivalent results. Lastly, I study whether Productivity Program indirectly affected the use of production inputs such as physical capital and labor. In the long run, firms that received the management transfer had significantly higher investment rates and became more profitable and capital-intensive. By contrast, investment rate and capital-to-labor ratio of firms that received the technology transfer went up upon receiving the US machines, but there is no evidence of an additional increase. Moreover, firms that received the management transfer were 29.1 percent more likely to hire managers with a college degree, invested an increasing higher share of the expenditures on employment training and paid higher wages. I do not find evidence of such changes on firms that received the technology transfer.

Finally, I examine possible threats to my identification strategy. If firms that eventually received the Productivity Program had been randomly selected, I could simply compare receiving firms and non-receiving firms that applied for the same US transfer in the post-Productivity Program period. The estimates obtained excluding the pre-program period are remarkably similar to the difference-in-differences coefficients, which suggests that the budget cut was plausibly exogenous. Moreover, the differential survival probabilities between receiving and non-receiving firms may downward bias my estimates if better firms that did not receive the Productivity Program were more likely to survive. To take into account the different survival rates, I use the bounding approach proposed by Lee (2002) to construct upper and lower bounds for the Productivity Program effects. Although the bounds are fairly large, they confirm the pattern of the main results. To conclude, I evaluate whether the self-reported nature of the balance sheets or the Hawthorne effects (the possibility that just being part of the Productivity Program determined an improvement in firm performance) are a concern for the validity of the results. Looking at the technical reports compiled by US experts that visited receiving firms after the program, I provide anecdotal evidence that the short-run results were driven by changes in the production practices. Moreover, these effects are likely to dissipate over time, so they should have limited effect on the long-run results.

The contribution of this paper is three-fold. First, the idea that management is correlated with the productivity of inputs goes back to Walker (1887) and is central in many other works (e.g., Mundlak (1961); Leibenstein (1966); Lucas (1978)). While it is well known that management practices and managers are positively associated with firm performance (Bertrand and Schoar (2003); Bloom and Van Reenen (2007)), recent RCTs provide causal evidence that management consulting leads to better firm outcomes (Bloom et al. (2013); Bruhn et al. (2013)). This paper contributes to this literature by examining the extent to which the international transfer of "managerial capital", distinct from human capital and considered a key form of missing capital in today's developing countries (Bruhn et al. (2010)), affects firm outcomes in the long-run. Moreover, it examines whether "managerial capital" is complementary with physical capital. The findings of this paper might have policy implications, as business training becomes a more widespread form of active support for small and medium-sized firms in developing countries (Mckenzie and Woodruff (2012)). In 1951, the Italian GDP per capita was almost the same of that of China and Peru in 2010 and its growth rate between 1951 and 1955 was similar to that of India and other East Asian and Pacific developing countries between 2010 and 2014.[7] Thus, Italy after WWII was comparable to some developing countries today. Likewise, the conditions of Italian firms during the 1950s were similar to those of firms in developing countries today. For example, a 1949 report to the US Bureau of Labor Statistics stated that "[Italian] plants are not well-organized and often work areas, lighting, and ventilation are not adequate. There is no thorough maintenance of machines, equipment and tools, which results in frequent breakdown and work interruptions. [...] Modern marketing strategies are undeveloped, and distribution channels are old-fashioned".[8]

Second, this paper contributes to the large literature analyzing the role of technology in explaining productivity differences. For instance, Doms et al. (1997) and Haltiwanger et al. (1999) document significant technology differences across plants within narrow sectors. Furthermore, the import of capital goods that embody new technology is considered one channel through which technology diffuses (Coe and Helpman (1995); Coe et al. (1997)). My research offers evidence of the causal impact of new capital goods on firm-level performance. Moreover, while the literature on technology spillovers mainly focus on the role of multinationals, this paper examines spillovers in a context of small and medium-sized firms.

Finally, this paper contributes to debate about the role of the Marshall Plan on European recovery after WWII. A large body of research in past decades has focused on the macroeconomic effects of the plan (Mayne (1970); Milward (1984); De Long and Eichengreen (1991); Eichengreen et al. (1992)), without reaching a consensus about the relevance of its impact on European economies. This work is, to the best of my knowledge, the

[7] GDP per capita in Italy in 1951 was 2010 USD 4,813 (Felice and Vecchi (2015)), in China and Peru in 2010 it was, respectively, 2010 USD 4,514 and 2010 USD 5,056. Between 1951 and 1955, Italian GDP per capita grew at a yearly rate of 6.5 percent; between 2010 and 2014, India GDP per capita grew at 6.1 percent and that of other East Asian and Pacific developing countries 6.9 percent per year (Source: http://data.worldbank.org/indicator, accessed on April 5, 2015).

[8] Quote from the "Productivity Survey of Italian Firms", commissioned by the US Bureau of Labor Statistics and compiled on August, 24 1949 (stored at Archivio Storico dello Stato (Rome-Italy), fondo CIR, busta 21, accessed on December 21, 2013).

first that uses firm-level data on a large scale to study one of the programs implemented under the Marshall Plan.[9] The contribution is a micro-level analysis of the Plan's effects and the extent to which it differs from the macro-level impact.

The rest of the paper is structured as follows. Section 1 described the Marshall Plan and the Productivity Program in Italy. Section 2 describes the data. Section 3 presents the empirical framework and discusses the identification strategy. Section 4 examines the effects of the Productivity Program on firm performance. Section 5 analyzes the mechanisms. Section 6 presents robustness checks. Section 7 concludes.

1 The Marshall Plan and the Productivity Program

The Marshall Plan, officially known as the European Recovery Program (E.R.P.), was an economic and financial aid program, sponsored by the US, which focused on helping Western and Southern European countries recover from World War II.[10] Between 1948 and 1951, it transferred approximately $ 130 billion to Europe (Eichengreen et al. (1992)),[11] with the goals of rebuilding war-devastated regions, removing trade barriers, and preventing the spread of communism (Hogan (1987)). Although the Plan had some common aspects across all of Europe, it assumed different characteristics in each country. In the rest of this section, I focus on Italy.

WWII in Italy officially ended on April 25, 1945 (Fauri (2006)). After 5 years of war, per capita GDP was 38 percent lower than in 1938, and the industrial production represented 34 percent of GDP in 1938 (Lombardo (2000)). The main obstacle to Italian industrial output growth was not the destruction of the industrial capacity, but rather damage to the infrastructure (Eichengreen et al. (1992)). Recent estimates suggest that little more than 10 percent of Italian industrial capacity had been destroyed by fighting and bombing (Zamagni (1997)).[12] By contrast, 70 percent of the roads had been damaged and 45 percent of the railroad system was no longer usable (Fauri (2006)). This situation created difficulties in obtaining raw materials and distributing goods and food (Eichengreen et al. (1992) and Fauri (2006)). Between April 1948 and December 1951, Italy received around $ 1,348.40 million[13] from the US under the E.R.P. (Fauri (2006), p.80). Given the widespread destruction, 90 percent of the aid was used by the government to

[9] The only exceptions are case studies for large firms. For instance, Lavista (2005) examines the firm Necchi in Italy and Yamazaki (2013a) study the Siemens in Germany.

[10] Officially announced by the US Secretary of State George C. Marshall on June 5, 1947, the Marshall Plan was in operation from 1948 to the end of the 1950s in 17 countries: Austria, Belgium and Luxembourg, Denmark, France, West Germany, Greece, Iceland, Ireland, Italy and Trieste, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, and United Kingdom.

[11] These values are in 2010 USD.

[12] Previous work by Grindrod (1955) indicates a 20 percent loss in Italian industrial capacity.

[13] These values are in 2010 USD.

repair infrastructure and finance public investment. Only the remaining 10 percent was distributed to firms in the form of loans (Fauri (2006), p.80). In terms of recovery, by 1951 both the GDP per capita and the industrial production had exceeded those of 1938 (Lombardo (2000), p. 25).

During the E.R.P. years, the US experts noted that Italian and, in general, European firms were characterized by lower labor productivity than US firms (ECA (1949)) and argued that this difference was largely due to lack of a "managerial mentality" (Segreto (2002)). In a 1949 report to the US Bureau of Labor Statistics, they stated that

> "Workers are not trained by the firms, and the flow of work and analysis of employees operations are not carefully studied and integrated. [...] The insufficient critical allocation of labor, and the accumulation of numerous small losses in efficiency determine an excess of workers per output, estimated between 50% and 400%. [...] Plants are not well-organized and often work areas, lighting, and ventilation are not adequate. There is less (compared to the US) thorough maintenance of machines, equipment and tools, that result in more frequent breakdown and work interruptions. [...] Modern marketing strategies are undeveloped, and distribution channels are old-fashioned".[14]

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)).[15]

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 small and medium-sized firms (with fewer than 250 employees) and had the goal of improving the productivity of European firms through the transfer of US managerial know-how (Kipping and Bjarnar (2002)). In practice, between 1952 and 1958, the US organized study trips of European managers to US plants, followed by consulting sessions of US experts in European firms. Managers were taught the modern management practices, largely based on the *training within industry* (TWI) method. These practices were: (1) factory operations; (2) production planning; (3) human resources training and management; and (4) marketing (ICA (1958)). Factory operations consisted of regular machinery maintenance and general maintenance of safety conditions within the firm;

[14] Quote from the "Productivity Survey of Italian Firms", commissioned by the US Bureau of Labor Statistics and compiled on August, 24 1949 (stored at Archivio Storico dello Stato (Rome-Italy), fondo CIR, busta 21, accessed on December 21, 2013).

[15] Ewan Clague, the US Bureau of Labor Statistics (BLS) Commissioner, stated that the "productivity levels in the United States were more than twice those in Great Britain, and more than three times that of Belgium, France and other industrial countries of Europe" (Memo from E. Clague to J. W. Gibson, December 27, 1948 (stored at the US National Archives and Records Administration, Washington, DC-USA).

production planning consisted of sales and order control. The human resources training and management required that the employees were trained within the firm and supervised on a regular basis. This allowed for much faster problem solving and constant improvement of the production methods. Finally, the marketing part consisted of market research, product requirements, branding, and design. It also included advertising campaigns, and modernization of the distribution channels.[16]

Although the main focus of the Productivity Program was the management training, the US also introduced a Loan Program. This program was intended to help Italian firms to renew their stock of capital.[17] In practice, the US administration granted loans whose use was restricted to the purchase of specialized machines produced in the US (ICA (1958)).[18] These machines, not yet sold in Europe, were supposed to have more modern technology. For example, in the beverage industry, US bottle-washing machines were able to wash and sterilize up to 200 bottles per minute. The same operation took 3 minutes for 50 bottles with European machines, and did not provide sterilization (Dunning (1998)). Similarly, in steel manufacturing, in the US the roof temperature of an open-hearth furnace was controlled by an electronic potentiometer that increased the roof life by four to five times (Dunning (1998)).

1.1 The Implementation of the Productivity Program

The timeline of the Productivity Program in Italy is illustrated in Figure 1. Originally, the US and Italian authorities intended to roll out the Productivity Program in two phases: a pilot program, and a nation-wide implementation. The pilot program would have been implemented in five regions, labelled *pilot regions*: Lombardia, Veneto, Toscana, Campania, and Sicilia (Figure 2, Panel A).[19] After testing whether the program was effective, it would be extended to the rest of the country.

During the pilot phase, firms had to meet four criteria to be eligible for the program: (1) to be located in one of the five *pilot regions*; (2) to operate in the manufacturing sector;

[16] Compared with the management practices implemented today, the main difference was the lack of content on quality management and lean production, developed by Toyota car factory in the early 70s. However, still today quality control is not included in many training programs headed to small and medium sized firms (Mckenzie and Woodruff (2012)), to which the Productivity Program was aimed.

[17] Since WWII had caused overall modest damage to the industrial capacity (Fauri (2006)), firms were using the same machines, and thus the same technology, in use before the war (ECA (1949)).

[18] The interest rate on these loans was 5.50 percent, compared with a national average interest rate on loans of 9 percent between 1952 and 1958 (Zamagni (1997)), and the repayment horizon was 15 years (ICA (1958)).

[19] The description of the negotiations between the Italian and US representatives in this phase of the program is described in the report "Up-to-date picture of the United States Technical Assistance and Productivity Program in Italy", compiled by W. J. Hoff, the director of the US Technical Assistance Division, on October 10, 1950 (stored at Archivio Storico dello Stato (Rome-Italy), fondo CIR, busta 18, accessed on December 18, 2013).

(3) to have between 10 and 250 employees; (4) to compile a balance sheet.[20] These criteria had to be met for each year between 1949 and 1951. Eligible firms interested in participating in the Productivity Program had to submit an application between January and June 1951 (ICA (1958)). At the time of the application process, eligible firms could choose whether to apply and, if they did, if they wanted to send their managers to the US firms (hereafter, management transfer), get new machines (hereafter, technology transfer), or for both (hereafter, both transfers). Out of 6,065 eligible firms, 3,624 applied to receive some form of US assistance. Firm applications were reviewed by a committee composed of Italian and US specialists and only 30 were rejected (ICA (1958)).[21]

However, when the program was about to start in 1952, the US cut the budget available for the pilot phase and reduced its scope from the regional to the smaller provincial level.[22] As a result, the program could be implemented in only five provinces - one in each *pilot region* originally selected (CNP (1960)). Since the goal of the pilot phase was to test whether the program was effective before the nation-wide implementation, the US experts argued they looked for provinces that could be "middling" in each *pilot region*. These provinces were selected to "have the average economic characteristics of the *pilot region* where they were located. They shouldn't have been the most or the least developed areas" (CNP (1960), p.108). For instance, in *pilot region* of Veneto, the province of Vicenza was selected because "its structure reproduces Veneto's structure very well" (Bianchi (1993), p.405). Eventually, the five selected provinces were: Monza for Lombardia, Vicenza for Veneto, Pisa for Toscana, Salerno for Campania, and Palermo for Sicilia (Figure 2, panel B). These selected provinces were labelled *experimental provinces*. In the rest of the paper, I will refer to provinces in *pilot region* not selected as *nonexperimental provinces*.

The Productivity Program started in 1952 and lasted until 1958 in *experimental provinces* (CNP (1960)). However, its budget was never increased and, therefore, the program was not rolled out in the rest of the country.

1.2 Description of Study Trips

Firms received the US transfers between 1952 and 1958, based on the order in which they submitted their applications. This order determined the year in which managers participated in study trips and firms received the new machines (ICA (1958)).[23]

[20] According to the Italian law, firms with at least 2010 USD 150,000 annual revenues were required to compile and deposit a balance sheet.

[21] 16 applications were disregarded because they were incomplete, 11 because they asked loans for machines available for sale in Europe, and 3 because the amount of their debt was considered too high. These 30 firms are excluded from my analysis in the rest of the paper.

[22] Provinces are Italian administrative areas, smaller than regions and comparable to US counties.

[23] The number of firms that could receive the US transfers in a given year was limited by the availability of US hosting firms and the number of trainees from other European countries (ICA (1958)).

Focusing on management transfers, the study trips for managers consisted of a stay in the US for a period between 8 and 12 weeks. Managers were grouped in teams of about 15-20 people coming from firms operating in the same industry across Europe. Almost all tours were preceded by an orientation period, lasting about one week, during which the team members could get to know each other. After that, the team members visited five or six US firms: these firms were chosen to have product lines similar to those that could be sold in Europe, and a scale of operation and managerial level to which Western European plants could aspire in 10 years (Silberman et al. (1996)). A typical week consisted of three working days of plant visits. Managers worked side by side with their US colleagues, in order to learn how US firms were managed. Italian managers were surprised by the level of US plants organization. For example, Francesco Sartori, from the Lanificio Sartori (located in Schio,Vicenza), visited the US in 1953, and noticed that "usually Italian workers work twice as long as workers in the US but only finish half the amount of work. [...] In the US, we learned to manage firms the way they did and we were able to bring back those practices to our firms".[24] During the other three week-days, managers received a formal training, and participated in meetings and seminars. Silberman noted that "demanding work requirements prevented boondoggling" (Silberman et al. (1996), p.447). At the end of the study trips, the trainees had to leave the US and return to their origin firms.[25]

Focusing on technology transfer, upon receiving the new machines, firms were granted a loan corresponding to the market value of the machines, for a maximum period of 10 years at an interest rate of 5.5 percent (ICA (1958)). In addition to the transfer of physical capital, the US also organized study trips for Italian engineers and technicians in the US in order to transfer the know-how needed to use these new machines. These trips lasted between 4 and 7 weeks, during which Italian workers spent three days in US plants where they could see the machines in operation. On the other week-days, they attended seminars and wrote technical reports (ICA (1958)).[26]

All receiving firms were then subject to a three-year monitoring period from US experts, that periodically visited them. During these visits, they provided consultation services in carrying out the program, and observed whether the new management practices and/or the new machines were in use (ICA (1958)).

[24] 1955 US report, while visiting Lanificio Sartori in the follow-up period (stored at Archivio Storico dello Stato (Rome-Italy), fondo CIR, busta 28, accessed on December 21, 2013).

[25] Managers entered the US under the nonimmigrant H-3 visa for *industrial trainees*. According to the 1952 Immigration and Nationality Act, "an H-3 industrial trainee visa allows a foreign national to enter the United States at the invitation of an organization or individual to work and receive training at any industrial site. The maximum period of stay is two years. Then the alien must leave the country and may not seek a change of status, extension, or re-admission to the US until he or she resides outside of the US for a period of two years or longer".

[26] Engineers and technicians were subject to the same H-3 visa regulation as the managers.

2 Data

I collected balance sheets for all the 6,065 firms eligible to apply for the Productivity Program in 1951, spanning from 1946 to 1973, as well as the applications submitted by such firms. This section documents the data collection process and describes the data collected.

2.1 Eligible Firms and Balance Sheets Data

To identify the population of firms eligible to apply for the Productivity Program in 1951, I referred to the firm registries stored at the Historical Archive of Confindustria, the Italian manufacturer employers' federation.[27] More specifically, I looked for all the firms that met the eligibility criteria, as established by the US, each year between 1949 and 1951.[28] This search produced the list of the 6,065 eligible firms. For each firm, I collected the balance sheets from 1946 to 1973.[29] The digitization of these data, completed between February and June 2014, provides detailed information for each firm about size, revenues, sales, assets, and governance structure.

Summary statistics for the 6,065 eligible firms in 1951 are reported in Table 1, columns 1-4.[30] On average these firms were multiplant organizations, with 47.8 employees, assets of $ 1.6 million and sales of $ 1 million,[31] and had been in operation for 12 years.[32] Almost all companies were family firms,[33] 43 percent of them were family-managed[34] and only 13 percent were exporters.[35] Eligible firms were heterogeneous in many respects.

[27] According to 1942 Italian civil code, all firms operating in a given *province* had to register with the correspondent Camere di Commercio Industria Artigianato e Agricoltura (CCIAA), a local institution comparable with US Chambers of Commerce (Art. 2429, Codice Civile Italiano, Regio Decreto-Legge 03/16/1942, n.262).

[28] As explained in Section 1, to be eligible for applying to the Productivity Program, firms had to meet four criteria: (1) to be located in one of the five *pilot regions*; (2) to operate in the manufacturing sector; (3) to have between 10 and 250 employees; (4) to compile a balance sheet.

[29] In the case a firm entered the market after 1946 or exited the market before 1973, I collected balance sheets for the available years.

[30] 30 firms whose applications had been rejected are excluded from the analysis.

[31] These values are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1.

[32] Assets and sales are expressed in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1.

[33] Although a formal definition of family firm was introduced in the Italian Civil Code only in 1975 (Art. 230-bis, Codice Civile Italiano, Regio Decreto-Legge 03/16/1942, n.262), the 1951 Census defined family firms as "a firm, of any size, in which the majority of decision-making rights is in the possession of the natural person(s) who established the firm or in the possession of their spouses, parents, child or children's direct heirs."

[34] 1951 Italian Census defined a family-managed firm as a firm in which "at least one representative of the family or kin is formally involved in the governance of the firm."

[35] The very low percentage of exporting firms could be explained by the economic self-sufficiency, known as autarky, imposed by the fascist regime since 1931, that destroyed trade channels and that was worsened by WWII (Lombardo (2000)).

For example, the number of employees spanned from a minimum of 15 to a maximum of 250.[36] The ratio between the top and bottom quantile is 26 times for assets, and 38.7 for sales. All eligible firms were operating in manufacturing sector. Appendix Figure A.2, panel A shows the distribution of eligible firms by manufacturing industries. Most firms were operating in textile and machinery industries (respectively, 45.0 and 22.9 percent), followed by wood and food industries (respectively, 14.5 and 10.5 percent). Only a small fraction of firms was operating in chemicals and minerals industries (respectively, 5.1 and 1.9 percent).

To check the extent to which the eligible firms were representative of the Italian manufacturing sector, I compare this sample with the 1951 Industrial Census data. Eligible firms represented about 3.3 percent of all Italian manufacturing firms and about 12 percent of manufacturing firms in the *experimental provinces*.[37] Appendix Table A.1 reports summary statistics by *pilot region*. Northern *pilot regions*, Lombardia and Veneto, had larger firms than Southern *pilot regions*. For instance, the average firm size was 56 employees in Lombardia and 47 in Veneto, compared to 38 in Campania and 40 in Sicilia. Firms in Lombardia, Veneto, and Toscana had on average higher assets, sales and productivity, and were older. Moreover, the percentage of family-owned firms in Northern *pilot regions* was around 40 percent, while it was around 50 percent in Center and Southern *pilot regions*. This evidence is consistent with the historical Italian development, where Northern regions were more industrialized than Southern ones (Daniele and Malanima (2007)). The distribution of firms across manufacturing industries varied across *pilot regions* (Figure A.2, Panel B). While in all regions more than 40 percent of firms were in the textile industry, Lombardia, Veneto and Toscana had more than 20 percent of firms operating in the machinery industry. By contrast, in Campania and Sicilia the food industry was predominant.

2.2 Applications for US Management and Technology Transfer

For firms that applied for the management transfer, I collected and digitized the applications they submitted in 1951, now stored at Italian Central Archives of the State (ACS).[38] These applications included both firms that chose only the management transfer

[36] No firms between 10 and 14 employees met the criteria to be eligible for the Productivity Program. The main reason is that, because of their size, these firms were not required to compile a balance sheet.

[37] According to the 1951 Industrial Census data, 606,093 manufacturing firms were operating in Italy. Among them, around 70 percent were handicraft firms with less that five employees (Saibante (1960)). These firms are not considered for checking the representativeness of my sample. Including these firms, eligible firms represent about 1 percent of all Italian manufacturing firms and about 2.1 percent of manufacturing firms in the *experimental provinces*.

[38] The Italian Central Archives of the State are the main national archives of Italy. They were created in 1875 under the name of Royal Archives. They took their present name in 1953. They are located in Rome and are put under the responsibility of the Ministry of Culture.

and firms that chose both the management and the technology transfers.

The applications are an incredibly rich source of information. Each firm has a unique folder, containing administrative information such as firm name, the municipality in which it was located, the application date, and the number of people to be sent in a study trip. This information is available for all the firms that applied, regardless of whether or not they eventually received the US assistance. For firms in *experimental provinces*, which eventually participated in study trips, the folders contain additional information. They include reports made by US committees that visited the firms just before the study trips, the date and the length of the study trips, the US firms in which the training took place, and follow-up notes compiled by the US experts that visited these firms for the three years after the study trips. They also include the name of managers that went to the US, their age and their education level (high school diploma or college degree).

For firms that applied for the technology transfer, I collected and digitized the applications they submitted in 1951, now stored at the Historical Archive of the Istituto Mobiliare Italiano (ASIMI).[39] Also in this case, the applications included both firms that chose only the technology transfer and firms that chose both the management and the technology transfer. Each firm that applied for the technology transfer had its specific folder containing the original application, the date of submission, the amount requested, the type of machinery requested, and the number of engineers/technicians to be sent to the US. For firms in *experimental provinces*, the folder also contains the date in which the new machine was received, its commercial value that corresponds to the value of the loan granted to the firm and whether and when the loan was repaid, as well as follow-up notes for five years after receiving the support. It also contains the name of engineers/technicians that participated in study trips, their age and their education level (secondary school, high school diploma, or college degree).

Using firm name and address, I uniquely match all the applications with firm balance sheets.[40] In total, out of the 6,065 eligible firms, 3,624 applied for the Productivity Program and 2,441 did not. Among applicant firms, 809 applied for management transfer, 1,190 for technology transfer, and 1,625 for both transfers. Table 1, columns 5-8 shows the summary statistics, separately for firms that applied for management and/or technology transfers and for firms that did not apply. Firms that applied for the Productivity Program were on average larger than those that did not apply. For instance, the average firm that applied for the Productivity Program had 58.7 employees, compared with 31.5

[39] The Istituto Mobiliare Italiano (IMI) was created in 1931 (Legge 11/13/1931, n. 1398), with the goal of helping firms facing difficulties despite their sustainable financial and economic positions. After WWII, IMI participated in the rebuilding of Italy, above all by managing the financial resources provided through international aid.

[40] Specifically, I was able to match all firms that submit an application for the Productivity Program with their balance sheets.

employees in the average firm that did not apply. Firms that applied had on average higher assets, more than double the sales, and around 25 percent higher productivity. 27 percent of the firms that applied were family-managed compared with 67 percent of the firms that did not apply. Finally, most firms that did not apply were operating in traditional industries such as food, textile and wood industries (Figure A.2, Panel B).

Conditional on applying, firms that chose both transfers were on average bigger than firms that chose either the management or the technology transfer, and had higher assets, sales, and productivity. Firms that chose the technology transfer were older (15.6 years compared to 10.9 years for firms that chose management transfer and 9.9 years for firms that chose both transfers) and more likely to be family-managed (33 percent of firms that chose technology transfer were family-owned compared to 25 percent of firms that chose management transfer and 27 percent of firms that chose both transfers). With respect to the managers to be sent in the US, their number was comparable across firms that chose management transfer and firms that chose both transfers (2.33 for management transfer compared to 2.45 for both transfers). Similarly, the number of engineers to be sent in the US was similar between firms that chose technology transfer and firms that chose both transfers (3.19 for technology transfer compared to 3.37 for both transfers). The average amount of loans requested by firms that chose both transfers is $ 250,771.33 compared to $ 223,493.28 for firms that chose technology transfer.[41] The average loan requested was around half of the maximum allowed by the US of $ 478,507.65, and amounted to less than 15 percent of firm capital stock. Firms that applied for management transfer were mostly operating in food and textile industries (Figure A.2, Panel B). More than 60 percent of firms that applied for technology transfer were in chemicals industry, followed by machinery industry (Figure A.2, Panel B). Finally, firms that applied for both transfers were concentrated in machinery, textile and chemicals industries (Figure A.2, Panel B).

In total, 918 Italian managers, all males, participated in study trips to the US. The average age of these managers was 35 years. Considering the retirement age for men was 60,[42] this means they were likely to spend the following 25 years working in the same firms and getting the tenure necessary to make operational decisions. Indeed, the balance sheets' information indicates that 88% of these managers were still working in the same firm 15 years after US intervention. Moreover, 2,469 engineers and technicians, all males, were trained in the US. 94 percent of them were still working in the origin firm at the end of the follow-up period. The average age of these trainees was 41 years, so, if they had worked in the same company until retirement, they would have been there for additional 19 years on average. However, with the data available, it is not possible to determine

[41] Values are expressed in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1.

[42] Source: www.inps.it.

whether and for how long they remained in the origin firm after the follow-up period. Though, it is worth noting that Italy was characterized by permanent contracts and very low labor turnover across firms (Saibante (1960)). Finally, 98 percent of loans granted were repaid within the ten-year horizon imposed by the US.[43]

3 Identification Strategy

The identification strategy of this paper relies on the unexpected cut in the US budget that reduced the scope of the Productivity Program from the regional to the smaller provincial level (Figure 2, Panels A and B). This budget cut occurred after all eligible firms applied for the program and all the applications were reviewed.[44] Therefore, in each region initially selected (*pilot region*) and for each US transfer firms applied for, some companies received it because they were located in selected provinces (*experimental provinces*); and some did not because they were located in provinces not selected (*nonexperimental provinces*).

To estimate the causal effects of the Productivity Program, I compare the pre- and post-Productivity Program outcomes of firms located in *experimental provinces* to firms located in *nonexperimental provinces* in the same *pilot region* and that applied for the same US transfer in 1951. The remainder of this section provides evidence in support of the research strategy and discusses the identifying assumptions.

3.1 Were *Experimental* and *Nonexperimental Provinces* in Each *Pilot Region* Comparable?

I use pre-Productivity Program province-level data to analyze the aggregate differences between *experimental* and *nonexperimental province* in each *pilot region*.

I first analyze whether *experimental provinces* had been more damaged during WWII. The WWII bombardment (1940-1945) determined a widespread destruction in Italy; however *experimental provinces* were neither the most nor the least damaged provinces in each *pilot region* (Appendix Figure A.1, Panel A). Since one of the goal of the Marshall Plan was to prevent the communism diffusion (Hogan (1987)), I examine whether *experimental provinces* had been more exposed to such risk. I measure the risk of communism diffusion by the percentage of firms that participated in the 1948 communist strikes. Between July

[43] 1.5 percent of the loans were extended and repaid in 15 years, and 0.5 percent were transferred to other firms through a procedure called *accollo*. The average Italian yearly inflation rate between 1952 and 1970 was 3.29 percent. The interest rate on these loans was 5.5 percent.

[44] Only 30 applications were rejected. These firms are not included in the analysis.

16 and July 18, 1948 a general communist-style strike diffused around the country.[45] I do not find evidence of a stronger or weaker participation in *experimental provinces* (Appendix Figure A.1, Panel B). Third, I check whether *experimental provinces* received less aid from the US through the E.R.P. between 1948 and 1951. However, the distribution of such aid looks very homogeneous within *pilot regions* (Appendix Figure A.1, Panel C). Finally, using the 1951 Industrial Census data, I look at provincial economic indicator, such as population, number of firms, number of firms operating in manufacturing sector, employment-population ratio and manufacturing labor share. For all these outcomes, *experimental provinces* look comparable to other *nonexperimental provinces* in the same region (Appendix Figure A.1, Panel D-H).

A possible concern about the use of post-WWII data is that, although *experimental provinces* were comparable to other provinces in each *pilot region* in 1951, they might have been different before WWII. In this case, differential firm outcomes in post-war period might reflect not only the effect of the Productivity Program, but also provinces return to their pre-war level. To address this issue, I examine the same economic indicators before WWII, using data from the 1937 Industrial Census. In 1937 *experimental* and *nonexperimental provinces* look comparable.

3.2 Were Firms in *Experimental* and in *Nonexperimental Provinces* Comparable?

Firms in *experimental* and *nonexperimental provinces* that applied for the same US transfer were very similar in their observed characteristics and outcomes in 1951, the year before the *experimental provinces* were selected (Table 2, columns 1-2, 4-5, 8-9). To test whether they were statistically equivalent, I estimate a cross-sectional regression, separately for each US transfer, in which I regress firm characteristics and outcomes in 1951 on an indicator for firms located in *experimental provinces* and a full set of *pilot regions* fixed effect. None of the 27 estimated coefficients on the *experimental provinces* indicator is statistically significant (Table 2, columns 3, 6, 9). I conclude these groups of firms were statistically indistinguishable before the Productivity Program.

[45] On July 14, 1948 the leader of the Italian Communist Party, Palmiro Togliatti, was shot three times, being severely wounded by Antonio Pallante, a strongly anti-communist student. This shooting caused a general strike called by the Italian General Confederation of Labour that spread around the country between July 16 and July 18, 1948 (Lombardo (2000)).

3.3 Were Firms in *Experimental* and in *Nonexperimental Provinces* on the Same Trend before the Productivity Program?

I use pre-Productivity Program data from 1946 to 1951 to estimate differential time trends in outcomes for firms in *experimental* and *nonexperimental provinces*. I first estimate a constant linear time trend model that allows for an interaction of the constant linear trend with an indicator for firms located in *experimental provinces*. The estimates from this model suggest that, for each US transfer, there is a positive time trend in firm employment, assets, sales and productivity (Appendix Table A.2). These results are consistent with the Italian recovery from WWII (Lombardo (2000)). However, the estimated coefficients on the interaction term are very close to zero and not significant (Appendix Table A.2). Moreover, the estimated coefficient on the *experimental provinces* indicator is not statistically different from zero in all the specifications, confirming the balancing tests' results presented in Table 2.

Second, I estimate a model in which I replace the linear time trend variable with a full series of year dummies and interactions of each year dummy with an indicator for firms in *experimental provinces*. The estimated coefficients on the interaction terms, small in magnitude, are never significantly different from zero (Appendix Table A.2). Moreover, some are positive and others are negative, confirming lack of any consistent pattern. Finally, the F-statistics, reported at the bottom of each panel, show that I cannot reject the null hypothesis that the interaction terms are jointly equal to zero (Appendix Table A.2). These results suggest that firms that applied for any US transfer in *experimental* and *nonexperimental provinces* were on a similar time trend in the six years before the Productivity Program.

3.4 Timing of the Productivity Program and Attrition

The Productivity Program was implemented between 1952 and 1958. Firms in *experimental provinces* were ranked based on their applications' submission date and received the US transfer according to this order. To take into account that firms received the US transfers in different years, I normalize the intervention year to zero. Since I can observe the application date also for firms in *nonexperimental provinces*, I assume that these firms would have received the US assistance in the same year of the firms in *experimental provinces* that applied at the same time.[46] In this subsection I discuss the implication of this assumption in terms of identification.

[46] For instance, if firms in *experimental provinces* that submitted an application between February 1 and February 20, 1951 received the US assistance in 1953, I assume that firms in *nonexperimental provinces* that submitted an application between February 1 and February 20, 1951 would have received the US assistance in 1953 as well.

I test whether firms that received the US transfer in a given year were statistically indistinguishable from firms that I assume would have received the US transfer in the same year. None of the coefficients on the interaction between the Productivity Program year and an *experimental province* dummy is statistically different from zero (Appendix Table A.4). Moreover, the F-statistics show that I cannot reject the null hypothesis that the all the coefficients are jointly equal to zero. This further suggests that firms application time was not correlated with their pre-program outcomes.

This approach might generate two additional concerns. First, although firms in *experimental* and *nonexperimental provinces* were similar in 1951, they might have differently changed after 1951, but before the Productivity Program implementation. In this case, they would no longer be comparable when firms in *experimental provinces* received the US assistance. Therefore, I test whether firms in *experimental provinces* that received the US transfers in a given year were still comparable in the four years before to firms in *nonexperimental provinces* that would have received the US assistance in the same year. In particular, I regress each firm outcome on four lagged years dummies and an interaction term for of each year dummies with an indicator for firms located in *experimental provinces*. The estimated coefficients on the interaction term are close to zero and never significant (Appendix Table A.5). This means that firms were still on a similar trend in the five years before the Productivity Program.

The second concern is that I can only analyze firms that survived long enough to receive (or would receive) the US assistance. However, if firm exit rate between 1951 and the start of the Productivity Program is different for firms in *experimental* and firms in *nonexperimental provinces*, an attrition bias will arise. However, Appendix Table A.6 shows that the characteristics and the outcomes of firms that exited the market between 1951 and the beginning of the Productivity Program are comparable across *experimental* and *nonexperimental provinces*.

4 The Effects of the Productivity Program

In this section, I examine the effects of the Productivity Program on firm performance. I document that firms that received the US transfers were more likely to survive, had larger size, measured by both sales and number of employees, and higher productivity, measured by total factor productivity revenue (TFPR). The effects of management transfer persisted in the long run, while the effects of technology transfer faded out after 10 years. Finally, the impact of the Productivity Program for firms that received both transfers was larger than the sum of the other two transfers, suggesting complementarity between management and technology.

4.1 Extensive Margin: Firm Survivorship

To examine whether the Productivity Program affected firm survivorship, I estimate the Kaplan-Meier survival function for firms in *experimental* and in *nonexperimental provinces* over three different samples: firms that applied for management transfer, firms that applied for technology transfer and firms that applied for both transfers. Figure 3, Panel A-C illustrates such curves. In each panel, all firms are on the market in the intervention year, normalized to zero.[47] The x-axis reports years to US intervention, and the y-axis reports the estimated survival probability, $\hat{S}(t)$, calculated according to the formula $\hat{S}(t) = \prod_{t_\tau \leq t} \left(1 - \frac{d_\tau}{n_\tau}\right)$ where n_τ is the number of firms that survived until time τ and d_τ is the number of firms that closed down at time τ.[48] I consider that a firm exited the market at time τ if the balance sheets at time $\tau + 1$ reports a liquidation form or if the firm had been acquired by another firm.[49]

In all three samples, firms in *experimental provinces* had higher probability of survival, compared with firms in *nonexperimental provinces*. However, the difference between survival curves in the short run is small. Focusing on the three years after the program,[50] no firms in *experimental provinces* exited the market, and the estimated survival probability of firms in *nonexperimental provinces* is higher than 96 percent. Survival rates diverge over time and, after 15 years, the estimated survival probability for firms in *experimental provinces* is between 88.5 and 93.9 percent, while it is between 67.6 and 69.1 percent for firms in *nonexperimental provinces*.[51]

To analyze whether differences in survivorship between receiving and non-receiving firms had very long-run effects, I match firms that applied for the Productivity Program in 1951 with Italian firms in the Amadeus database between 2010 and 2013.[52] I find that 8.1 percent of firms that received the management transfer, 5.5 percent of firms that received the technology transfer, and 12.3 percent of firms that received both transfers were still in operation between 2010 and 2013. The percentage are 2.2 percent for firms that applied for management transfer, 1.9 percent for firms that applied for technology transfer, and 2.5 percent of firms that applied both transfers but did not participate in

[47] See Section 3 for the implications of these assumptions.

[48] In this context, data are right censored since firms are observed only up to 15 years after the US intervention, and left truncated since all the firms were operating - and then at risk of exiting the market- before the US intervention.

[49] I do not find evidence of acquisitions and merging across firms in different provinces.

[50] Three years after the US intervention correspond to the follow-up period of US experts.

[51] In all the samples, the log-rank test, stratified by *pilot region*, rejects the null hypothesis of equality between the empirical survivor functions of the two groups. The estimation of the corresponding Cox survival model is reported in Appendix Table A.7.

[52] To match the firms in my sample with firms in Amadeus database, I consider valid matches only firms with the same name and headquarter address.

the Productivity Program due to the budget cut.[53]

4.2 Intensive Margin: Sales, Employment, and TFPR

To examine the impact of the US intervention on the intensive margin, I estimate the following equation:

$$\text{outcome}_{isprt} = \alpha + \beta \text{ExpProv}_p + \sum_{\tau=-5}^{15} \delta_{t+\tau}(\text{ExpProv}_p \cdot \text{PostPP}_{t+\tau}) + \lambda_r + \zeta_s + \nu_t + \epsilon_{isprt} \quad (1)$$

where dependent variable, outcome_{isprt}, is one of the key performance metrics of logged (deflated) sales, number of employees, and TFPR of firm i operating in industry s, located in province p in region r at time t. Although for robustness, TFPR is estimated in a number of ways, the core method uses a version of the Ackerberg et al. (2006) method.[54] α is a constant term; ExpProv_p is an indicator that equals one if firm i is located in an *experimental province* ; $\text{PostPP}_{t+\tau}$ is an indicator for each year t, after firm i received the Productivity Program assistance, from 5 years before to 15 years after the program. *Pilot region* fixed effects λ_r control for variation in outcomes across regions that are constant over time; industry fixed effects ζ_s control for variation in outcomes across manufacturing industries; time fixed effects ν_t control for variation in outcomes over time that is common across all Italian regions. ϵ_{isprt} is the error term. Each $\delta_{t+\tau}$ coefficient captures the effects of the Productivity Program τ years after its implementation.[55]

Table 3 reports the estimates of equation 1: in Panel A for firms that applied for management transfer; in Panel B for firms that applied for technology transfer; and in Panel C for firms that applied for both transfers. For each outcome variable, the first two columns show the coefficients estimated on the sample of firms that survived for the 15 years after the Productivity Program. This allows keeping each sample the same over time. However, it is likely to underestimate the effect of the program since firms in

[53] The estimation of a probit model for the probability of survived until the period 2010-2013 indicates that these differences are statistically significant.

[54] Ackerberg et al. (2006) extend the framework of Olley and Pakes (1996) and Levinsohn and Petrin (2003) to control for the simultaneity bias that arises because input demand and unobserved productivity are positively correlated. Details about the TFPR estimation can be found in Appendix C.

[55] Standard errors are clustered at the province level, for a total of 35 clusters. For DID estimators, Bertrand et al. (2004) show that clustering at the province level if the number of provinces is small may yield inconsistent estimates for standard errors and bootstrapping over-rejects the null hypothesis. A solution proposed by Cameron et al. (2008) is the t-wild bootstrap method which provides asymptotic refinement by using the bootstrap-t procedures that are generalizations of those proposed for regression with heteroskedastic errors in the nonclustered case. As robustness check, I estimate the standard errors by using the t-wild bootstrap method and the results, available upon request, do not change the significance of the coefficients.

nonexperimental provinces that survived are expected to be better than firms that failed. For this reason, the third column presents the estimates on the full sample. Finally, the fourth column uses a matched sample that will be discussed in Subsection 4.2.1.

Focusing the discussion on the balanced samples, sales of firms in *experimental provinces* that applied for management and both transfers increased by, respectively, 7.3 and 9.6 percent one year after the US intervention, compared to firms in *nonexperimental provinces* that applied for the same transfer.[56] These differences significantly increased over time and, after 15 years, amounted to 42.5 and 60.0 percent, respectively.[57] The increase in sales for firms that applied for technology transfer is not significant in the first year after the US intervention. Although the cumulative gain after 15 years is 10.4 percent, the impact is not significantly increasing beyond 10 years.[58]

Employment did not immediately respond to the US intervention, but, in all the three samples, the number of employees rose within 5 years since the start of the program. As for sales, while the estimated difference is significantly increasing over time for firms that applied for management and both transfers, there are no additional effects after 10 years for technology transfer.

After receiving management and both transfers, TFPR went up by 16.5 and 23.1 percent, respectively, during the intervention year, compared to firms in *nonexperimental provinces* (Figure 4, Panel A and C). The difference in TFPR between the two groups of firms was constantly increasing and, after 15 years, it amounted to 52.3 and 86.5 percent, respectively. After the Productivity Program implementation, TFPR for firms that applied for technology transfer was on an upward trend, with an impact becoming significant after 5 years (+ 4.2 percent). The cumulative effects after 10 and 15 years were statistically indistinguishable among each other and amounted to around 19.5 percent.

Firms that applied for the Productivity Program were different in many respects. To control for firm specific characteristics constant over time, in Table 3, columns 2, 6 and 10, I report a specification with firm fixed effects. These coefficients are similar to those from the baseline specification, which is an implication of the similarity between firms in *experimental* and *nonexperimental provinces*.[59]

Finally, in Table 3, columns 3, 7 and 11, I report the coefficients estimated on the unbalanced panel. These estimates are, on average, 20 percent larger than the baseline ones.

[56] Note that the dependent variables are estimated in logs, so that the percentage variation is 7.3=[exp(0.070)-1]*100 and 9.6=[exp(0.092)-1]*100.

[57] The F-statistics, reported in Appendix Table A.8, always reject the null hypothesis of equality of coefficients between year 1 and year 5, year 5 and year 10 and year 10 and year 15.

[58] The F-statistics, reported in Appendix Table A.8, fail to reject the null hypothesis of equality of coefficients between year 10 and year 15.

[59] Additional specifications that control for the calendar year in which the US transfers were received and for fixed effects for US hosting firms are comparable with the main specification's results, and, thus, not reported.

This is consistent with the assumptions that better firms in *nonexperimental provinces* were more likely to survive and confirms that restricting the sample to firms that survived for all the 15 years after the program produces a downward bias of the estimates.

These short-run results are comparable to the findings in Bloom et al. (2013) which documents a 9 percent increase in sales and a 17 percent increase in output TFP one year after offering management consulting to large Indian firms. Bruhn et al. (2013) finds limited short-term impact, but larger medium run effects on employment, with an estimated 44 percent raise in number of employees in 5 years. However, the average size of firms is 14 employees, much smaller than that in my sample.

The 1950's and 1960's were decades of sustained economic growth for Italy, especially in manufacturing sector (Felice and Vecchi (2015)). However, the difference-in-differences approach does not allow capturing the growth rate of firms that did not participate in the Productivity Program. To do so, in Appendix Table A.9, I report the growth rates of eligible firms that did not receive the US transfers and the growth rate of the Italian economy between 1950 and 1970. The growth rates are roughly comparable which indicates that firms that did not participate in the program were nevertheless growing in the Italian boom years.

4.2.1 Comparison of Management and Technology Transfers

Estimating the effects of the Productivity Program separately for the three different transfers allows controlling for unobservable characteristics that might have determined firm decision to apply for a specific transfer.[60] However, it does not allow comparing the effects across transfers. For instance, firms that self-selected into the management transfer might have been different in terms of observed or unobservable characteristics from firms that chose the technology transfer.

To address this issue, I combine a matching approach with a difference-in-differences estimation. First, for each firms that applied for a given transfer in *experimental provinces*, I find a "nearest-neighbor" firm in *nonexperimental provinces* that applied for the same transfer. Second, for each matched-pair in the both transfer sample, I find a "nearest neighbor" matched-pair in the management sample and one in the technology sample. I use as matching variables firm size, assets, sales, productivity, exports and family ownership in 1951, the year before the budget cut. In total, I match 125 firms in each sample.[61]

[60] This is subject to the assumption that there are no unobservable characteristics that determined firm decision to apply for a given US transfer that were systematically different across *experimental* and *nonexperimental provinces* in the same pilot region.

[61] The matching is doing with one replacement.To limit the risk that this procedure yields "bad" matches, I impose a caliper of 0.25, following Rosenbaum and Rubin (1985). This means that all matches not equal to or within 0.25 standard deviations of each covariate are dropped. The balancing tests for the matched firms are presented in Appendix Table A.10.

Finally, I estimate

$$\begin{aligned} \text{outcome}_{isprt} &= \sum_{j=1}^{3} \alpha_j \text{Transfer}_i^j + \sum_{j=1}^{3} \beta_j (\text{Transfer}_i^j \cdot \text{ExpProv}_p) + \\ & \sum_{j=1}^{3} \sum_{\tau=-5}^{15} \delta_{j(t+\tau)} (\text{Transfer}_i^j \cdot \text{ExpProv}_p \cdot \text{PostPP}_{t+\tau}) + \\ & \lambda_r + \zeta_s + \nu_t + \epsilon_{isprt} \end{aligned} \tag{2}$$

where Transfer_i^j is an indicator for firms that applied for management transfer for $j = 1$, for technology transfer for $j = 2$, and for both transfers for $j = 3$, and the other variables are as defined for equation 1. Each $\delta_{j(t+\tau)}$ coefficient measures the impact of the Productivity Program τ years after the US intervention on firms located in *experimental provinces* that applied for transfer j, compared with firms in *nonexperimental provinces* that applied for transfer j.

The δ_{jt} matched estimates are reported in Table 1, columns 4, 8, and 12. The effects of the Productivity Program are significantly larger for firms that received the management transfer than for firms that received the technology transfer both in the short and in the long run. The F-statistics, reported in Appendix Table A.8, Panel D, indicate to reject the null hypothesis of equality between the coefficients in any given year and for all the outcomes.

Firms that received both the management and the technology transfers increased their performance more than the sum of the impact of the management and the technology transfer. Again, the F-statistics indicate to reject the null hypothesis of equality between the coefficients on both transfers and the sum than the other two. This result suggests that management and technology might have a complementary effects.

4.3 Allowing for Heterogeneous Effects: Industry, Size, Location

I first examine whether the Productivity Program affected firms operating in different manufacturing industries differently. The heterogeneous estimates, reported in Appendix Table A.11, Panel A1, indicate that the effects of management and both transfers are comparable across different industries both in the short and in the long run. Moreover, the F-statistic shows that the null hypothesis of equality between all the coefficients cannot be rejected for all the different regression outcomes. For technology transfer, the impact of the Productivity Program was larger for companies operating in textile, machinery and chemicals industries. These results indicate that while modern management practices were implemented to a similar extent across different industries, more capital intensive industries benefitted more from introducing new machines.

Second, I allow for heterogeneity of the effect by firm size in 1951. Firms in the top quartile of size distribution for management and both transfers had the largest increase in sales and TFPR both one year and 15 years after US intervention. The Productivity Program had larger effects on firms in the lowest quartile compared with the second and third quartile for both sales and TFPR, suggesting that there was a "catching-up" effect among these firms. The impact on employment, similar in magnitude one year after the intervention, is larger in the long run for firms in the third and fourth quartile. If smaller firms were relatively more credit constrained than large companies, the management transfer might have weakened credit constraints. The impact of technology transfer in the short run is comparable across different firm size (Appendix Table A.11, Panel A2). This suggests that new machines did not immediately become productive, regardless of the firm size. In the longer run, the Productivity Program produced larger effects on relatively smaller firms, which were ex-ante potentially more credit constrained.

Finally, I investigate whether the Productivity Program had different effects on firms located in different areas within Italy. Since Northern Italy was more industrialized than Southern Italy (Daniele and Malanima (2007)), firms located in Northern *experimental provinces* might have responded more to the US intervention. As shown in Appendix Table A.11, Panel A3, management and both transfers had a larger effects on firms located in Northern Italy, but the the F-statistics indicate that it is not possible to reject the null hypothesis of equality between the estimates in Northern and Southern Italy. By contrast, the technology transfer had a slightly larger and significant impact on Northern-Italy firms. This evidence suggests that the effects of the Productivity Program were little driven by firm location.

4.4 Why Did Some Firms Apply for the Productivity Program and Some Did Not?

Although the monetary cost of applying for the Productivity Program was virtually zero, 40 percent of the eligible firms did not apply. Moreover, among applicants, firms chose different US transfers. To examine the relationship between firm characteristics and self-selection into the Productivity Program, I estimate the following multinomial logit model

$$\text{Log}\left(\frac{Pr(\text{Apply}_i = j)}{Pr(\text{No Apply})}\right) = \alpha X_i + \beta \text{ExpProv}_p + \lambda_r + \zeta_s + \epsilon_i \tag{3}$$

where the choice is to apply for management transfer, to apply for technology transfer, to apply for both transfers or not to apply, used as baseline; ExpProv_p is an indicator for firms located in *experimental provinces*, λ_r is *pilot region* fixed effect, and ζ_s is manufacturing industries fixed effect. X_i is a vector of firm characteristics in 1951.

Appendix Table A.12 reports the estimation results. Larger firms, with higher sales and TFPR were more likely to apply for the Productivity Program, compared to firms that did not apply. For instance, one percent more employees increased the probability of applying for management transfer by 0.8 percent, the probability of applying for technology transfer by 1.7 percent and the probability of applying for both transfer by 2.8 percent. Firms that were family-managed were between 15.1 and 17.6 less likely to apply.

Based on this evidence, it seems that "better" firms were more likely to apply for the program. There are several potential explanations for this fact. One could be that smaller and less productive firms were not aware they needed the US assistance, so they did not apply. It is also possible that these firms, very far below the frontier, thought that the Productivity Program would not have led to any improvement, given the differences between the US companies and them. Finally, firms that did not apply might have had liquidity constraints. Even if the program paid for the monetary costs of travel, there was an opportunity cost in sending managers in the US or purchasing a new machine. In this case, even if the expected net present value of participating in Productivity Program was positive, these firms decided not to apply.[62]

4.5 General Equilibrium Effects

The Productivity Program determined an improvement in performance of firms that received US transfers. However, it might have affected also firms that did not participate in the program. For instance, firms that did not receive the US transfers might have received positive spillovers from firms that participated. As a consequence, they might have started implemented modern management practices or have bought new machines. However, participant firms might have stolen business from non-receiving firms, generating negative spillovers. In this setting, a complete general equilibrium analysis is not possible since I only observe firms that were eligible for the Productivity Program. Nevertheless, this section offers some suggestive evidence about the effects of the Productivity Program on non-receiving firms.

I first compare eligible firms in *experimental* and *nonexperimental provinces* that did not apply for the Productivity Program. On the extensive margin, as shown in Figure 5, Panel A, the Kaplan-Meier survival curves are similar for the two groups of firms and

[62] It seems unlikely that some firms did not apply because they were unaware of the Productivity Program. In fact, the US administration promoted a massive advertising campaign of the Productivity Program through a number of different local institutions, including banks and Chambers of Commerce (ICA (1958)).

repeatedly overlap over time.[63] The long-rank test fails to reject the null hypothesis of equality between the two curves. On the intensive margin, I estimate equation 1 on this sample of firms. The results are reported in Table 4. Firms that did not apply for the Productivity Program in *experimental provinces* do not show any differential changes with respect to firms in *nonexperimental provinces* both in the short and in the long run. The full pattern of TFPR over time, illustrated in Figure 5, Panel B, confirms the absence of different performance for firms that did not apply before and after the Productivity Program.

The interpretation of these results is not straightforward. On the one hand, this evidence suggests that the Productivity Program did not generate localized spillover effects. On the other hand, it could be the case that the Productivity Program generated both positive and negative local spillovers and not finding results might be simply due to a combination of these two effects. Finally, it is worth noting that these results do not contradict the identification assumption of this paper that *experimental provinces* would have performed as *nonexperimental provinces* in the absence of US intervention.

Second, I examine whether the US transfers generated spillover effects on firms geographically closer to receiving firms. I estimate the following equation on all the firms in *experimental provinces* and in *nonexperimental provinces* that did not receive the US assistance:

$$\text{outcome}_{it} = \alpha + \beta \text{ExpProv}_p + \sum_{j=1}^{3} \mu_j N_i^j + \sum_{j=1}^{3} \theta_j N_i^j \cdot Post_t + \lambda_r + \zeta_s + \nu_t + \epsilon_{it} \tag{4}$$

where α is a constant term; ExpProv_p is an indicator variable that equals one if firm i is located in an *experimental province*; N_i is the count of firms that received US transfers, operating in the same industry and located in the radius of x km from firm i, where x is 5, 10 or 20 km; $Post_t$ is an indicator variable that equals one for the years after these firms received the US transfer. The dependent variables, outcome, are shut down dummy, sales, employees, and TFPR. The coefficients θ_j captures the effect of an additional firm within x km and in the same industry that received the US transfer j on the outcome of non-receiving firms.

The results, reported in Appendix Table A.13, show some evidence of a decrease in sales and TFPR for firms within a radius of 10 km of firms that participated to the Productivity Program. There is no evidence of localized spillover effects on employment or beyond 20 km of radius from participant firms.

[63] In this case, it is not possible to use an event study since firms did not apply for the Productivity Program. For this reason, the time period considered is from 1952 to 1970.

4.5.1 Why Non-Receiving Firms Did Not Catch-Up?

Given the positive effects of the Productivity Program on receiving firms, one natural question is why other firms did not adopt the new management practices or purchase the new machines. Focusing on the management practices, for excluded firms it was not possible to replicate the content of the program, even if they might have wanted to participate in study trips by paying the costs out of their pocket. A back-of-the-envelope cost-benefit analysis shows that this would have been profitable for excluded firms.[64] In fact, the average participation cost per firm of $ 38,723, which corresponds to 4.67 percent of firm annual revenues; therefore, the expenses would have been covered by the increased revenues within one year of the program. However, the US did not allow non-receiving firms to enroll. Nevertheless, such firms could have started implementing modern management practices by imitating those of receiving firms. Information constraints might have prevented this process though. First, excluded firms might have not been able to directly observe receiving firms. For instance, they might have not known which firms ended up participating in the Productivity Program or not realized the productivity increase caused by the management transfer. Second, even if they were aware of the importance of such practices, they might not have known how to implement these practices. Third, it could be the case that they thought these practices were not profitable, attributing the success of receiving firms to other factors, for example, the networking effects.

Excluded firms could have purchase the US machines on the private market, without benefitting of the lower interest rates. In this case, credit constraints might have been relevant. In fact, such companies would have needed to obtain a loan to buy the machines and pay them in dollars, which would have additionally increased the costs.

5 Mechanisms

The evidence presented in Section 4 shows that the effects of management transfer persisted in the long run, while the effects of technology transfer faded out after 10 years. In this section, I examine possible mechanisms that might have determined such results.

[64] More specifically, the cost of participating to the US study trips for a firm is given by the sum of the administrative costs of visas, lodging and travels of each trainee, the wages earned by such trainees while working in the US plants, and the cost of the monitoring the firms in the follow-up period. I estimate such costs by using the data I collected from the Productivity Program accounting, stored at the Italian Central Archives of the State (ACS), accessed in January 2014. It is harder to estimate the opportunity cost of sending the managers in the US. However, given the average age of trainees was 35 years, it is reasonable to think that more senior people were able to run the firms during this period of leave. Moreover, the US experts started monitoring such companies, contributing to limit the impact of this opportunity cost.

5.1 Short-Run Mechanisms

In the three years after the Productivity Program, US experts periodically visited participating firms. After evaluating the extent to which these companies were implementing the new management practices and/or whether they were using the new machines, they compiled technical reports. I use such reports to provide some anecdotical evidence about the short-run mechanisms of improved performance. This information is available only for firms that received the US assistance.

Using as baseline the year before the intervention,[65] the technical reports indicate that 65 percent of the firms that received management and both transfers started performing routine maintenance of the machines and 71 percent a general maintenance of firm safety condition in the year of intervention. These percentages are, respectively, 87 percent and 92 percent after three years. As a result, interventions to repair machines dropped by 22.3 percent, and workers' reported injuries by 28.5 percent over the same period. Almost all firms re-organized and programmed the tasks of their employees, and organized yearly training courses. Finally, almost all firms promoted an advertising campaigns within 18 months since the study trips and 88 percent of them created an independent marketing research groups with jurisdiction over sales and publicity in the three years after the US intervention.

The technical reports for firms that received the technology transfer indicate that 95 percent of the firms asked for technical assistance in setting up of the new machines more than once and 65 percent more than twice. These implementation issues are fully consistent with my estimates that show limited and insignificant effects in the years immediately after the Productivity Program. Moreover, I do not find any evidence of a reduction in interventions to repair machines or in workers' reported injuries.

5.2 Price Effects

The improved performance of firms that received the US transfer might have determined an increase in their market power over time. If firms that received the management transfer were able to gain more market power than firms that received the technology transfer (for instance, through marketing strategies), this could explain why the effects of management transfer persisted over time.

To capture these effects, I would need to observe firm markups. However, the balance sheets do not report such information. To try to bypass this issue, I use the method pioneered by De Loecker and Warzynski (2012) to derive a firm-level markups estimation. This approach computes markup without relying on detailed market-level demand

[65] Baseline year is 1952 for firms that received the US assistance in 1952.

information; it only requires standard firm-level data on input use and production output. The main assumptions are that at least one input is variable (therefore, not subject to adjustment costs) and that firms minimize costs. The intuition is that, under cost minimization, the output elasticity of a variable factor of production is only equal to its expenditure share in total revenue when price equals marginal cost of production. Under any form of imperfect competition, however, the relevant markup drives a wedge between the input's revenue share and its output elasticity. Therefore, the markup is calculated via

$$\mu_{it} = \underbrace{\left(\frac{\partial Q_{it}(\cdot)}{\partial X_{it}} \cdot \frac{X_{it}}{Q_{it}}\right)}_{\text{output elasticity}} \Big/ \underbrace{\left(\frac{p_{it}^X X_{it}}{p_{it}^Q Q_{it}}\right)}_{\text{revenue share}}$$

where μ_{it} is the markup of firm i at time t; Q_{it} is firm output; X_{it} is the variable input; $p_{it}^X X$ is the expenditure on input X; and $p_{it}^Q Q$ is total revenue. I estimate the output elasticity from the production function, estimated using the Ackerberg et al. (2006) method, where labor is the variable input and deflated sales the production output, and I calculate the revenue share on labor from balance sheets.[66]

I re-estimate equation 1, controlling for the markup variation over time

$$\begin{aligned} \text{outcome}_{it} &= \alpha + \beta \text{ExpProv}_p + \sum_{\tau=-5}^{15} \delta_{t+\tau}(\text{ExpProv}_p \cdot \text{PostPP}_{t+\tau}) + \theta_1 \ln(\mu_{it}) + \\ &\quad \theta_2(\ln(\mu_{it}) \cdot \text{ExpProv}_p) + \sum_{\tau=-5}^{15} \theta_{3(t+\tau)}(\ln(\mu_{it}) \cdot \text{ExpProv}_p \cdot \text{PostPP}_{t+\tau}) + \\ &\quad \lambda_r + \zeta_s + \nu_t + \epsilon_{it} \end{aligned} \tag{5}$$

where the definition of the variables is the same as in equation 1 and μ_{it} is the estimated mark-up. If the long run effects of the Productivity Program were driven by the increase the markup, the coefficients $\delta_{t+\tau}$'s should not longer be significant.

Table A.14 reports the δs estimates from equation 5, separately for management, technology and both transfers. One year after the Productivity Program, the estimates are very close in magnitude to those from equation 1 for all the transfers and all the outcomes. This suggests that, in the short run, the Productivity Program had a small impact on firm market power. Between 5 and 15 years after the US intervention, the estimates from equation 5 are smaller than estimates from equation 1. The pattern over time, however,

[66] I use deflated sales, instead of physical output, in computing the output elasticity which is potentially subject to the omitted price variable bias discussed in Klette and Griliches (1996). This, if anything, might downward bias the estimates of the markup. However, under a Cobb-Douglas technology, the output elasticity reduces to a constant, and therefore the bias induced by unobserved prices impacts only the level of markup but not how it changes over time, which is the outcome of interest in this context. Additional details can be found in De Loecker and Warzynski (2012).

is fully consistent with the estimates from equation 1. Therefore, the change in market power of firms that received the Productivity Program is correlated with its long-run effects, but cannot entirely explain its pattern over time.

5.3 Exports

The study trips in the US might have allowed Italian firms establishing contacts with US firms and with trainees from other European countries. Consequently, their firms might have been able to create a network with other European and US firms and started exporting. Moreover, a process of "learning-by-exporting" may have been started. Upon entering into export markets (either because of the network effects or because of the increase in productivity), firms might have gained new knowledge and expertise which allowed them keeping improving their efficiency (De Loecker (2007); Van Biesebroeck (2006); Aw et al. (2000); Grossman and Helpman (1991)). If managers were in charge of making the export decisions, the export channel may explain why the effects of management transfer persisted over time.

In 1951 about 14 percent of the firms that applied for the Productivity Program were exporters, so I first examine whether the US assistance increased the probability of exporting for non-exporters firms. I estimate a linear probability model in each year after the US intervention $\tau = 1, ..., 15$ via the equation

$$\text{Exports}_{ispr(t=\tau)} = \alpha + \beta \text{ExpProv}_p + \lambda_r + \zeta_s + \epsilon_{ispr(t=\tau)} \quad (6)$$

where Exports_{ispr} is an indicator variable that equals one if firm i in industry s, located in province p in region r is exporting in year τ; α is a constant term; ExpProv_p is an indicator variable that equals one if firm i is located in an *experimental province*. λ_r is *pilot region* fixed effects and ζ_s is manufacturing industries fixed effects; and ϵ_{ispr} is the error term.

Table 5, column 1, reports the marginal effects. Management and both transfers increased firm probability of exporting from, respectively, 2.4 and 3.3 percent one year after the US intervention to, respectively, 29.0 and 31.5 percent after 15 years. Technology transfer increased the probability of exporting by 1.3 percent in one year and by 5.1 after 15 years.

To estimate the networking/export effects, I restrict the sample to firms that did not start exporting after the Productivity Program and re-estimate equation 1. These estimates, reported in Table 5, column 2-3, are smaller in magnitude than the effects of the full sample, suggesting that firms which started exporting after the Productivity Program improved more their performance. However, the pattern over time for non-exporters is the same than for the full sample. Restricting the sample to non-exporters might lead to lower estimates because these firms were less productive than those that started exporting, even if the exports channel did not matter. However, this result shows that not all the long-run effect of the program is coming from the export channel.

5.4 Capital and Labor

The Productivity Program might have indirectly affected the production input, such as physical capital and labor. For instance, after the study trips, participating firms might have been able to make fewer mistakes in how they employed physical capital. Such effects might have been more relevant for firms that received the management transfer because usually managers take the operational decisions within the firm. Moreover, one part of the study trips program for managers regarded the organization and the management of labor. As a consequence, trained managers might have been able to retain workers better and increase the skills of the firm employees.

On the capital side, first I test whether firms that received US transfers were more likely to undertake new investment. I estimate the following linear probability model

$$\text{Investment}_{ispr(t=\tau)} = \alpha + \beta \text{ExpProv}_p + \lambda_r + \zeta_s + \epsilon_{ispr(t=\tau)} \tag{7}$$

where Investment_{ispr} is a dummy that equals one if firm i in industry s, located in province p in region r undertook a new investment in year t and the other variables are as defined in equation 6. Then, I re-estimate equation 1, using as dependent variables return-to-asset, and capital-to-labor ratio. The results, reported in Table 6, columns 1-3, indicate that investment and capital-to-labor ratio increased by, respectively, 9.5 and 7.9 percent one after the the US intervention for firms that received technology transfer. This is a mechanical reflection of the injection of US machines. However, in the longer run there is no additional increase and the ROA has a cumulative impact of merely 1.7 percent. By contrast, for firms that received management, there was no immediate increase in any of these variables , but, in the longer run, there was a positive impact. For example, after 15 years, investment rate went up by 57.3 percent, ROA by 17.9 percent, and capital-to-labor ratio by 23.9 percent. For firms that received both transfers, there was both a short-run effects, as the US machines were received, and a long-run effect.

On the labor side, first I test whether firms that received US transfers were able to access to better leaders, by looking at the education of new hired top executives. I estimate the following linear probability model

$$\text{Managers}_{ispr(t=\tau)} = \alpha + \beta \text{ExpProv}_p + \lambda_r + \zeta_s + \epsilon_{ispr(t=\tau)} \tag{8}$$

where Managers$_{ispr}$ is a dummy that equals one if firm i in industry s, located in province p in region r hired an executive with college degree in year t and the other variables are as defined in equation 6. After the US intervention, firms that received management and both transfers increased the probability of hiring an executive with college degree by, respectively, 5.6 and 6.7 percent after 5 years and by 29.1 and 32.9 percent after 15 years (Table 6, column 4, Panels A and C). These estimates are considerably large, especially considering that the number of college degrees in the 1960s was very low (ISTAT (1986)). By contrast, there is no evidence of effects for firms that applied for the technology transfer.

I also try to test whether firms that received the transfers were able to access better workers. One good proxy for quality of workers would be their education, but balance sheets do not report this information. For this reason, I look at other two outcomes: investment in employees training, defined as the ratio between firm expenditures in employees training and total firm expenditures on production inputs, and real wages. I estimate equation 1 using investment in employees training and real wages as dependent variables. I find that firms that received management and both transfers increased the investment in employees training by, respectively, 15.5 and 16.7 percent after 5 years and 38.6 and 38.7 percent after 15 years. Finally, real wages in firms that received management and both transfers went up by, respectively, 15.7 and 18.1 percent in 15 years, compared to a national increase of mere 2 percent. Although interpreting real wages as a proxy for labor productivity would suggest that these workers become more productive, real wages could also reflect higher bargaining power.

For firms that received the technology transfer, I do not find evidence of any changes on labor force (Table 6, columns 4-6, Panel B). This result is consistent with the evidence presented in Doms et al. (1997), which show that the adoption of new technology does not typically lead to a significant change in the skill level of the employees of the firm.

6 Robustness Checks

In this section, I address possible threats to the identification and I discuss the validity of the results.

6.1 Selection of *Experimental Provinces*

A possible threat to the identification strategy of this paper is that the selection of firms that participated in the program was not random. The evidence presented in Section 3 shows that firms in *experimental* and in *nonexperimental provinces* were comparable in terms of their observed characteristics when the formers were selected and were on the same trend in the years before the selection. However, concerns regarding selection on unobservables are not addressed.

If firms that eventually received the Productivity Program had been randomly selected, I could have simply compared receiving firms and non-receiving firms that applied for the same US transfer in the post-Productivity Program period. Appendix Table A.17 reports such estimations. The estimates obtained excluding the pre-program period are substantially the same as the difference-in-differences coefficients, which confirms that the budget cut was plausibly exogenous.

6.2 Attrition

Firms in *experimental* and *nonexperimental provinces* show a different survival rate after the implementation of the Productivity Program. To examine the robustness of my results to this differential attrition, I use the bounding approach of Lee (2002) to construct upper and lower bounds for the Productivity Program effects. Briefly, the Lee (2002) approach requires obtaining the same share of observations in *experimental* and *nonexperimental provinces*, by trimming the "excess observations" in *experimental provinces*. The lower bound trims the largest values of the outcome variable, the upper bound the lowest value. The key identifying assumption required for implementing the Lee (2002)'s bounds is a monotonicity assumption which assumes that assignment to the Productivity Program affects sample selection only in one direction. In other words, this requires assuming that there are some firms that would have attrited if they had not been assigned to *experimental provinces*, but that no firm attrits as a result of being assigned to *experimental provinces*. This assumption seems plausible in the examined research design.

Lee (2002)'s bounds are reported in Appendix Table A.18. The bounds are tightened by sales, assets, TFP, sector, *pilot region*, ownership and export dummies. Although the bounds are pretty large, they confirm the results discussed in 4.

6.3 Robustness to Reporting Effects

The values of three main outcomes, sales, employment and TFPR, are reported in (or estimated from) firm balance sheets. Given the self-reported nature of the balance sheets data, possible concerns are both misreporting and changes in reporting behavior caused by the Productivity Program. These effects are unlikely to be a major factor in this research, for a number of reasons. First, from the follow-up notes compiled by the US experts visiting Italian plants, it seems that firm performance improved due to changes in management practices and production technology. Second, survivorship and employment are little subject to reporting errors and have a pattern similar to sales and TFPR. Third, the Productivity Program did not organize specific sessions for reporting and accounting, and I do not observe changes in balance sheets structure of receiving firms after the program.

Another concern is represented by the Hawthorne effects. They involve the possibility that just being part of the Productivity Program and being monitored by the US during the follow-up period had improved firm performance. For instance, study trips participants or employees could have been more motivated or have worked harder during the three years of monitoring period. Although the data does not allow ruling out this possibility, the Hawthorne-type effects would be expected to dissipate after the follow-up period and so could not explain why the results persisted over time.

7 Conclusions and Discussion

In this paper, I use evidence from a unique historical episode, the Marshall Plan Productivity Program, to estimate the long run effects of management and technology transfers on firm performance. This is, to the best of my knowledge, one of the first studies that uses non-experimental data to examine the long-term impact of management and technology. To do so, I collected and digitized balance sheets for all the Italian firms eligible to participate in this program and the application records for firms that applied for it. The identification strategy exploits that, after all the applications had been submitted and reviewed, the US unexpectedly cut the budget for the Productivity Program. As a result, among the applicant firms, some received the transfer they applied for and some did not, based on their geographical location.

Using a survival analysis and a difference-in-differences approach, I document that firms that received the US transfers were more likely to survive and have larger sales, employment, and productivity. Moreover, management transfer produced larger and more persistent effects than technology transfer and that the impact of receiving received both transfers simultaneously is broader than the sum of the two separate transfers. To explain these results, I investigate possible mechanisms. In particular, I analyze whether firms that participated in the Productivity Program increased their market power and whether the increase differed across different transfers. Although I find that firms that received any transfer increased in their market power, not all of the downstream effects appears driven by such change. Similarly, I find evidence of larger increase in the probability of exporting for firms that received management, but repeating the main analysis only on firms that did not start exporting in response to the US intervention leads to estimates that follow the same long run pattern. Finally, I study whether the Productivity Program indirectly affected the production input, such as physical capital and labor. In the long run, firms that received management and joint management and technology transfers had significantly higher investment rate, became more profitable and more capital intensive. Moreover, I find evidence of an increase in the quality of labor force: such firms were able to access better leaders, better workers, and paid higher real wages.

What are the implications of this research for public policy? Italy in the 1950s is comparable to some developing countries today, where business training and technology transfer are among the most common forms of active support for small and medium firms (Mckenzie and Woodruff (2012)). However, the evaluations of such policies are usually made over a limited number of months or years and on relatively small samples. Therefore, the Productivity Program could be informative by offering longer-term analysis of a similar policy that involved a fairly large number of firms. Another advantage of this research is that I observe the population of firms that could have potentially received the Productivity Program, while in most settings only firms that apply for the program can be observed. The fact that firms that did not apply for the Productivity Program were, on average, smaller and less productive than firms that applied for, might suggest that "worse" firms are not aware of their condition. In a developing-country context, this might mean that firms with more need of business training and technology transfer might not receive them because they do not apply for such programs.

Finally, this paper contributes to to the literature about the effects of the international aid given by the US to Europe after WWII under the Marshall Plan. At the end of the first part of the Marshall Plan aid, in 1951, the industrial production and GDP per capita of most European countries were at higher level than in 1938. Moreover, during the 1950s Europe experienced a "golden" age. A long-standing debate among economic historians seek to understand the role of the Marshall Plan on European recovery and development. While Mayne (1970) argued that Marshall Plan was as "a precondition of all later [European] affluence and economic miracles" (Mayne (1970), p. 328), Milward (1984) argued that European recovery had already started in 1948, before the Plan's implementation. More recently, Eichengreen et al. (1992) recognized that the US intervention had a level effect on European recovery, although most of the Plan's effects were only temporary. I focus on a part of the Marshall Plan that involved the transfer of managerial and technological knowledge, a form of "useful knowledge" described by Mokyr (2003). Although my findings can only apply to a specific program of the Marshall Plan and to one country, Italy, they suggest that the Marshall Plan had a substantial impact on firms' productivity.

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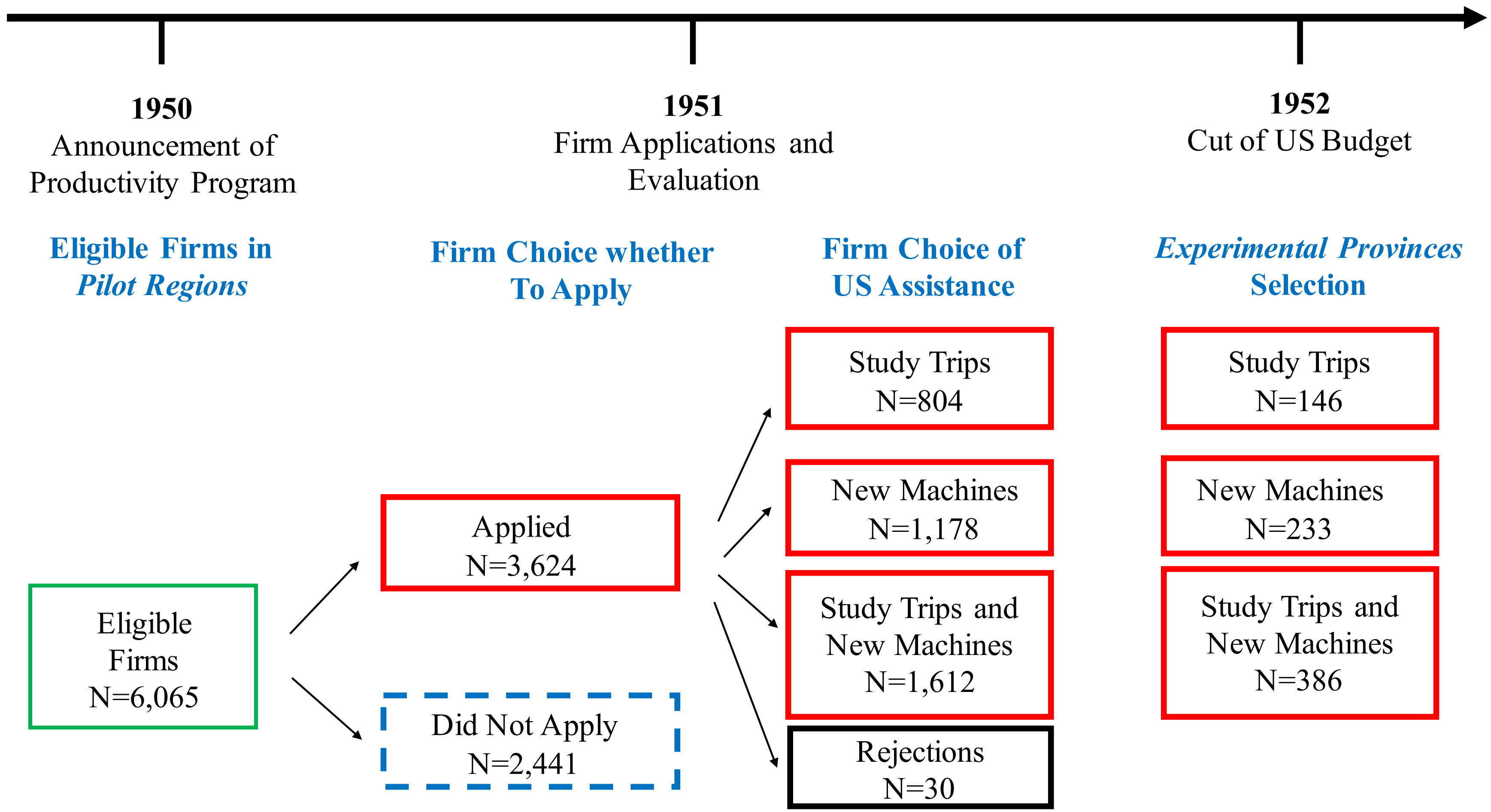
Figures and Tables

Figure 1: Timeline of the Productivity Program in Italy, 1950-1952

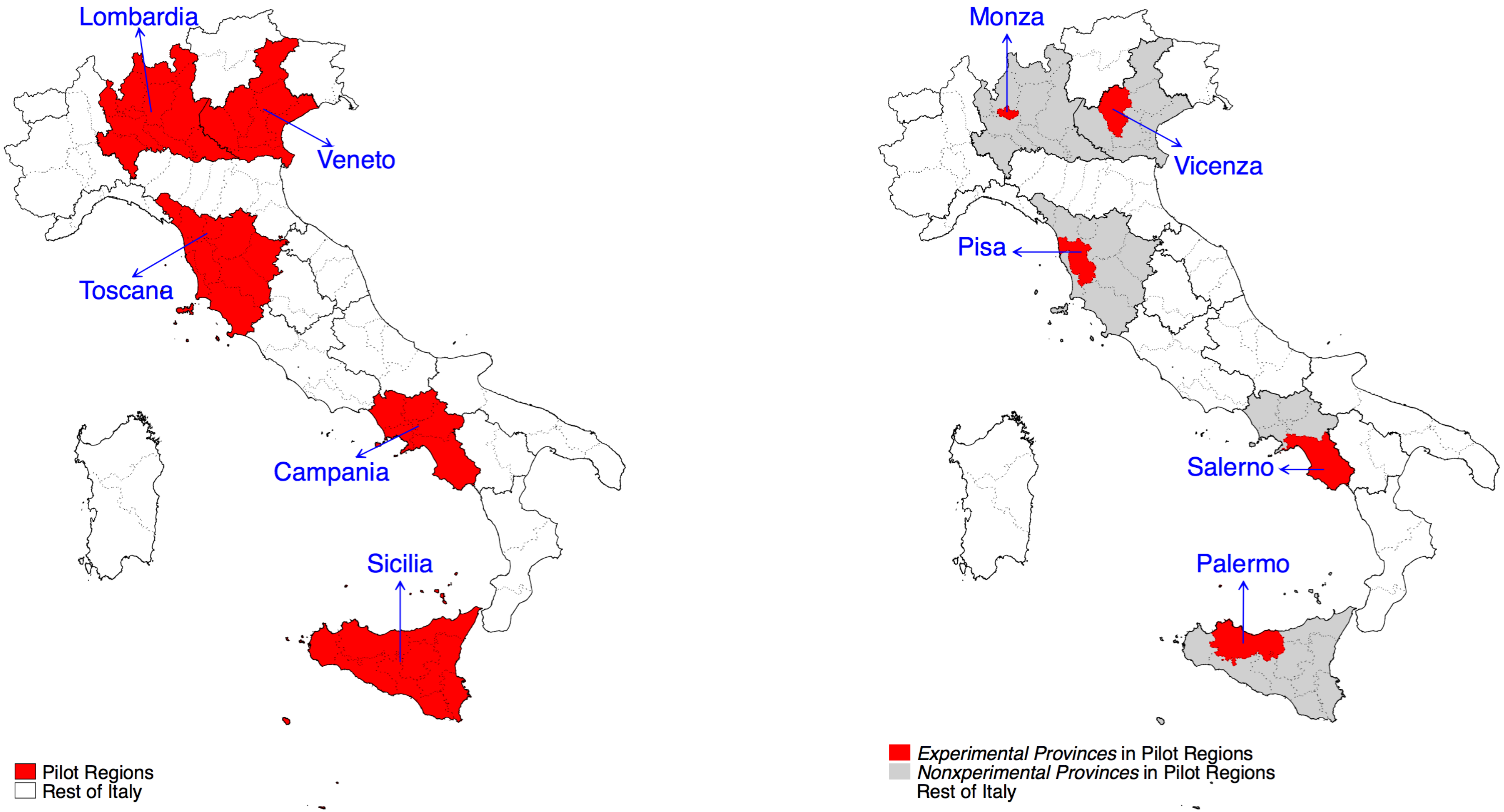


Notes. Timeline of the Productivity Program in Italy in the period 1950-1952.

Figure 2: *Pilot Regions* and *Experimental Provinces* Selected for the Productivity Program, 1950-1952

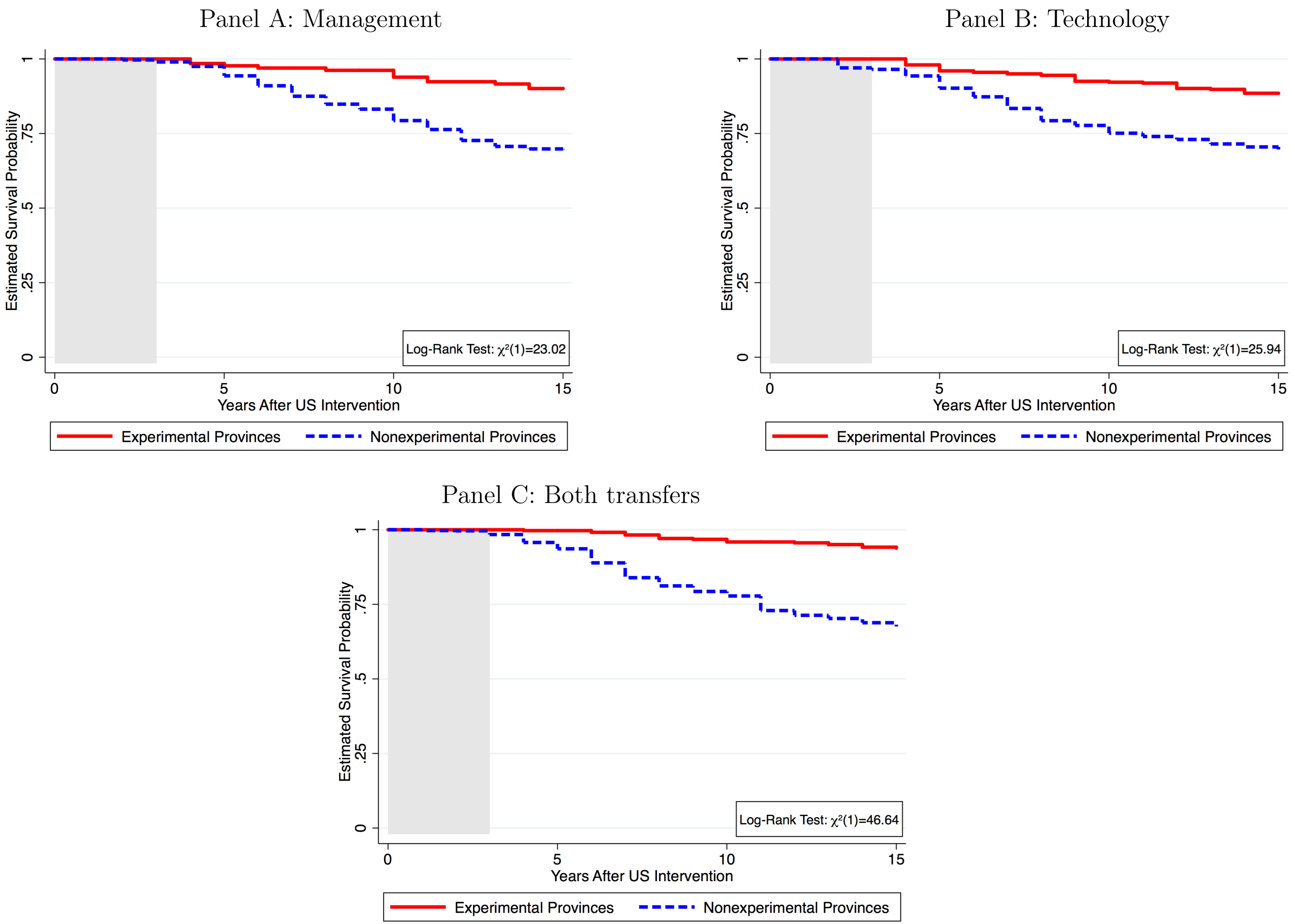
Panel A: *Pilot Regions* in 1950

Panel B: *Experimental Provinces* in 1952



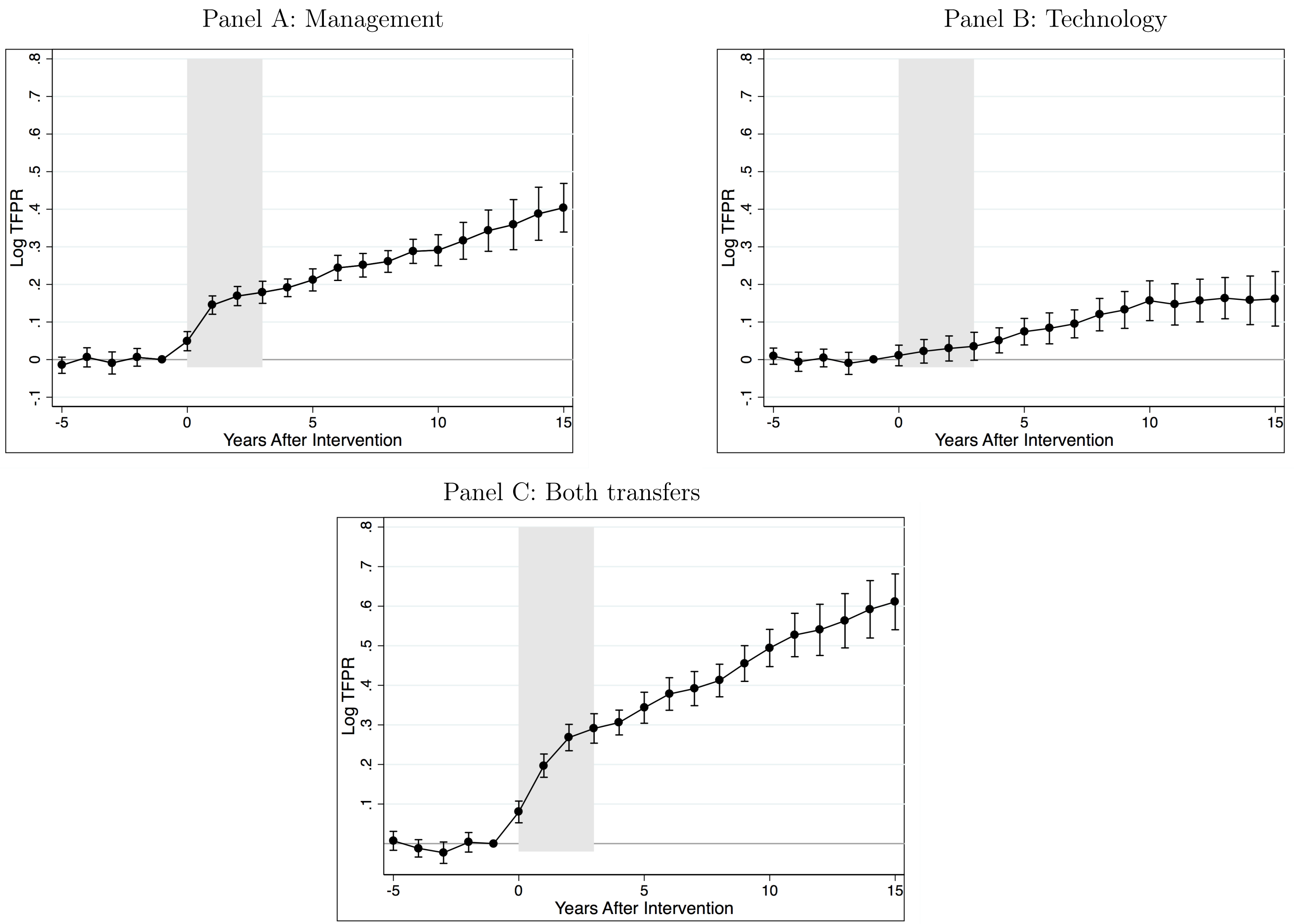
Notes. *Pilot regions* chosen for the pilot phase of the Productivity Program in 1950 (Panel A) and *experimental provinces* selected after the US budget cut in 1952 (Panel B). Only firms located in *experimental provinces* eventually received the US transfers, conditionally on having applied for the program.

Figure 3: The Effects of Productivity Program on Firm Survivorship



Notes. Kaplan-Meier survivor function for 731 firms that applied for management transfer (Panel A), 1,053 firms that applied for technology transfer (Panel B), and 1,468 firms that applied for both transfers (Panel C). In each panel, the Kaplan-Meier survivor function is estimated separately for firms in *experimental* and *nonexperimental provinces*. Data are provided at firm level. The gray shaded area corresponds to the three-year follow-up period after the US intervention. Log-rank test, stratified by *pilot regions*, of the null hypothesis of equality of survival functions between the two groups is reported.

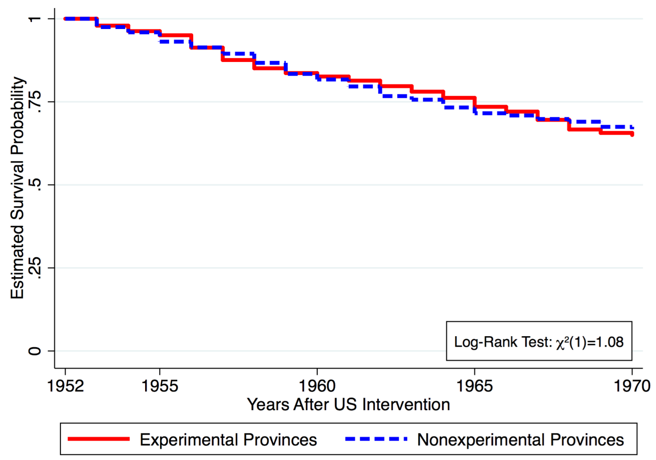
Figure 4: The Effects of Productivity Program on Firm TFPR



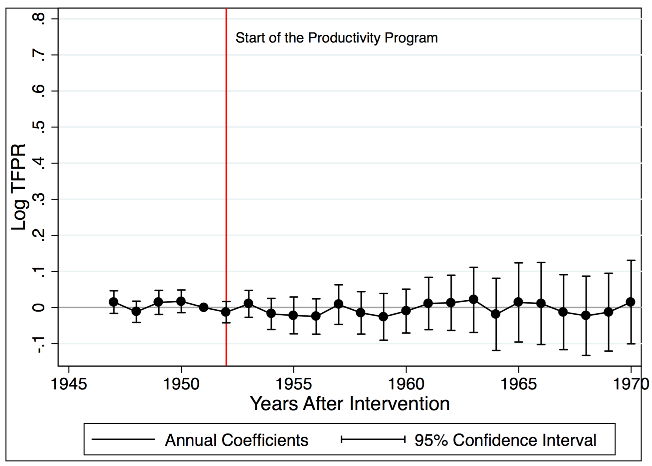
Notes. Coefficients estimated from equation 1 for 731 firms that applied for management transfer (Panel A), 1,053 firms that applied for technology transfer (Panel B), and 1,468 firms that applied for both transfers (Panel C). Data are provided at firm level. The US intervention year is normalized to zero and the gray shaded area corresponds to the three-year follow-up period. The dependent variable, log TFPR, is total factor productivity revenue, estimated using the Ackerberg et al. (2006) method. Standard errors are clustered at province level.

Figure 5: The Effects of Productivity Program on Firms that Did Not Apply for the Productivity Program

Panel A: Kaplan-Meier Curve



Panel B: TFPR



Notes. Panel A plots the Kaplan-Meier survivor function for 2,441 firms that did not applied for the Productivity Program. The Kaplan-Meier survivor function is estimated separately for firms in *experimental* and *nonexperimental provinces*. Data are provided at firm level. Log-rank test, stratified by *pilot regions*, of the null hypothesis of equality of survival functions between the two groups is reported. Panel B plots the coefficients from OLS regression predicting log TFPR for the same group of firms. The vertical line indicates the year in which the Productivity Program started (1952). Data are provided at firm level. Log TFPR is total factor productivity revenue, estimated using the Ackerberg et al. (2006) method. Standard errors are clustered at province level.

Table 1: Summary Statistics for the 6,065 Firms Eligible to Apply for the Productivity Program, 1951

	All Eligible Firms				Management	Technology	Both Transfers	Did Not Apply
	Mean	St. Dev.	Min	Max	Mean	Mean	Mean	Mean
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Plants per firm	1.33	1.58	1	5	1.25	1.45	1.62	1.10
Employees per firm	47.67	56.39	15	250	41.27	59.89	66.47	31.32
Current assets (k USD)	1,632.59	2,355.67	356.72	9,432.76	1,891.49	1,545.82	1,932.59	1,389.37
Annual sales (k USD)	1,015.63	1,956.78	193.46	7,487.91	915.63	945.78	1,293.44	897.88
Value added (k USD)	491.55	773.45	60.93	3,945.09	507.55	558.41	633.28	359.30
Age	12.41	7.44	4	43	10.93	15.67	9.87	13.00
Productivity (log TFPR)	2.48	0.51	1.98	3.71	2.67	2.55	2.70	2.24
Export	0.13	0.33	0	1	0.13	0.12	0.14	0.13
Family-managed	0.43	0.50	0	1	0.25	0.33	0.27	0.64
Submit application	0.59	0.49	0	1	1	1	1	0
Management	0.13	0.34	0	1	1	0	0	0
Technology	0.20	0.39	0	1	0	1	0	0
Both Transfers	0.27	0.44	0	1	0	0	1	0
Managers in US	n/a	n/a	n/a	n/a	2.33	n/a	2.45	n/a
Engineers in US	n/a	n/a	n/a	n/a	n/a	3.19	3.37	n/a
Loans (k USD)	n/a	n/a	n/a	n/a	n/a	223.49	250.77	n/a
Observations	6,065	n/a	n/a	n/a	809	1,190	1,625	2,441

Notes. Summary statistics for the 6,065 firms eligible to apply for the Productivity Program in 1951. Data are provided at firm level. Columns 1, 2, 3, and 4 present, respectively, mean, standard deviation, minimum and maximum of characteristics and outcomes of all the 6,065 eligible firms. Columns 5, 6, 7, and 8 report the mean of the same variables, separately, for 809 firms that applied for management transfer, 1,190 firms that applied for technology transfer, 1,625 firms that applied for both transfers, and 2,441 firms that did not apply. *Plants per firm* reports the total number of plants per firm; *Employees per firm* reports the number of employees per firm; *Current assets*, *Annual sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method; *Export*, *Family-managed*, *Submit application*, *Management*, *Technology*, *Both transfers* are indicators that equal one if, respectively, firm exported, was family-managed (as defined on p. 11), applied for the Productivity Program, chose management transfer, chose technology transfer, chose both transfers; *Managers in US*, *Engineers in US* and *Loans (k USD)* report, respectively, the number of managers or engineers for which a visit in US firms was asked and the amount of loans requested.

Table 2: Verifying Balance in Terms of Firms' Characteristics and Outcomes between *Experimental* and *Nonexperimental Provinces*

	Management (1-3)			Technology (4-6)			Both transfers (7-9)		
	Experimental Provinces		Difference	Experimental Provinces		Difference	Experimental Provinces		Difference
	Yes	No		Yes	No		Yes	No	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Plants per firm	1.17	1.28	-0.122	1.32	1.50	-0.17	1.56	1.66	-0.12
	(1.21)	(1.25)	(0.245)	(1.29)	(1.31)	(0.298)	(1.45)	(1.55)	(0.301)
Employees per firm	37.06	42.52	-5.89	57.66	61.20	-3.67	69.26	66.30	2.33
	(39.87)	(40.63)	(15.69)	(44.65)	(46.54)	(12.33)	(47.85)	(49.82)	(8.76)
Current assets (k USD)	1,943.21	1,894.39	47.39	1,497.58	1,581.78	-98.58	2,037.45	1,920.07	115.34
	(2,678.91)	(2,741.57)	(98.74)	(2,453.12)	(2,333.94)	(156.01)	(2,671.82)	(2,891.01)	(167.23)
Annual sales (k USD)	946.71	915.69	30.92	958.43	954.67	3.45	1,263.07	1,316.72	-55.61
	(1,672.39)	(1,655.78)	(78.95)	(1,709.43)	(1,679.19)	(4.94)	(1,908.45)	(1,782.33)	(89.13)
Value added (k USD)	499.39	513.22	-14.56	567.11	563.36	3.94	617.31	645.02	-25.49
	(643.12)	(657.90)	(21.92)	(601.23)	(610.89)	(5.69)	(701.56)	(764.90)	(38.21)
Age	10.21	11.17	-1.01	14.69	16.11	-1.56	11.35	9.51	1.81
	(6.89)	(7.03)	(2.45)	(8.91)	(9.68)	(3.45)	(7.89)	(8.03)	(4.55)
Productivity (log TFPR)	2.63	2.70	-0.07	2.55	2.58	-0.05	2.67	2.74	-0.06
	(0.47)	(0.45)	(0.22)	(0.61)	(0.59)	(0.12)	(0.88)	(0.93)	(0.56)
Export	0.14	0.13	0.01	0.11	0.12	-0.01	0.14	0.14	0.01
	(0.34)	(0.34)	(0.04)	(0.32)	(0.32)	(0.03)	(0.34)	(0.35)	(0.08)
Family-managed	0.25	0.25	0.02	0.35	0.33	-0.03	0.22	0.29	-0.09
	(0.44)	(0.43)	(0.05)	(0.43)	(0.47)	(0.06)	(0.41)	(0.45)	(0.11)
% application	0.11	0.14	-0.03	0.18	0.20	-0.02	0.30	0.26	0.05
	(0.32)	(0.34)	(0.04)	(0.39)	(0.40)	(0.05)	(0.46)	(0.44)	(0.08)
Observations	146	658	n/a	233	945	n/a	386	1,226	n/a
Total eligible firms	1,278	4,757	n/a	1,278	4,757	n/a	1,278	4,757	n/a

Notes. Balancing tests for 804 firms that applied for management transfer (columns 1-3), 1,178 firms that applied for technology transfer (columns 4-6), and 1,612 firms that applied for both transfers (columns 7-9). 30 firms whose applications were rejected are excluded. Data are provided at firm level. Columns 1-2, 4-5, and 7-8 present mean and standard deviation (in parenthesis) of characteristics and outcomes for firms in *experimental* and in ab *experimental province*, separately for management, technology transfer and both transfers. Columns 3, 6, and 9 report the coefficients estimated from regressing each variable on a dummy for being located in an *exeperimental province* and a full set of *pilot regions* fixed effects. Lombardia is the excluded *pilot regions*. Standard errors are clustered at province level. *Plants per firm* reports the total number of plants per firm; *Employees per firm* reports the number of employees per firm; *Current assets*, *Annual sales* , and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method; *Export* and *Family-managed* are indicators that equal one if, respectively, a firm exported and was family-managed, as defined on p. 11.

Table 3: The Effects of the Productivity Program on Sales, Employment, and TFPR

	Log sales (1-4)				Log employees (5-8)				Log TFPR (9-12)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Management												
Year1AfterPP	0.070***	0.063***	0.073***	0.059***	0.011	0.008	0.012	0.006	0.153***	0.146***	0.159***	0.145***
	(0.014)	(0.011)	(0.010)	(0.007)	(0.015)	(0.011)	(0.013)	(0.008)	(0.031)	(0.027)	(0.027)	(0.012)
Year5AfterPP	0.125***	0.119***	0.142***	0.104***	0.069***	0.067***	0.076***	0.064***	0.221***	0.215***	0.234***	0.212***
	(0.025)	(0.022)	(0.027)	(0.018)	(0.019)	(0.016)	(0.023)	(0.014)	(0.037)	(0.032)	(0.039)	(0.015)
Year10AfterPP	0.208***	0.205***	0.235***	0.199***	0.219***	0.209***	0.257***	0.205***	0.312***	0.303***	0.341***	0.291***
	(0.031)	(0.029)	(0.045)	(0.027)	(0.046)	(0.038)	(0.051)	(0.029)	(0.051)	(0.049)	(0.055)	(0.021)
Year15AfterPP	0.354***	0.344***	0.406***	0.336***	0.326***	0.312***	0.384***	0.304***	0.421***	0.414***	0.473***	0.404***
	(0.049)	(0.043)	(0.061)	(0.039)	(0.054)	(0.047)	(0.073)	(0.039)	(0.065)	(0.044)	(0.079)	(0.033)
Observations	10,760	10,760	13,902	15,000	10,760	10,760	13,902	15,000	10,760	10,760	13,902	15,000
Number of firms	538	538	731	750	538	538	731	750	538	538	731	750
B. Technology												
Year1AfterPP	0.013	0.009	0.015	0.008	0.018	0.013	0.021	0.012	0.028	0.023	0.032	0.022
	(0.019)	(0.014)	(0.016)	(0.007)	(0.022)	(0.017)	(0.025)	(0.014)	(0.038)	(0.027)	(0.033)	(0.021)
Year5AfterPP	0.051***	0.047***	0.058***	0.045***	0.041**	0.037**	0.047**	0.035**	0.083***	0.079***	0.091***	0.074***
	(0.017)	(0.014)	(0.015)	(0.010)	(0.018)	(0.016)	(0.023)	(0.015)	(0.022)	(0.019)	(0.025)	(0.018)
Year10AfterPP	0.081***	0.075***	0.094***	0.071***	0.084**	0.082**	0.095**	0.079**	0.181***	0.165***	0.191***	0.157***
	(0.030)	(0.027)	(0.034)	(0.025)	(0.039)	(0.036)	(0.042)	(0.034)	(0.037)	(0.030)	(0.047)	(0.027)
Year15AfterPP	0.099**	0.095**	0.114**	0.090**	0.105**	0.100**	0.125**	0.095**	0.178***	0.172***	0.212***	0.162***
	(0.049)	(0.043)	(0.055)	(0.037)	(0.047)	(0.043)	(0.049)	(0.041)	(0.048)	(0.041)	(0.055)	(0.037)
Observations	14,960	14,960	20,213	15,000	14,960	14,960	20,213	15,000	14,960	14,960	20,213	15,000
Number of firms	748	748	1,178	750	748	748	1,178	750	748	748	1,178	750
Sample	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched
Pilot region FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Firm FE	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No

(Continues)

Table 3: Continued

	Log Sales (1-4)				Log Employees (5-8)				Log TFPR (9-12)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
C. Both transfers												
Year1AfterPP	0.092***	0.087***	0.094***	0.085***	0.049***	0.044***	0.051***	0.041***	0.208***	0.199***	0.212***	0.197***
	(0.019)	(0.015)	(0.017)	(0.017)	(0.017)	(0.015)	(0.014)	(0.010)	(0.044)	(0.041)	(0.053)	(0.015)
Year5AfterPP	0.252***	0.244***	0.279***	0.161***	0.185***	0.181***	0.197***	0.177***	0.351***	0.347***	0.358***	0.343***
	(0.021)	(0.023)	(0.025)	(0.022)	(0.043)	(0.038)	(0.059)	(0.033)	(0.044)	(0.040)	(0.049)	(0.020)
Year10AfterPP	0.310***	0.290***	0.369***	0.329***	0.389***	0.374***	0.429***	0.368***	0.505***	0.500***	0.533***	0.494***
	(0.039)	(0.034)	(0.034)	(0.035)	(0.056)	(0.054)	(0.068)	(0.052)	(0.067)	(0.063)	(0.071)	(0.024)
Year15AfterPP	0.470***	0.459***	0.602***	0.457***	0.530***	0.513***	0.591***	0.504***	0.623***	0.615***	0.705***	0.611***
	(0.058)	(0.062)	(0.059)	(0.057)	(0.081)	(0.075)	(0.085)	(0.071)	(0.055)	(0.049)	(0.085)	(0.036)
Observations	21,640	21,640	27,870	15,000	21,640	21,640	27,870	15,000	21,640	21,640	27,870	15,000
Number of firms	1,082	1,082	1,468	750	1,082	1,082	1,468	750	1,082	1,082	1,468	750
Sample	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched
Pilot region FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Firm FE	No	Yes	No	No	No	Yes	No	No	No	Yes	No	No

Notes. Columns 1-3, 5-7, and 9-11 report the coefficients estimated from equation 1 for firms that applied for management transfer (Panel A), firms that applied for technology transfer (Panel B) and firms that applied for both transfers (Panel C). Columns 4, 8, and 12 report coefficients estimated from equation 2. In columns 1-2, 5-6, and 9-11 the samples include only that survived in the 15 years after the Productivity Program; in columns 3, 7, and 11 all applicant firms are included; in columns 4, 8 and 12 the samples include only matched firms. Data are provided at firm level. The dependent variables are logged deflated *sales*, converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (columns 9-12). Standard errors are clustered at the province level in columns 1-3, 5-7 and 9-11, and bootstrapped with 250 replications in columns 4, 8 and 12. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table 4: Effects of the Productivity Program on Firms that Did Not Apply

	Log Sales (1-3)			Log Employees (4-6)			Log TFPR (7-9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year1952	0.019	0.016	0.010	-0.015	-0.011	-0.009	0.014	0.011	0.008
	(0.022)	(0.026)	(0.018)	(0.021)	(0.019)	(0.013)	(0.016)	(0.013)	(0.009)
Year1955	0.014	0.010	0.008	0.027	0.020	0.015	-0.021	-0.019	-0.013
	(0.017)	(0.021)	(0.012)	(0.031)	(0.027)	(0.022)	(0.027)	(0.024)	(0.015)
Year1960	-0.006	-0.004	-0.003	0.015	0.010	0.007	0.013	0.010	0.008
	(0.022)	(0.019)	(0.015)	(0.036)	(0.031)	(0.027)	(0.035)	(0.028)	(0.022)
Year1965	-0.018	-0.013	-0.011	-0.025	-0.019	-0.012	0.017	0.013	0.010
	(0.036)	(0.030)	(0.024)	(0.043)	(0.035)	(0.031)	(0.022)	(0.019)	(0.014)
Year1970	0.028	0.019	0.013	-0.014	-0.011	-0.008	-0.023	-0.018	-0.011
	(0.045)	(0.034)	(0.029)	(0.022)	(0.017)	(0.012)	(0.036)	(0.031)	(0.024)
Observations	49,830	42,146	42,146	49,830	42,146	42,146	49,830	42,146	42,146
Number of firms	2,441	1,621	1,621	2,441	1,621	1,621	2,441	1,621	1,621
Sample	Full	Balanced	Balanced	Full	Balanced	Balanced	Full	Balanced	Balanced
Pilot region FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Firm FE	No	No	Yes	No	No	Yes	No	No	Yes

Notes. Coefficients estimated from equation 1 for firms that did not apply for the Productivity Program. In columns 1, 4, and 7 all firms are included; in columns 2-3, 5-6, and 8-9 the samples are restricted to firms that survived 15 years the Productivity Program. Data are provided at firm level. The dependent variables are logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-3); logged *employement*, reporting the number of employees per firm (columns 4-6); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (columns 7-9). Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table 5: The Effects of the Productivity Program on Exports

	All Firms	Non-Exporters		
	Export	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)
A. Management				
Year1AfterPP	0.024***	0.051***	0.006	0.112***
	(0.009)	(0.008)	(0.014)	(0.025)
Year5AfterPP	0.155***	0.092***	0.042**	0.169***
	(0.026)	(0.026)	(0.018)	(0.037)
Year10AfterPP	0.221***	0.154***	0.125***	0.253***
	(0.039)	(0.033)	(0.029)	(0.042)
Year15AfterPP	0.290***	0.252***	0.233***	0.301***
	(0.044)	(0.047)	(0.036)	(0.039)
Observations	538	3,500	3,500	3,500
Number of firms	538	175	175	175
B. Technology				
Year1AfterPP	0.013**	0.006	0.001	0.013
	(0.006)	(0.010)	(0.006)	(0.023)
Year5AfterPP	0.026**	0.035***	0.028**	0.065***
	(0.012)	(0.012)	(0.014)	(0.015)
Year10AfterPP	0.047***	0.051***	0.057***	0.092***
	(0.008)	(0.018)	(0.017)	(0.029)
Year15AfterPP	0.051***	0.072***	0.083***	0.119***
	(0.013)	(0.027)	(0.024)	(0.038)
Observations	748	7,240	7,240	7,240
Number of firms	748	362	362	362
C. Both transfers				
Year1AfterPP	0.033***	0.061***	0.039***	0.189***
	(0.010)	(0.016)	(0.006)	(0.019)
Year5AfterPP	0.172***	0.223***	0.167***	0.299***
	(0.031)	(0.052)	(0.037)	(0.025)
Year10AfterPP	0.275***	0.295***	0.339***	0.423***
	(0.041)	(0.065)	(0.049)	(0.033)
Year15AfterPP	0.315***	0.378***	0.401***	0.532***
	(0.056)	(0.058)	(0.055)	(0.039)
Observations	1,082	7,360	7,360	7,360
Number of firms	1,082	368	368	368
Model	LPM	OLS	OLS	OLS
Sample	Balanced	Balanced	Balanced	Balanced
Pilot region FE	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes

Notes. Column 1 reports the coefficients estimated from the linear probability model (LPM) of equation 6 for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C) and survived for 15 years after the Productivity Program.. Columns 2-4 report the coefficients estimated from equation 1 for 175 firms that applied for management transfer (Panel A), 362 firms that applied for technology transfer (Panel B) and 368 firms that applied for both transfers (Panel C), that did not start exporting after the Productivity Program and that survived 15 years after the Productivity Program. The dependent variables are *export*, indicator variable that equals one if a firm exported; logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (column 2); logged *employement*, reporting the number of employees per firm (column 3); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (column 4). Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table 6: The Effects of the Productivity Program on Capital and Labor

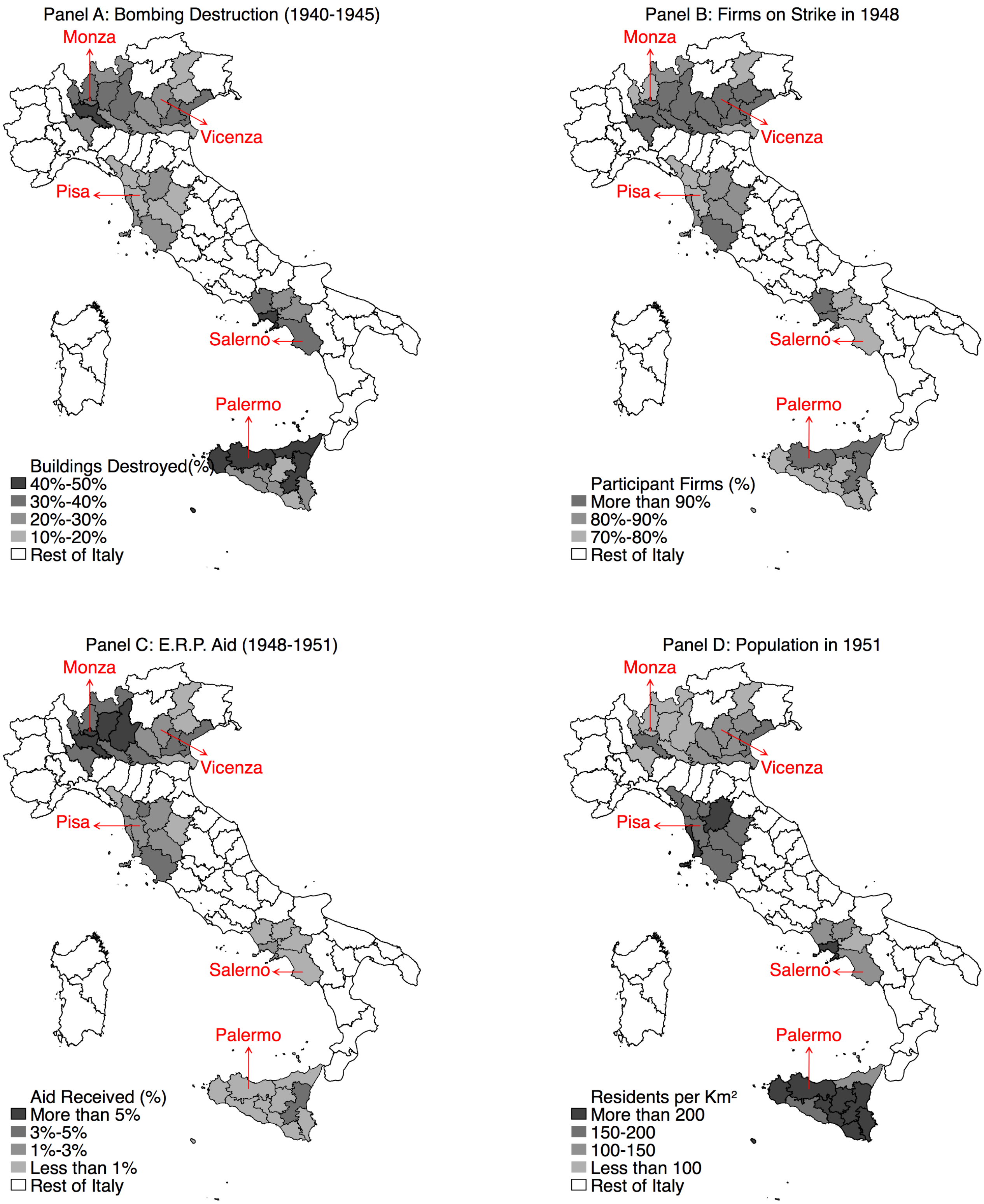
	Investment (1)	Log ROA (2)	Log K/L (3)	Managers (4)	Log Training (5)	Log Real Wages (6)
A. Management						
Year1AfterPP	0.006	0.015***	0.012	0.003	0.021***	0.007*
	(0.008)	(0.004)	(0.015)	(0.008)	(0.005)	(0.004)
Year5AfterPP	0.061***	0.091***	0.076***	0.056***	0.155***	0.047***
	(0.012)	(0.011)	(0.016)	(0.012)	(0.036)	(0.011)
Year10AfterPP	0.227***	0.158***	0.145***	0.193***	0.244***	0.098***
	(0.022)	(0.015)	(0.042)	(0.022)	(0.042)	(0.015)
Year15AfterPP	0.453***	0.265***	0.244***	0.291***	0.386***	0.157***
	(0.027)	(0.014)	(0.067)	(0.027)	(0.067)	(0.014)
Observations	538	10,760	10,760	538	10,760	10,760
Number of firms	538	538	538	538	538	538
B. Technology						
Year1AfterPP	0.091***	0.004	0.112***	0.004	0.001	0.003
	(0.014)	(0.006)	(0.032)	(0.014)	(0.032)	(0.006)
Year5AfterPP	0.097***	0.013	0.122***	0.009	0.011	0.002
	(0.033)	(0.009)	(0.045)	(0.033)	(0.045)	(0.009)
Year10AfterPP	0.095***	0.015**	0.119***	-0.001	-0.006	0.009
	(0.015)	(0.006)	(0.041)	(0.015)	(0.041)	(0.006)
Year15AfterPP	0.091***	0.027***	0.101***	0.008	0.012	0.005
	(0.014)	(0.004)	(0.028)	(0.014)	(0.028)	(0.004)
Observations	748	14,960	14,960	748	14,960	14,960
Number of firms	748	748	748	748	748	748
C. Both transfers						
Year1AfterPP	0.109***	0.025***	0.138***	0.006	0.032***	0.011**
	(0.036)	(0.006)	(0.035)	(0.006)	(0.011)	(0.005)
Year5AfterPP	0.179***	0.061***	0.217***	0.067***	0.167***	0.055***
	(0.059)	(0.009)	(0.055)	(0.019)	(0.044)	(0.015)
Year10AfterPP	0.229***	0.159***	0.301***	0.178***	0.276***	0.093***
	(0.072)	(0.017)	(0.067)	(0.038)	(0.047)	(0.017)
Year15AfterPP	0.467***	0.287***	0.361***	0.329***	0.387***	0.181***
	(0.091)	(0.028)	(0.089)	(0.041)	(0.069)	(0.028)
Observations	1,082	21,640	21,640	1,082	21,640	21,640
Number of firms	1,082	1,082	1,082	1,082	1,082	1,082
Model	LPM	OLS	OLS	LPM	OLS	OLS
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Pilot region FE	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	No	Yes	Yes	No	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes

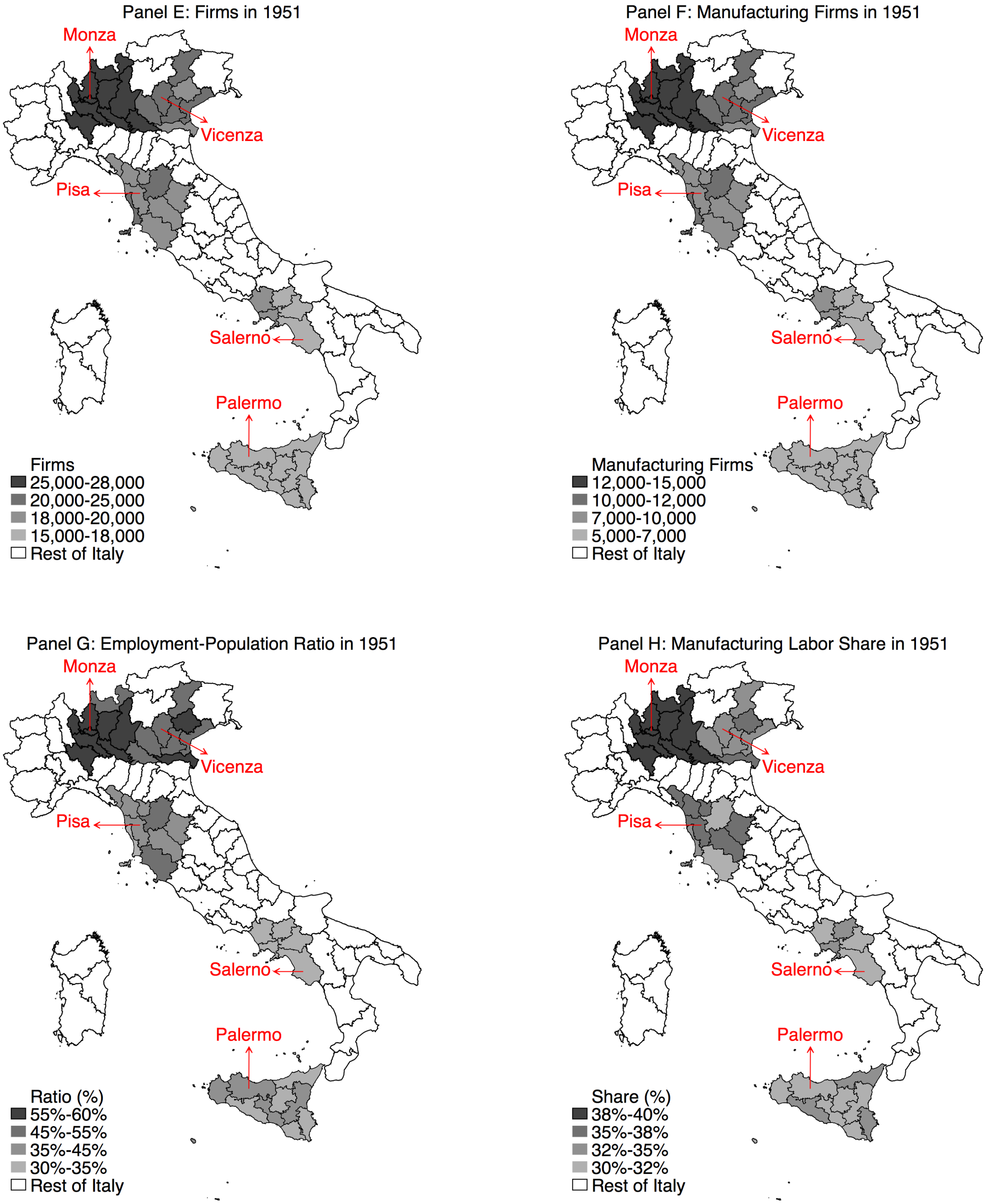
Notes. Columns 2-3 and 5-6 report the coefficients estimated from equation 1 for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C) and survived for 15 years after the Productivity Program. Columns 1 and 4 reports the coefficients estimated from the linear probability model (LPM) of equations 6 and 8 for the same samples of firms. The dependent variables are *Investment*, dummy for firms that undertook a new investment, logged *ROA*, firm return to assets, measured as the ratio between profit and capital , logged *Capital-to-labor ratio*, measured as capital per unit of labor, *Managers* is a dummy if firms hired a manager with a college degree, logged *Training* is the share on expenditures for employment training, logged *Real wages* are the average firm real wages. Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

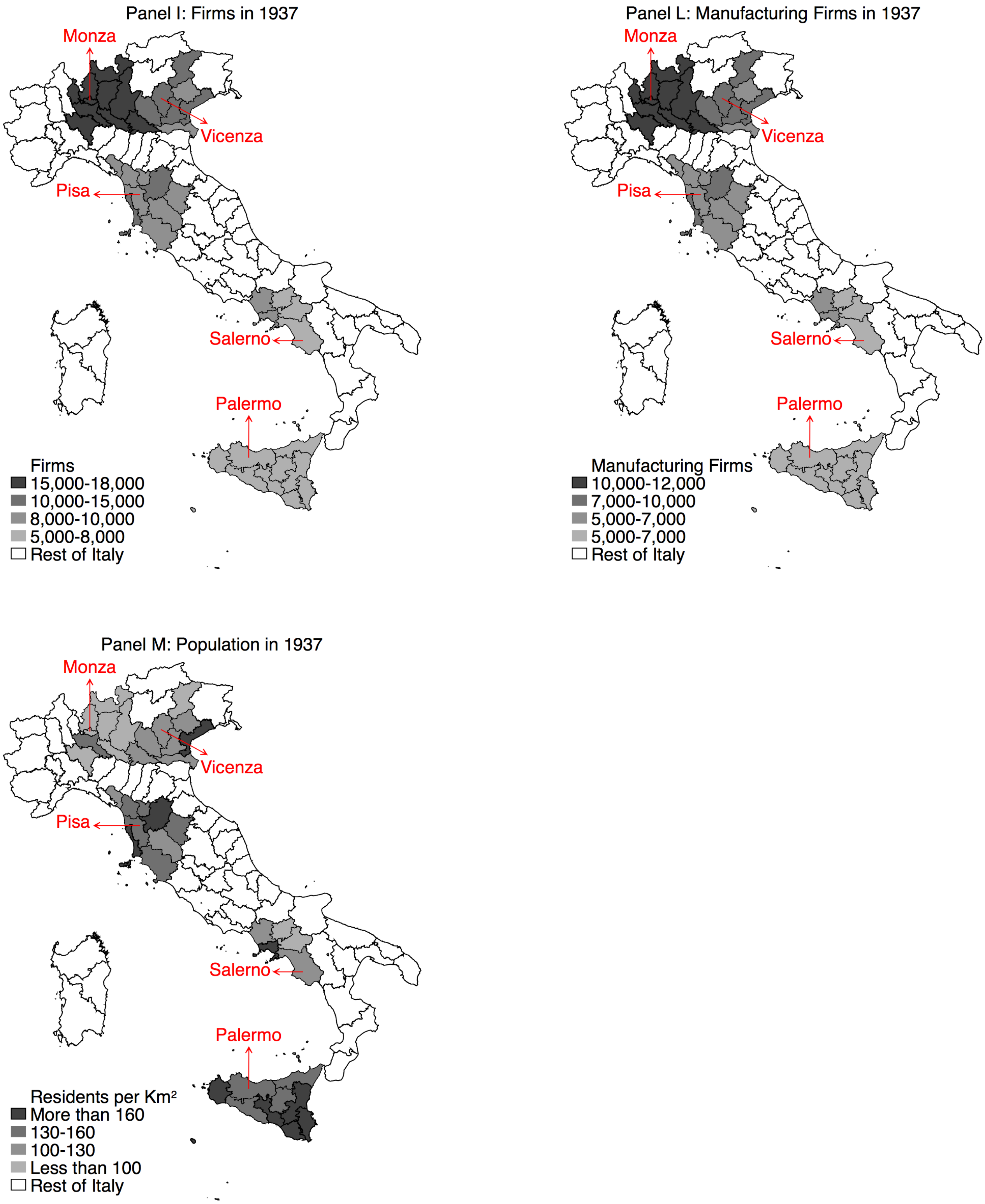
Appendix

A Additional Figures and Tables

Figure A.1: *Experimental* and *Nonexperimental Provinces*



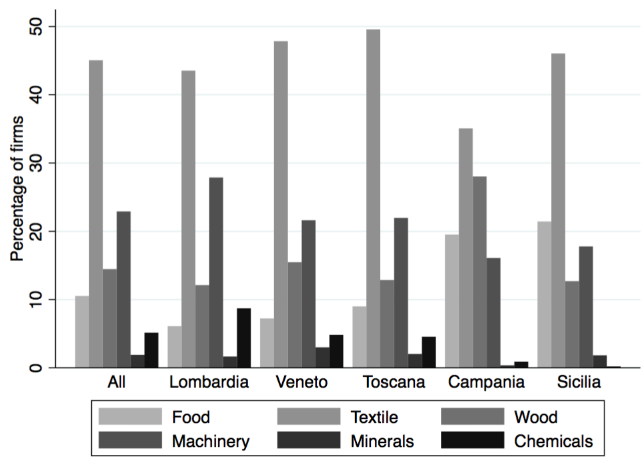

Panel E: Firms in 1951
Monza
Vicenza
Pisa
Salerno
Palermo
Firms
25,000-28,000
20,000-25,000
18,000-20,000
15,000-18,000
Rest of Italy
Panel F: Manufacturing Firms in 1951
Monza
Vicenza
Pisa
Salerno
Palermo
Manufacturing Firms
12,000-15,000
10,000-12,000
7,000-10,000
5,000-7,000
Rest of Italy
Panel G: Employment-Population Ratio in 1951
Monza
Vicenza
Pisa
Salerno
Palermo
Ratio (%)
55%-60%
45%-55%
35%-45%
30%-35%
Rest of Italy
Panel H: Manufacturing Labor Share in 1951
Monza
Vicenza
Pisa
Salerno
Palermo
Share (%)
38%-40%
35%-38%
32%-35%
30%-32%
Rest of Italy



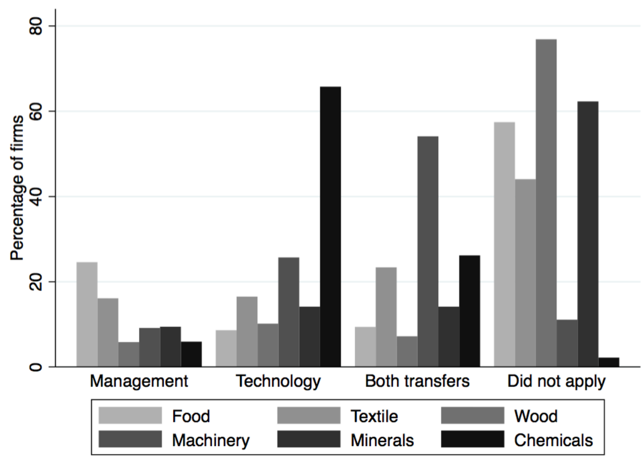
Notes. Maps showing percentage of buildings in a province destroyed by bombing between 1940 and 1945 (Panel A), percentage of firms involved in 1948 communist strikes (Panel B), E.R.P. aid received between 1948 and 1951 as fraction of total aid received by Italy (Panel C), population in 1951 and in 1937 (Panel D and M), total number of firms (Panel E and I), manufacturing firms (Panel F and L), Employment-population ratio (Panel F), and labor share (Panel G). Data are provided at province level. Data for Panel A, B and C had been collected from the Archivio Storico dello Stato (Rome-Italy), fondo CIR, busta 39, accessed on January 12, 2013. Data for population are from the Italian Population Census of 1951 and 1936. The remaining data are from the Italian Industrial Census of 1951 and 1937. Data on labor share in 1937 are not available.

Figure A.2: Distribution of Eligible Firms by Industries, 1951

Panel A: By *pilot regions*



Panel B: By US Transfer Chosen



Notes. Distribution of 6,065 firms eligible to apply for the Productivity Program by manufacturing industries in 1951. Panel A presents the distribution separately for *pilot regions*; panel B presents the distribution separately for US transfer chosen by firms. Industries are defined according to the 1951 National Institute for Statistics (ISTAT) classification. *Food* includes food, beverages and tobacco industries; *Textile* includes textile, wearing apparel and leather industries; *Wood* includes wood and wood products (including furniture); *Machinery* includes fabricated metal products, machinery and equipment; *Minerals* includes non-metallic mineral products, except products of petroleum and coal; *Chemicals* includes manufacture of chemicals and chemical, petroleum, coal, rubber and plastic products.

Table A.1: Summary Statistics by *pilot region*, 1951

	All Eligible firms (N=6,065)				
	Lombardia	Veneto	Toscana	Campania	Sicilia
	(1)	(2)	(3)	(4)	(5)
Plants per firm	1.54	1.23	1.24	1.13	1.17
Employees per firm	55.65	46.87	43.47	37.89	39.78
Current assets (k USD)	1,873.49	1,546.73	1,567.89	1,289.28	1,432.55
Annual sales (k USD)	1,278.90	1,345.98	978.90	357.21	392.26
Value added (k USD)	567.88	489.76	398.58	409.32	459.10
Age	12.58	13.57	11.69	10.38	12.50
Productivity (log TFPR)	2.71	2.44	2.39	2.25	2.21
Export	0.15	0.13	0.12	0.09	0.12
Family-managed	0.36	0.41	0.48	0.48	0.54
Submit application	0.63	0.61	0.65	0.47	0.47
Management	0.13	0.16	0.16	0.11	0.07
Technology	0.19	0.19	0.26	0.16	0.19
Both Transfers	0.31	0.27	0.28	0.20	0.120
Observations	2,301	1,207	1,038	556	963

Notes. Summary statistics for the 6,065 firms eligible to apply for the Productivity Program in 1951, separately for *pilot region*. Data are provided at firm level. Columns 1 report the mean for 2,301 eligible firms in Lombardia, column 2 for 1,207 firms in Veneto, column 3 for 1,038 firms in Toscana, column 4 for 556 firms in Campania, and column 5 for 963 firms in Sicilia. *Plants per firm* reports the total number of plants per firm; *Employees per firm* reports the number of employees per firm; *Current assets*, *Annual sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of firm productivity, estimated using the Ackerberg et al. (2006) method; *Export*, *Family-managed*, *Submit application*, *Management*, *Technology*, *Both transfers* are indicator variables that equal one if, respectively, firm exports, is family-managed (as defined on p. 11), had submitted an application for the Productivity Program, chose management transfer, chose technology transfer, chose both transfers.

Table A.2: Pre-Productivity Program Differences in Time Trends between *Experimental* and *Nonexperimental Provinces*, 1946-1951

	Log Employees		Log Assets		Log Sales		Log Value added		Log TFPR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Management										
Time trend	0.031**	0.027**	0.033*	0.038**	0.043***	0.036***	0.029***	0.026***	0.016***	0.014***
	(0.015)	(0.013)	(0.019)	(0.018)	(0.011)	(0.013)	(0.006)	(0.005)	(0.003)	(0.003)
Time trend · Experimental Province	0.013	0.011	-0.012	-0.014	0.012	0.009	0.019	0.010	0.014	0.010
	(0.013)	(0.015)	(0.013)	(0.017)	(0.017)	(0.015)	(0.025)	(0.018)	(0.015)	(0.012)
Experimental Province	0.011	0.014	-0.007	-0.009	-0.009	-0.012	-0.008	-0.006	0.020	0.018
	(0.013)	(0.012)	(0.009)	(0.014)	(0.014)	(0.016)	(0.011)	(0.009)	(0.026)	(0.022)
Observations	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141
B. Technology										
Time trend	0.039**	0.035***	0.029**	0.026**	0.055*	0.054*	0.041***	0.037***	0.015***	0.011***
	(0.017)	(0.013)	(0.013)	(0.011)	(0.033)	(0.032)	(0.013)	(0.014)	(0.004)	(0.003)
Time trend · Experimental Province	-0.006	-0.003	0.010	0.008	0.006	0.005	0.009	0.007	-0.005	-0.005
	(0.010)	(0.009)	(0.014)	(0.012)	(0.008)	(0.008)	(0.010)	(0.007)	(0.008)	(0.010)
Experimental Province	0.014	0.016	0.015	0.010	-0.013	-0.012	0.011	0.009	-0.006	-0.003
	(0.021)	(0.019)	(0.023)	(0.019)	(0.019)	(0.015)	(0.010)	(0.014)	(0.009)	(0.007)
Observations	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678
C. Both transfers										
Time trend	0.046***	0.041***	0.038***	0.035***	0.045***	0.041***	0.049***	0.048***	0.018***	0.016***
	(0.009)	(0.008)	(0.012)	(0.010)	(0.009)	(0.008)	(0.013)	(0.011)	(0.005)	(0.004)
Time trend · Experimental Province	0.008	0.010	-0.021	-0.010	-0.007	-0.008	0.004	0.006	-0.008	-0.008
	(0.011)	(0.013)	(0.029)	(0.025)	(0.011)	(0.010)	(0.007)	(0.012)	(0.015)	(0.011)
Experimental Province	-0.017	-0.015	0.005	0.003	0.011	0.014	-0.009	-0.014	0.017	0.014
	(0.022)	(0.019)	(0.006)	(0.008)	(0.013)	(0.021)	(0.015)	(0.015)	(0.020)	(0.019)
Observations	6,238	6,238	6,238	6,238	6,238	6,238	6,238	6,238	6,238	6,238
Pilot region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pilot region x time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes. OLS regressions predicting outcomes in the pre-Productivity Program period for 804 firms that applied for management transfer (Panel A), 1,178 firms that applied for technology transfer (Panel B) and 1,612 firms that applied for both transfers (Panel C). 30 firms whose applications were rejected are excluded. Data are provided at firm level. Outcomes are allowed to vary according to a linear time (year) trend that differs for *experimental provinces*. Excluded year is 1946. Standard errors clustered at the province level are presented in parentheses. All the dependent variables are expressed in logs. *Employees* is the total number of employees per firm; *Assets* , *Sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *TFPR* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method.

Table A.3: Pre-Productivity Program Differences in Yearly Trends between *Experimental* and *Nonexperimental Provinces*, 1946-1951

	Log Employees		Log Assets		Log Sales		Log Value Added		Log TFPR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Management										
Experimental province· 1947	0.012	0.007	-0.010	-0.014	0.021	0.022	-0.009	-0.005	0.006	0.004
	(0.021)	(0.019)	(0.023)	(0.026)	(0.033)	(0.021)	(0.014)	(0.013)	(0.006)	(0.007)
Experimental province· 1948	0.006	0.009	-0.014	-0.009	0.017	0.014	0.004	0.003	0.012	0.010
	(0.015)	(0.025)	(0.017)	(0.012)	(0.028)	(0.009)	(0.009)	(0.009)	(0.019)	(0.014)
Experimental province· 1949	-0.009	-0.015	-0.009	-0.003	-0.010	-0.009	-0.012	-0.011	-0.007	-0.008
	(0.010)	(0.029)	(0.024)	(0.009)	(0.007)	(0.012)	(0.008)	(0.014)	(0.008)	(0.016)
Experimental province· 1950	0.008	-0.007	0.007	0.011	0.008	0.009	-0.012	-0.014	-0.004	-0.005
	(0.014)	(0.009)	(0.009)	(0.021)	(0.013)	(0.012)	(0.018)	(0.029)	(0.008)	(0.008)
Experimental province· 1951	0.011	0.008	-0.005	-0.004	-0.005	-0.007	0.011	0.007	-0.012	-0.011
	(0.024)	(0.013)	(0.012)	(0.008)	(0.017)	(0.013)	(0.015)	(0.009)	(0.014)	(0.013)
Observations	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141	3,141
F-statistic	0.58	0.72	0.49	0.50	0.33	0.44	0.67	0.41	0.39	0.57
p-value	0.782	0.744	0.691	0.732	0.678	0.633	0.771	0.723	0.706	0.658
B. Technology										
Experimental province· 1947	0.013	0.009	0.015	0.006	-0.004	-0.004	0.007	0.006	0.013	0.014
	(0.021)	(0.014)	(0.023)	(0.006)	(0.007)	(0.006)	(0.009)	(0.009)	(0.019)	(0.018)
Experimental province· 1948	-0.002	-0.004	0.013	0.012	-0.010	-0.014	-0.015	-0.019	0.011	0.009
	(0.009)	(0.009)	(0.009)	(0.019)	(0.014)	(0.017)	(0.021)	(0.023)	(0.026)	(0.019)
Experimental province· 1949	-0.009	-0.012	-0.011	-0.012	0.008	0.009	0.009	0.014	0.014	0.017
	(0.012)	(0.008)	(0.014)	(0.008)	(0.016)	(0.015)	(0.018)	(0.024)	(0.018)	(0.023)
Experimental province· 1950	0.018	0.012	0.014	0.014	0.005	0.008	0.024	0.021	0.016	0.019
	(0.022)	(0.018)	(0.029)	(0.028)	(0.008)	(0.014)	(0.028)	(0.029)	(0.019)	(0.021)
Experimental province· 1951	0.007	0.011	0.007	0.012	0.011	0.012	0.015	0.013	0.003	0.005
	(0.013)	(0.015)	(0.009)	(0.014)	(0.013)	(0.015)	(0.023)	(0.026)	(0.008)	(0.009)
Observations	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678
F-statistic	0.21	0.59	0.83	0.26	0.69	0.41	0.58	0.44	0.39	0.42
p-value	0.543	0.588	0.643	0.659	0.492	0.781	0.683	0.732	0.783	0.640
Pilot region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pilot region x time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

(Continues)

Table A.3: Continued

	Log Employees		Log Assets		Log Sales		Log Value Added		Log TFPR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C. Both transfers										
Experimental province· 1947	-0.018	-0.015	0.023	0.024	0.014	0.012	0.017	0.015	0.005	0.004
	(0.021)	(0.018)	(0.026)	(0.025)	(0.012)	(0.011)	(0.019)	(0.018)	(0.006)	(0.006)
Experimental province· 1948	0.009	0.009	0.015	0.013	-0.007	0.006	-0.011	-0.009	0.002	0.002
	(0.012)	(0.011)	(0.019)	(0.017)	(0.008)	(0.009)	(0.012)	(0.010)	(0.003)	(0.004)
Experimental province· 1949	0.007	0.008	-0.003	-0.002	0.005	0.006	0.015	0.017	0.004	0.003
	(0.009)	(0.009)	(0.006)	(0.004)	(0.004)	(0.007)	(0.016)	(0.014)	(0.004)	(0.004)
Experimental province· 1950	0.010	0.012	0.009	0.006	-0.011	-0.008	-0.011	-0.011	0.004	0.005
	(0.015)	(0.014)	(0.011)	(0.009)	(0.013)	(0.012)	(0.012)	(0.011)	(0.005)	(0.005)
Experimental province· 1951	-0.017	-0.016	0.011	0.014	0.003	0.003	0.004	0.006	-0.002	-0.002
	(0.021)	(0.020)	(0.015)	(0.013)	(0.007)	(0.008)	(0.005)	(0.005)	(0.004)	(0.003)
Observations	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678	4,678
F-statistic	0.59	0.68	0.91	0.65	0.63	0.65	0.49	0.81	0.39	0.42
p-value	0.419	0.556	0.792	0.534	0.704	0.732	0.801	0.598	0.783	0.640
Pilot region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pilot region x time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes. OLS regressions predicting outcomes in the pre-Productivity Program period for 804 firms that applied for management transfer (Panel A), 1,178 firms that applied for technology transfer (Panel B) and 1,612 firms that applied for both transfers (Panel C). Data are provided at firm level. The trend is allowed to vary freely for each year before the Productivity Program implementation. Year dummies are included but their coefficients are not reported. Standard errors clustered at the province level are presented in parentheses. All the dependent variables are expressed in logs. *Employees* is the total number of employees per firm; *Assets* , *Sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *TFPR* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method. The F-statistics at the bottom of each panel test whether all the interaction terms between *experimental provinces* and the year dummy variables are jointly zero.

Table A.4: Pre-Productivity Program Differences between *Experimental* and *Nonexperimental Provinces*, by Firm Application Date

	Log Employees	Log Assets	Log Sales	Log Value Added	Log TFPR
	(1)	(2)	(3)	(4)	(5)
A. Management					
Productivity Program 1953	0.019	0.018	-0.016	0.009	-0.011
	(0.021)	(0.020)	(0.019)	(0.015)	(0.014)
Productivity Program 1954	-0.021	0.003	0.007	0.015	0.004
	(0.025)	(0.009)	(0.016)	(0.019)	(0.014)
Productivity Program 1955	0.014	0.010	-0.012	0.008	0.019
	(0.013	(0.011)	(0.015)	(0.010)	(0.023)
Productivity Program 1956	0.011	-0.008	0.015	0.011	0.002
	(0.015)	(0.010)	(0.014)	(0.013)	(0.009)
Productivity Program 1957	-0.009	0.016	0.003	0.006	-0.009
	(0.011)	(0.022)	(0.004)	(0.012)	(0.011)
Productivity Program 1958	0.017	0.006	0.008	0.012	0.021
	(0.021)	(0.016)	(0.009)	(0.013)	(0.019)
Productivity Program 1952· Experimental province	-0.007	0.015	0.009	0.015	-0.003
	(0.010)	(0.019)	(0.013)	(0.019)	(0.008)
Productivity Program 1953· Experimental province	0.008	-0.014	0.003	0.011	0.017
	(0.015)	(0.013)	(0.008)	(0.015)	(0.022)
Productivity Program 1954· Experimental province	0.011	0.005	-0.002	0.012	-0.005
	(0.014)	(0.008)	(0.002)	(0.018)	(0.008)
Productivity Program 1955· Experimental province	-0.014	0.009	0.003	0.014	-0.011
	(0.015)	(0.011)	(0.007)	(0.021)	(0.010)
Productivity Program 1956· Experimental province	0.006	-0.003	0.009	0.007	-0.015
	(0.007)	(0.004)	(0.011)	(0.013)	(0.014)
Productivity Program 1957· Experimental province	0.011	0.005	0.008	0.014	-0.004
	(0.014)	(0.007)	(0.009)	(0.017)	(0.005)
Productivity Program 1958· Experimental province	0.013	-0.022	0.016	0.019	-0.017
	(0.016)	(0.023)	(0.018)	(0.024)	(0.021)
Observations	538	538	538	538	538
F-statistic	0.58	0.67	0.44	0.79	0.61
p-value	0.521	0.493	0.576	0.489	0.533
B. Technology					
Productivity Program 1953	0.014	-0.021	0.009	0.018	-0.007
	(0.015)	(0.025)	(0.010)	(0.017)	(0.009)

(Continues)

Table A.4: Continued

	Log Employees	Log Assets	Log Sales	Log Value Added	Log TFPR
	(1)	(2)	(3)	(4)	(5)
Productivity Program 1954	0.012	0.019	-0.007	0.011	-0.003
	(0.015)	(0.021)	(0.011)	(0.014)	(0.006)
Productivity Program 1955	0.015	0.017	-0.021	0.013	0.025
	(0.021)	(0.022)	(0.025)	(0.016)	(0.031)
Productivity Program 1956	-0.021	0.023	0.015	0.014	0.011
	(0.028)	(0.026)	(0.019)	(0.024)	(0.014)
Productivity Program 1957	0.024	-0.010	-0.011	0.021	0.018
	(0.023)	(0.015)	(0.013)	(0.025)	(0.022)
Productivity Program 1958	0.009	0.022	0.016	-0.025	0.008
	(0.010)	(0.025)	(0.015)	(0.031)	(0.018)
Productivity Program 1952· Experimental province	0.013	-0.016	0.012	0.009	-0.017
	(0.016)	(0.021)	(0.011)	(0.009)	(0.023)
Productivity Program 1953· Experimental province	-0.011	0.014	-0.018	0.021	0.013
	(0.021)	(0.016)	(0.023)	(0.025)	(0.014)
Productivity Program 1954· Experimental province	0.008	-0.017	0.014	0.016	0.011
	(0.011)	(0.024)	(0.015)	(0.023)	(0.010)
Productivity Program 1955· Experimental province	0.010	0.024	0.011	0.020	0.015
	(0.012)	(0.028)	(0.013)	(0.023)	(0.018)
Productivity Program 1956· Experimental province	-0.015	0.013	0.021	-0.016	0.019
	(0.023)	(0.018)	(0.025)	(0.019)	(0.023)
Productivity Program 1957· Experimental province	0.021	-0.017	-0.023	0.013	0.024
	(0.023)	(0.025)	(0.026)	(0.016)	(0.029)
Productivity Program 1958· Experimental province	0.016	0.019	0.010	0.014	0.008
	(0.015)	(0.022)	(0.012)	(0.018)	(0.007)
Observations	748	748	748	748	748
F-statistic	0.44	0.78	0.54	0.89	0.31
p-value	0.437	0.549	0.499	0.371	0.653
C. Both transfers					
Productivity Program 1953	0.015	0.013	-0.020	0.018	0.014
	(0.021)	(0.016)	(0.019)	(0.022)	(0.017)
Productivity Program 1954	0.025	-0.017	0.009	0.011	0.015
	(0.029)	(0.022)	(0.011)	(0.015)	(0.019)

(Continues)

Table A.4: Continued

	Log Employees	Log Assets	Log Sales	Log Value Added	Log TFPR
	(1)	(2)	(3)	(4)	(5)
Productivity Program 1955	0.022	-0.020	0.016	0.008	-0.015
	(0.025)	(0.022)	(0.019)	(0.009)	(0.019)
Productivity Program 1956	0.011	-0.008	0.018	-0.012	0.023
	(0.013)	(0.009)	(0.025)	(0.014)	(0.028)
Productivity Program 1957	0.019	0.014	-0.010	0.021	0.014
	(0.023)	(0.016)	(0.016)	(0.024)	(0.013)
Productivity Program 1958	0.014	-0.013	0.022	0.014	0.009
	(0.018)	(0.012)	(0.023)	(0.016)	(0.008)
Productivity Program 1952· Experimental province	-0.017	0.013	0.018	-0.021	-0.024
	(0.021)	(0.017)	(0.023)	(0.25)	(0.031)
Productivity Program 1953· Experimental province	-0.008	0.020	0.025	-0.014	0.017
	(0.009)	(0.024)	(0.031)	(0.015)	(0.024)
Productivity Program 1954· Experimental province	0.023	0.011	0.020	0.008	0.013
	(0.021)	(0.015)	(0.022)	(0.011)	(0.016)
Productivity Program 1955· Experimental province	-0.014	0.009	-0.017	0.012	0.010
	(0.019)	(0.009)	(0.021)	(0.018)	(0.009)
Productivity Program 1956· Experimental province	0.011	0.017	0.020	-0.009	0.021
	(0.013)	(0.023)	(0.025)	(0.011)	(0.024)
Productivity Program 1957· Experimental province	-0.012	0.010	0.016	0.011	0.017
	(0.015)	(0.014)	(0.022)	(0.024)	(0.021)
Productivity Program 1958· Experimental province	0.013	-0.008	0.019	-0.013	-0.007
	(0.019)	(0.010)	(0.022)	(0.015)	(0.010)
Observations	1,082	1,082	1,082	1,082	1,082
F-statistic	0.56	0.69	0.36	0.49	0.71
p-value	0.543	0.439	0.596	0.359	0.404
Pilot region	Yes	Yes	Yes	Yes	Yes
Pilot region x time FE	No	No	No	No	No

Notes. Coefficients estimated from regressing each dependent variable on a full set of dummies for the year in which firms received/should have received the US transfers and an interaction term between these dummies and an indicator for firms located in *exeperimental provinces* for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C). The sample is restricted to firms that survived until the intervention year. The excluded year is 1952. Standard errors are clustered at province level. *Employees* is the total number of employees per firm; *Assets* , *Sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *TFPR* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method. The F-statistics at the bottom of each panel test whether all the coefficients are jointly zero.

Table A.5: Pre-Productivity Program Differences in Time Trends between *Experimental* and *Nonexperimental Provinces*, in the Four Years before the Program Implementation

	Log Employees		Log Assets		Log Sales		Log Value Added		Log TFPR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
A. Management										
Experimental province· (t-1)	0.009	0.008	0.013	0.011	0.015	0.015	0.008	0.008	0.012	0.010
	(0.011)	(0.010)	(0.015)	(0.014)	(0.019)	(0.018)	(0.010)	(0.009)	(0.015)	(0.013)
Experimental province· (t-2)	0.011	0.009	-0.016	-0.012	0.024	0.022	-0.005	-0.005	0.009	0.007
	(0.012)	(0.012)	(0.019)	(0.013)	(0.029)	(0.028)	(0.006)	(0.004)	(0.012)	(0.011)
Experimental province· (t-3)	-0.010	-0.010	0.022	0.020	-0.013	-0.012	0.006	0.005	0.009	0.08
	(0.014)	(0.012)	(0.024)	(0.021)	(0.015)	(0.014)	(0.005)	(0.005)	(0.010)	(0.009)
Experimental province· (t-4)	0.016	0.013	-0.012	-0.011	0.013	0.11	0.011	0.010	0.021	0.018
	(0.018)	(0.015)	(0.014)	(0.013)	(0.016)	(0.015)	(0.010)	(0.008)	(0.026)	(0.024)
Observations	538	538	538	538	538	538	538	538	538	538
F-statistic	0.77	0.85	0.59	0.63	0.42	0.49	0.55	0.62	0.59	0.71
p-value	0.451	0.489	0.511	0.505	0.439	0.433	0.458	0.468	0.348	0.324
B. Technology										
Experimental province· (t-1)	0.018	0.016	0.008	0.008	0.022	0.021	0.013	0.012	0.021	0.019
	(0.022)	(0.021)	(0.009)	(0.008)	(0.026)	(0.024)	(0.018)	(0.017)	(0.024)	(0.022)
Experimental province· (t-2)	0.012	0.012	-0.019	-0.015	0.011	0.009	0.020	0.018	-0.024	-0.021
	(0.015)	(0.013)	(0.021)	(0.020)	(0.014)	(0.012)	(0.023)	(0.022)	(0.031)	(0.027)
Experimental province· (t-3)	0.025	0.021	0.010	0.009	0.015	0.014	0.011	0.008	0.016	0.012
	(0.031)	(0.029)	(0.011)	(0.010)	(0.019)	(0.017)	(0.014)	(0.011)	(0.019)	(0.018)
Experimental province· (t-4)	0.017	0.016	-0.021	-0.019	0.008	0.006	0.018	0.018	-0.009	-0.006
	(0.024)	(0.022)	(0.023)	(0.020)	(0.009)	(0.008)	(0.021)	(0.021)	(0.010)	(0.008)
Observations	748	748	748	748	748	748	748	748	748	748
F-statistic	0.89	0.91	0.45	0.61	0.56	0.73	0.42	0.56	0.69	0.78
p-value	0.398	0.412	0.498	0.533	0.567	0.599	0.439	0.421	0.436	0.427

(Continues)

Table A.5: Continued

	Log Employees		Log Assets		Log Sales		Log Value Added		Log TFPR	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
C. Both transfers										
Experimental province· (t-1)	0.016	0.013	0.020	0.018	0.009	0.008	-0.017	-0.015	0.011	0.011
	(0.022)	(0.020)	(0.027)	(0.022)	(0.010)	(0.007)	(0.025)	(0.025)	(0.014)	(0.013)
Experimental province· (t-2)	0.023	0.020	0.015	0.014	-0.008	-0.007	0.009	0.008	0.019	0.018
	(0.026)	(0.025)	(0.016)	(0.016)	(0.012)	(0.012)	(0.008)	(0.008)	(0.022)	(0.022)
Experimental province· (t-3)	-0.017	-0.015	0.019	0.016	0.025	0.022	0.013	0.012	-0.007	-0.007
	(0.020)	(0.017)	(0.025)	(0.021)	(0.029)	(0.027)	(0.018)	(0.017)	(0.009)	(0.007)
Experimental province· (t-4)	0.008	0.007	0.023	0.019	-0.011	-0.010	0.018	0.014	0.023	0.022
	(0.007)	(0.007)	(0.028)	(0.027)	(0.015)	(0.014)	(0.022)	(0.019)	(0.032)	(0.029)
Observations	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082	1,082
F-statistic	0.59	0.73	0.67	0.91	0.56	0.69	0.071	0.98	0.43	0.55
p-value	0.478	0.512	0.433	0.496	0.505	0.567	0.356	0.385	0.453	0.499
Pilot region	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pilot region x time FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Notes. OLS regressions predicting outcomes in the pre-Productivity Program period for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C). The sample is restricted to firms that survived until the intervention year. Data are provided at firm level. The trend is allowed to vary freely for each year before the Productivity Program implementation. Year dummies are included but their coefficients are not reported. Standard errors clustered at the province level are presented in parentheses. *Employees* is the total number of employees per firm; *Assets* , *Sales*, and *Value added* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *TFPR* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006) method. The F-statistics at the bottom of each panel test whether all the interaction terms in between *experimental provinces* and the year dummy variables are jointly zero.

Table A.6: Firms that Exited the Market before the Implementation of the Productivity Program

	A. Management			B. Technology			C. Both transfers		
	Experimental Provinces		Diff p-value	Experimental Provinces		Diff p-value	Experimental Provinces		Diff p-value
	Yes	No		Yes	No		Yes	No	
	Mean	Mean		Mean	Mean		Mean	Mean	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Plants per firm	1.12	1.15	0.809	1.33	1.29	0.432	1.21	1.28	0.340
Employees per firm	39.85	37.65	0.567	34.51	38.95	0.489	33.45	31.21	0.435
Current assets (k in 2010 USD)	405,671.33	420,983.12	0.482	567,893.36	542,142.59	0.501	606,093.23	587,784.30	0.483
Annual sales (k in 2010 USD)	203,567	234,402.34	0.453	245,682.32	287,671.11	0.444	324,591.34	301,298.35	0.348
Value added (k in 2010 USD)	80.94	85.93	0.521	90.83	94.84	0.536	101.34	106.79	0.210
Age	11.23	12.56	0.322	10.09	11.38	0.439	12.37	10.76	0.398
Productivity (log TFPR)	2.02	2.05	0.492	2.12	2.10	0.321	2.09	2.14	0.394
Export	0.11	0.13	0.671	0.11	0.10	0.702	0.09	0.11	0.475
Family-managed	0.55	0.57	0.459	0.52	0.56	0.540	0.55	0.51	0.555
N	15	58	n/a	18	107	n/a	44	100	n/a
Ratio (%)	10.27	8.81	n/a	7.73	11.32	n/a	11.40	8.15	n/a

Notes. Balancing tests for firms that closed down before the implementation of the Productivity Program. Data are provided at firm level. Columns 1, 2, 4, 5, 7, and 8 report mean, respectively, in *experimantal* and *nonexperimantal provinces*. Columns 3, 6, and 9 report the p-value of the mean difference. Standard errors are clustered at province level. *Plants per firm* reports the total number of plants per firm; *Employees per firm* reports the number of employees per firm; *Current assets (k in 2010 USD)*, *Annual sales (k in 2010 USD)*, and *Value added (k in 2010 USD)* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of firm productivity, estimated using the Ackerberg et al. (2006) method; *Export* and *Family-managed* are indicator variables that equal one if, respectively, firm exported and was is family-managed.

Table A.7: Cox Survival Model Estimation of Firm Shut Down Hazard

	Shut down hazard ratio							
	Proportional hazard ratio (1-4)				Different hazard ratio for $t \geq 7$ (5-8)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
A. Management								
Experimental Provinces	0.294***	0.292***	0.289***	0.276****	0.621***	0.620***	0.618***	0.615***
	(0.085)	(0.084)	(0.080)	(0.079)	(0.148)	(0.146)	(0.143)	(0.138)
Experimental Provinces, $t \geq 7$					0.413***	0.409***	0.404***	0.401***
					(0.132)	(0.130)	(0.127)	(0.126)
Observations	731	731	731	731	731	731	731	731
Failures	193	193	193	193	193	193	193	193
B. Technology								
Experimental Provinces	0.407***	0.404***	0.399***	0.388***	0.723***	0.721***	0.717***	0.715***
	(0.076)	(0.074)	(0.071)	(0.068)	(0.155)	(0.151)	(0.149)	(0.145)
Experimental Provinces, $t \geq 7$					0.591***	0.589***	0.585***	0.581***
					(0.132)	(0.129)	(0.125)	(0.123)
Observations	1,035	1,035	1,035	1,035	1,035	1,035	1,035	1,035
Failures	305	305	305	305	305	305	305	305
C. Both transfers								
Experimental Provinces	0.163***	0.160***	0.157***	0.151***	0.744***	0.739***	0.734***	0.729***
	(0.037)	(0.033)	(0.030)	(0.025)	(0.031)	(0.030)	(0.028)	(0.026)
Experimental Provinces, $t \geq 7$					0.311***	0.308***	0.302***	0.298***
					(0.025)	(0.021)	(0.020)	(0.018)
Observations	1,468	1,468	1,468	1,468	1,468	1,468	1,468	1,468
Failures	386	386	386	386	386	386	386	386
Pilot regions controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Calendar year controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Industry controls	No	No	Yes	Yes	No	No	Yes	Yes
Pre-Productivity Program controls	No	No	No	Yes	No	No	No	Yes

Notes. Shut down hazard ratio estimated from the Cox survival model $h(t) = h_0(t)\exp(\beta \text{ExpProv}_p + \lambda_r)$, where $h(t)$ is the hazard of shut down t years after the US intervention, ExpProv_i is an indicator variable for firms located in *experimental provinces* and λ_r is *pilot regions* fixed effects, for 731 firms that applied for management transfer (Panel A), 1,053 firms that applied for technology transfer (Panel B), and and 1,468 firms that applied for both transfers (Panel C). Data are provided at firm level. Standard errors clustered at the province level are presented in parentheses. Columns 1-4 report estimates of a proportional hazard ratio, constant over time; columns 5-8 report estimates in which the hazard ratio is allowed to change seven years after the Productivity Program. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.8: Comparison of the Effects of the Productivity Program over Time

	Log Sales (1-3)			Log Employees (4-6)			Log TFPR (7-9)		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
A. Management									
Year1=Year5	3.70	2.78	3.42	2.95	4.43	7.45	5.96	5.57	5.15
Year5=Year10	4.22	7.69	4.46	3.67	4.71	9.15	3.28	5.86	4.83
Year10=Year15	7.67	6.28	6.46	3.05	4.85	7.20	3.40	4.79	4.91
B. Technology									
Year1=Year5	5.37	2.74	3.54	3.32	3.58	5.02	3.04	3.29	4.05
Year5=Year10	2.18	2.50	2.32	2.74	2.40	2.25	2.41	2.64	2.84
Year10=Year15	0.31	0.39	0.43	0.34	0.32	0.30	-0.05	0.14	0.11
C. Both transfers									
Year1=Year5	11.25	12.65	3.30	3.10	3.57	4.32	3.49	2.67	7.08
Year5=Year10	5.34	4.99	6.51	3.15	3.23	3.49	2.89	3.02	11.38
Year10=Year15	4.55	4.87	4.93	3.42	5.97	3.08	3.25	2.73	3.96
D. Comparison Management-Technology									
Year1 Management=Technology	n/a	n/a	12.34	n/a	n/a	11.33	n/a	n/a	15.64
Year5 Management=Technology	n/a	n/a	15.67	n/a	n/a	16.79	n/a	n/a	19.82
Year10 Management=Technology	n/a	n/a	19.01	n/a	n/a	17.45	n/a	n/a	19.89
Year15 Management=Technology	n/a	n/a	23.44	n/a	n/a	26.78	n/a	n/a	25.51
E. Comparison across Transfers									
Year1 Both=Management+Technology	n/a	n/a	16.78	n/a	n/a	14.52	n/a	n/a	12.21
Year5 Both=Management+Technology	n/a	n/a	19.01	n/a	n/a	16.78	n/a	n/a	16.93
Year10 Both=Management+Technology	n/a	n/a	22.34	n/a	n/a	24.56	n/a	n/a	19.65
Year15 Both=Management+Technology	n/a	n/a	23.67	n/a	n/a	27.89	n/a	n/a	22.45
Sample	Balanced	Balanced	Matched	Balanced	Balanced	Matched	Balanced	Balanced	Matched
Pilot region FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	Yes	No	Yes	Yes	No	Yes
Firm FE	No	Yes	No	No	Yes	No	No	Yes	No

Notes. Panel A-C report the t-tests of the null hypothesis of equality of the coefficients estimated from equation 1 between one and five, five and ten, ten and fifteen years after the Productivity Program, respectively, for firms that applied for management transfer (Panel A), firms that applied for technology transfer (Panel B) and firms that applied for both transfers (Panel C). Panel D and E report, respectively, the F-statistics of the null hypothesis of equality between the coefficients on management and technology transfers, and between the coefficients on both transfers and the sum of coefficients on management and technology transfers one, five, ten and fifteen years after the Productivity Program. Data are provided at firm level. The dependent variables are logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (columns 9-12).

Table A.9: Sales, Employment, TFPR Growth Rates in Italy and in Firms Eligible for the Productivity Program, 1950-1970

	Italy (1)	Management (2)	Technology (3)	Both Transfers (4)	Did Not Apply (5)
Real GDP/Sales					
1950-1955	6.45	4.79	4.23	4.98	4.21
1955-1960	5.23	4.51	4.12	4.73	4.04
1960-1965	6.37	4.23	3.08	4.21	2.99
1965-1970	5.80	3.23	2.96	3.45	2.54
Employees					
1950-1955	3.49	3.55	3.12	4.30	3.07
1955-1960	2.12	3.21	3.07	3.59	2.49
1960-1965	2.00	2.99	2.78	3.01	1.95
1965-1970	1.95	2.08	2.43	2.21	1.97
TFPR					
1950-1955	3.57	3.55	2.41	3.78	2.02
1955-1960	2.94	2.45	2.03	2.98	1.80
1960-1965	2.49	2.33	1.98	2.57	1.55
1965-1970	1.97	2.14	1.82	2.27	1.55

Notes. Average annual growth rates (%) of Italian real GDP and firm *sales*, and *employment* and *TFPR* of all Italian manufacturing firms; of eligible firms that applied for management transfer, technology transfer and both transfers and did not receive the US assistance; and of eligible firms that did not apply between 1950-1955, 1955-1960, 1960-1965, 1965-1970. Italian growth rates are from the Historical Archive of Bank of Italy (ASBI), accessed in February 2014.

Table A.10: Verifying Balance in Terms of Firms' Characteristics and Outcomes of the "Nearest-Neighbor" Matched Firms

	Management (1-3)			Technology (4-6)			Both transfers (7-9)			All Transfers
	Experimental Provinces		Difference	Experimental Provinces		Difference	Experimental Provinces		Difference	p-value Equality All Means
	Yes	No		Yes	No		Yes	No		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Employees per firm	39.56	41.28	-2.33	40.23	38.12	3.45	41.55	39.91	1.38	0.650
	(32.32)	(35.67)	(5.33)	(34.78)	(33.89)	(7.54)	(38.76)	(36.92)	(8.91)	n/a
Current assets (k USD)	1,824.55	1,809.23	-14.67	1,845.39	1,858.40	-15.97	1,833.94	1,827.74	7.78	0.478
	(2,412.56)	(2,498.74)	(23.98)	(2,338.78)	(2,409.81)	(32.12)	(2,423.39)	(2,567.21)	(15.93)	n/a
Annual sales (k USD)	910.98	903.21	8.12	924.32	921.10	4.34	938.77	945.49	-7.78	0.401
	(1,556.94)	(1,503.98)	(18.77)	(1,607.83)	(1,587.31)	(7.89)	(1,450.93)	(1,467.82)	(10.94)	n/a
Productivity (log TFPR)	2.61	2.59	0.02	2.59	2.56	0.04	2.62	2.64	-0.03	0.533
	(0.43)	(0.42)	(0.06)	(0.47)	(0.45)	(0.07)	(0.44)	(0.49)	(0.04)	n/a
Export	0.14	0.13	0.02	0.12	0.14	-0.03	0.14	0.13	0.01	0.455
	(0.35)	(0.34)	(0.07)	(0.34)	(0.35)	(0.08)	(0.35)	(0.34)	(0.04)	n/a
Family-managed	0.25	0.24	0.01	0.24	0.23	0.01	0.25	0.25	-0.02	0.326
	(0.44)	(0.43)	(0.05)	(0.43)	(0.42)	(0.04)	(0.44)	(0.44)	(0.07)	n/a
Observations	125	125	125	125	125	125	125	125	125	125

Notes. Balancing tests for firms matched using a "nearest neighbor" estimator. Data are provided at firm level. Columns 1-2, 4-5, and 7-8 present mean and standard deviation (in parenthesis) of variables used for doing the match in 1951, separately for firms in *experimental* and in *nonexperimental provinces* and for firms that applied for management transfer, technology transfer and both transfers. Columns 3, 6, and 9 report the coefficients estimated from $\text{outcome}_i = \sum_{j=1}^{3} \alpha_j \text{Transfer}_i^j + \sum_{j=1}^{3} \beta_j (\text{Transfer}_i^j \cdot \text{ExpProv}_p) + \lambda_r + \epsilon_i$, where Transfer^j is an indicator for firms that applied for management transfer for $j = 1$, for technology transfer for $j = 2$, and for both transfers for $j = 3$, ExpProv is an indicator for firms located in an *experimental province*, and λ_r is pilot region fixed effect. Columns 10 reports the F-statistics of testing the null hypothesis of equality between all the coefficients. Standard errors are clustered at province level. *Plants per firm* reports the total number of plants per firm; *Employees per firm* reports the number of employees per firm; *Current assets* and *Annual sales* are in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of total factor productivity revenue, estimated using the Ackerberg et al. (2006); *Export* and *Family-managed* (as defined on p. 11) are indicators that equal one if, respectively, a firm exported and was family-managed.

Table A.11: Heterogeneity Effects: Panel A1 by Manufacturing Industries

	A. Management			B. Technology			C. Both transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I. Food									
Year1AfterPP	0.062***	0.006	0.143***	0.012	0.008	0.020	0.065***	0.039***	0.197***
	(0.011)	(0.015)	(0.033)	(0.017)	(0.021)	(0.025)	(0.014)	(0.011)	(0.044)
Year15AfterPP	0.342***	0.319***	0.408***	0.075**	0.077**	0.187***	0.460***	0.511***	0.611***
	(0.053)	(0.058)	(0.061)	(0.033)	(0.037)	(0.061)	(0.081)	(0.077)	(0.078)
II. Textile									
Year1AfterPP	0.067***	0.011	0.156***	0.008	0.017	0.025	0.072***	0.045***	0.194***
	(0.011)	(0.018)	(0.035)	(0.014)	(0.026)	(0.033)	(0.021)	(0.013)	(0.047)
Year15AfterPP	0.361***	0.321***	0.430***	0.112***	0.119***	0.156***	0.454***	0.517***	0.615***
	(0.055)	(0.061)	(0.058)	(0.043)	(0.045)	(0.051)	(0.079)	(0.081)	(0.085)
III. Wood									
Year1AfterPP	0.045***	0.007	0.141***	0.009	0.009	0.018	0.075***	0.040***	0.191***
	(0.006)	(0.011)	(0.029)	(0.009)	(0.016)	(0.023)	(0.015)	(0.012)	(0.049)
Year15AfterPP	0.339***	0.312***	0.404***	0.072***	0.071***	0.143***	0.451***	0.512***	0.617***
	(0.054)	(0.052)	(0.061)	(0.017)	(0.021)	(0.041)	(0.067)	(0.071)	(0.075)
IV. Machinery									
Year1AfterPP	0.059***	0.012	0.155***	0.017	0.021	0.028	0.062***	0.043***	0.204***
	(0.014)	(0.021)	(0.037)	(0.023)	(0.032)	(0.036)	(0.021)	(0.015)	(0.039)
Year15AfterPP	0.357***	0.312***	0.4295***	0.117**	0.109**	0.195***	0.472***	0.516***	0.620***
	(0.063)	(0.049)	(0.058)	(0.046)	(0.051)	(0.067)	(0.071)	(0.068)	(0.083)
V. Minerals									
Year1AfterPP	0.054***	0.009	0.148***	0.007	0.008	0.015	0.071***	0.048***	0.201***
	(0.011)	(0.014)	(0.039)	(0.013)	(0.019)	(0.022)	(0.016)	(0.013)	(0.041)
Year15AfterPP	0.336***	0.309***	0.411***	0.081**	0.106***	0.157***	0.467***	0.514***	0.611***
	(0.059)	(0.056)	(0.071)	(0.032)	(0.041)	(0.051)	(0.069)	(0.074)	(0.077)
VI. Chemicals									
Year1AfterPP	0.046***	0.008	0.141***	0.014	0.020	0.033	0.062***	0.043***	0.202***
	(0.005)	(0.014)	(0.034)	(0.022)	(0.021)	(0.023)	(0.015)	(0.013)	(0.051)
Year15AfterPP	0.338***	0.309***	0.413***	0.109**	0.111**	0.203***	0.459***	0.512***	0.618***
	(0.056)	(0.062)	(0.066)	(0.046)	(0.055)	(0.063)	(0.075)	(0.081)	(0.081)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic Year1	0.58	0.73	0.97	42.10	40.21	38.32	0.34	0.38	0.46
F-statistic Year15	0.96	0.46	0.62	47.27	58.35	46.20	0.41	0.42	0.31

(Continues)

Table A.11: Continued - Heterogeneity Effects: Panel A2 by 1951 Firm Size

	A. Management			B. Technology			C. Both transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I. Size Quartile 1									
Year1AfterPP	0.061***	0.012	0.170***	0.007	0.011	0.019	0.064***	0.041***	0.209***
	(0.012)	(0.015)	(0.033)	(0.012)	(0.014)	(0.022)	(0.014)	(0.009)	(0.039)
Year15AfterPP	0.360***	0.315***	0.424***	0.088***	0.089***	0.165***	0.461***	0.505***	0.608***
	(0.051)	(0.049)	(0.058)	(0.031)	(0.029)	(0.051)	(0.061)	(0.059)	(0.067)
II. Size Quartile 2									
Year1AfterPP	0.050***	0.006	0.133***	0.009	0.009	0.019	0.061***	0.035***	0.190***
	(0.011)	(0.010)	(0.027)	(0.013)	(0.012)	(0.025)	(0.016)	(0.011)	(0.041)
Year15AfterPP	0.336***	0.295***	0.404***	0.091***	0.093***	0.171***	0.450***	0.512***	0.606***
	(0.049)	(0.054)	(0.068)	(0.033)	(0.029)	(0.055)	(0.058)	(0.071)	(0.049)
III. Size Quartile 3									
Year1AfterPP	0.054***	0.008	0.141***	0.013	0.015	0.025	0.069***	0.049***	0.197***
	(0.009)	(0.012)	(0.031)	(0.017)	(0.021)	(0.029)	(0.017)	(0.014)	(0.045)
Year15AfterPP	0.341***	0.308***	0.414***	0.103***	0.109***	0.174***	0.462***	0.519***	0.617***
	(0.053)	(0.049)	(0.053)	(0.031)	(0.035)	(0.059)	(0.068)	(0.078)	(0.079)
IV. Size Quartile 4									
Year1AfterPP	0.057***	0.011	0.147***	0.014	0.013	0.027	0.071***	0.050***	0.205***
	(0.012)	(0.013)	(0.039)	(0.018)	(0.016)	(0.033)	(0.018)	(0.011)	(0.055)
Year15AfterPP	0.351***	0.338***	0.425***	0.104***	0.106***	0.182***	0.469***	0.523***	0.623***
	(0.059)	(0.051)	(0.063)	(0.028)	(0.032)	(0.054)	(0.061)	(0.058)	(0.054)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic Year1	47.9	48.9	41.7	47.5	53.6	42.7	33.3	55.8	42.3
F-statistic Year15	35.4	47.6	32.9	30.7	41.2	53.5	45.9	38.0	51.3

Table A.11: Continued - Heterogeneity Effects: by Panel A3 Geographic Location

	A. Management			B. Technology			C. Both transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
I. Northern Italy									
Year1AfterPP	0.065***	0.010	0.152***	0.010	0.016	0.031	0.092***	0.051***	0.204***
	(0.014)	(0.012)	(0.033)	(0.014)	(0.018)	(0.029)	(0.021)	(0.014)	(0.045)
Year15AfterPP	0.354***	0.321***	0.419***	0.104***	0.110***	0.185***	0.479***	0.515***	0.621***
	(0.055)	(0.053)	(0.063)	(0.035)	(0.032)	(0.056)	(0.065)	(0.079)	(0.057)
II. Southern Italy									
Year1AfterPP	0.058***	0.006	0.139***	0.006	0.010	0.015	0.086***	0.038***	0.193***
	(0.010)	(0.009)	(0.027)	(0.008)	(0.014)	(0.019)	(0.018)	(0.012)	(0.043)
Year15AfterPP	0.346***	0.303***	0.408***	0.089***	0.098***	0.164***	0.464***	0.511***	0.609***
	(0.058)	(0.059)	(0.075)	(0.032)	(0.033)	(0.061)	(0.072)	(0.085)	(0.059)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-statistic Year1	0.43	0.54	0.88	23.5	26.0	24.7	0.59	0.72	0.64
F-statistic Year15	0.56	0.39	0.91	29.2	32.4	31.6	0.63	0.55	0.41

Notes. OLS estimation of equation 2 for 538 firms that chose management transfer (columns 1-3), 748 firms that chose technology transfer (columns 4-6) and 1,082 firms that chose both transfers (columns 7-9) and survived for 15 years after the Productivity Program. In Panel A1 each sample is stratified by manufacturing industries, in Panel A2 by firm size distribution quartile in 1951, in Panel A3 by firm geographic location. Northern Italy includes Lombardia, Veneto and Toscana; Southern Italy Campania and Sicilia. The dependent variables are logged (deflated) *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 3-5); logged *employees*, reporting the number of employees per firm (columns 6-8); and logged TFPR, estimated using the Ackerberg et al. (2006) method (columns 9-11). Data are provided at firm level. Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.12: Multinomial Logit, US Transfers Choice

	Choice of US Transfer		
	Management	Technology	Both transfers
	(1)	(2)	(3)
Plants per firm	0.012**	0.027***	0.033***
	(0.006)	(0.009)	(0.011)
Employees per firm	0.008***	0.017***	0.028***
	(0.003)	(0.003)	(0.09)
Annual sales (k USD)	0.015***	0.013***	0.022***
	(0.004)	(0.005)	(0.008)
TFPR	0.021***	0.016***	0.025***
	(0.006)	(0.004)	(0.008)
Age	-0.009	-0.011	-0.008
	(0.011)	(0.012)	(0.013)
Export	0.009	0.018*	0.031*
	(0.008)	(0.010)	(0.017)
Family-managed	-0.151***	-0.127***	-0.176***
	(0.032)	(0.025)	(0.034)
Number of firms	804	1,178	1,612
Pilot region FE	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes

Notes. Marginal effects estimated from the multinomial logit model of equation 3, where the choice is either applying for management transfer, technology transfer, both transfers or not to apply, used as baseline. 30 firms whose applications were rejected are excluded. *Plants per firm* is the total number of plants per firm; *Employees per firm* is the number of employees per firm; *Annual sales* is in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Productivity (log TFPR)* is the logarithm of firm productivity, estimated using the Ackerberg et al. (2006) method; *Export* and *Family-managed* that are indicator variables that equal one if, respectively, firm exported and was family-managed (as defined on p. 11). Data are provided at firm level. Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.13: Spillovers Effects on Firms that Did Not Receive the US Transfers

	Probability of Shut Down			Log Sales			Log Employees			Log TFPR		
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Management	0.002	0.002	0.002	-0.004	-0.003	-0.002	0.006	0.005	0.003	0.009	0.007	0.007
	(0.004)	(0.003)	(0.003)	(0.006)	(0.005)	(0.002)	(0.009)	(0.008)	(0.005)	(0.014)	(0.013)	(0.012)
Technology	0.001	-0.001	-0.001	0.005	0.005	0.003	-0.011	-0.010	-0.010	0.002	0.002	0.001
	(0.004)	(0.004)	(0.004)	(0.007)	(0.007)	(0.004)	(0.015)	(0.013)	(0.010)	(0.005)	(0.004)	(0.03)
Both transfers	0.004	0.003	0.003	-0.006	-0.006	-0.004	0.014	0.012	0.009	0.008	0.007	0.007
	(0.006)	(0.005)	(0.005)	(0.008)	(0.008)	(0.006)	(0.017)	(0.015)	(0.011)	(0.012)	(0.010)	(0.007)
Manag·PostPP	0.012*	0.012**	0.002	-0.032*	-0.029*	0.001	-0.007	-0.007	-0.003	-0.017**	-0.015**	-0.006
	(0.007)	(0.006)	(0.005)	(0.019)	(0.017)	(0.007)	(0.012)	(0.011)	(0.010)	(0.008)	(0.007)	(0.006)
Techn·PostPP	0.015*	0.015*	0.001	-0.024*	-0.021*	-0.002	-0.004	-0.004	-0.002	-0.013**	-0.012**	-0.002
	(0.009)	(0.009)	(0.007)	(0.014)	(0.012)	(0.006)	(0.009)	(0.008)	(0.004)	(0.006)	(0.006)	(0.005)
Both ·PostPP	0.014*	0.014*	0.002	-0.035*	-0.028*	-0.011	-0.005	-0.005	-0.002	-0.022**	-0.019**	-0.009
	(0.008)	(0.008)	(0.007)	(0.020)	(0.017)	(0.012)	(0.008)	(0.007)	(0.006)	(0.010)	(0.008)	(0.007)
Exp Prov	0.009	0.008	0.008	0.011	0.010	0.010	-0.007	-0.006	-0.006	0.005	0.005	0.005
	(0.010)	(0.010)	(0.010)	(0.015)	(0.014)	(0.013)	(0.009)	(0.008)	(0.008)	(0.007)	(0.006)	(0.005)
Observations	105,400	105,400	105,400	73,780	73,780	73,780	73,780	73,780	73,780	73,780	73,780	73,780
Radius (km)	5	10	20	5	10	20	5	10	20	5	10	20
Panel	Full	Full	Full	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Pilot region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Coefficients estimated from equation 4 for 5,270 firms that did not received the Productivity Program transfers. In columns 1-3 the samples include all the firms; in columns 4-12 only firms that survived in the 15 years after the Productivity Program. *Management*, *Technology*, and *Both transfers* report the count of firms that received management, technology, and both transfers in the radius of 5, 10, and 20 km of firm i in year t; *postPP* is an indicator for the years after the Productivity Program. Data are provided at firm level. The dependent variables are *Probability of Shut Down*, an indicator for firms that shut down in year t; *Log Sales*, logged sales reported in 2010 USD, reevaluated from 1951 to 2010 values at 1 lira=30.884 euros and exchanged at 0.780 euro=USD 1; *Log Employees*, reporting the logged number of employees per firm;*Productivity (log TFPR)*, logarithm of firm productivity, estimated using the Ackerberg et al. (2006) method; Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.14: The Effects of the Productivity Program after Controlling for Variation in Markups

	A.Management			B. Technology			C. Both Transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year1AfterPP	0.038***	0.009	0.151***	0.010	0.022	0.025	0.069***	0.048*	0.199***
	(0.012)	(0.015)	(0.031)	(0.009)	(0.017)	(0.023)	(0.016)	(0.025)	(0.043)
Year5AfterPP	0.117***	0.064***	0.208***	0.047***	0.075***	0.078***	0.235***	0.177***	0.333***
	(0.016)	(0.017)	(0.032)	(0.012)	(0.021)	(0.025)	(0.049)	(0.041)	(0.042)
Year10AfterPP	0.184***	0.209***	0.299***	0.069***	0.077***	0.161***	0.288***	0.381***	0.478***
	(0.044)	(0.040)	(0.051)	(0.017)	(0.029)	(0.035)	(0.065)	(0.058)	(0.061)
Year15AfterPP	0.304***	0.311***	0.398***	0.104***	0.098***	0.157***	0.417***	0.507***	0.595***
	(0.059)	(0.054)	(0.055)	(0.039)	(0.035)	(0.037)	(0.106)	(0.099)	(0.054)
Observations	10,760	10,760	10,760	14,960	14,960	14,960	21,640	21,640	21,640
Number of firms	538	538	538	748	748	748	1,082	1,082	1,082
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Pilot region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Coefficients estimated from equation 5 for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C). Data are provided at firm level. The dependent variables are logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *Productivity (log TFPR)*, estimated using the Ackerberg et al. (2006) method (columns 9-12). Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.15: Comparison of the Effects of the Productivity Program over Time after Controlling for Variation in Markups

	A. Management			B. Technology			C. Both Transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Year1=Year5	3.23	3.91	6.07	2.24	2.34	1.56	2.79	4.13	2.96
Year5=Year10	5.90	4.40	3.84	0.51	1.07	1.73	2.94	3.16	3.19
Year10=Year15	2.97	3.36	2.70	0.34	0.38	0.06	3.70	2.96	2.78
Region FE	No	No	No	No	No	No	No	No	No
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Program Year FE	No	No	No	No	No	No	No	No	No
Sector FE	Yes	Yes	No	Yes	Yes	No	Yes	Yes	No
Firm FE	No	No	Yes	No	No	Yes	No	No	Yes
Observations	10,760	10,760	10,760	14,960	14,960	14,960	21,640	21,640	21,640
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Number of firms	538	538	538	748	748	748	1,082	1,082	1,082
Pilot region FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes. t-tests of the null hypothesis of equality of coefficients estimated from equation 5 between one and five, five and ten, ten and fifteen years after the Productivity Program for 538 firms that applied for management transfer (Panel A), 748 firms that applied for technology transfer (Panel B) and 1,082 firms that applied for both transfers (Panel C). Columns 4, 8, and 12 report the t-tests estimated from the pooled near-neighbor matched difference-in-differences. In columns 1-2, 5-6, and 9-11 the samples include only that survived in the 15 years after the Productivity Program; in columns 3, 7, and 11 all firms are included. Data are provided at firm level. The dependent variables are logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *Productivity (log TFPR)*, estimated using the Ackerberg et al. (2006) method (columns 9-12). Standard errors clustered at the province level are presented in parentheses. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.16: Comparison of the Effects of the Productivity Program over Time on Firms that Did Not Export

	Non-Exporters		
	Sales	Employment	TFPR
	(1)	(2)	(3)
A. Management			
Year1=Year5	5.23	8.04	4.09
Year5=Year10	4.83	5.86	7.28
Year10=Year15	3.64	4.30	5.21
Observations	3,500	3,500	3,500
Number of firms	175	175	175
B. Technology			
Year1=Year5	4.37	4.77	3.26
Year5=Year10	1.94	1.71	1.65
Year10=Year15	0.63	0.88	0.56
Observations	7,240	7,240	7,240
Number of firms	362	362	362
C. Both transfers			
Year1=Year5	3.18	4.25	3.87
Year5=Year10	6.34	3.15	4.10
Year10=Year15	2.96	3.00	3.83
Observations	7,360	7,360	7,360
Number of firms	368	368	368
Model	OLS	OLS	OLS
Sample	Balanced	Balanced	Balanced
Pilot region FE	Yes	Yes	Yes
Time FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes

Notes. t-tests of the null hypothesis of equality of coefficients estimated from equation 6 between one and five, five and ten, ten and fifteen years after the Productivity Program for for 175 firms that applied for management transfer (Panel A), 362 firms that applied for technology transfer (Panel B) and 368 firms that applied for both transfers (Panel C), that did not start exporting after the Productivity Program. Data are provided at firm level. The dependent variables are logged deflated *sales* converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1; logged *employement*, reporting the number of employees per firm; and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (column 4).

Table A.17: The Effects of the Productivity Program on Sales, Employment, and TFPR (Using Only Post-Program Data)

	Log sales (1-4)				Log employees (5-8)				Log TFPR (9-12)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
A. Management												
Year1AfterPP	0.072***	0.060***	0.068***	0.055***	0.010	0.007	0.014	0.006	0.151***	0.142***	0.150***	0.139***
	(0.011)	(0.013)	(0.011)	(0.009)	(0.014)	(0.010)	(0.015)	(0.009)	(0.030)	(0.025)	(0.025)	(0.010)
Year5AfterPP	0.123***	0.115***	0.136***	0.107***	0.065***	0.061***	0.079***	0.059***	0.220***	0.209***	0.227***	0.205***
	(0.020)	(0.019)	(0.030)	(0.015)	(0.021)	(0.020)	(0.025)	(0.013)	(0.041)	(0.029)	(0.036)	(0.011)
Year10AfterPP	0.211***	0.200***	0.231***	0.193***	0.212***	0.200***	0.262***	0.203***	0.308***	0.298***	0.336***	0.285***
	(0.033)	(0.025)	(0.044)	(0.025)	(0.049)	(0.034)	(0.052)	(0.033)	(0.046)	(0.042)	(0.052)	(0.020)
Year15AfterPP	0.348***	0.339***	0.397***	0.330***	0.318***	0.308***	0.392***	0.300***	0.415***	0.409***	0.465***	0.398***
	(0.051)	(0.046)	(0.065)	(0.035)	(0.057)	(0.050)	(0.070)	(0.043)	(0.060)	(0.040)	(0.069)	(0.028)
Observations	8,070	8,070	10,247	11,250	8,070	8,070	10,247	11,250	8,070	8,070	10,247	11,250
Number of firms	538	538	731	750	538	538	731	750	538	538	731	750
B. Technology												
Year1AfterPP	0.011	0.010	0.014	0.009	0.015	0.011	0.019	0.010	0.025	0.020	0.029	0.018
	(0.017)	(0.013)	(0.014)	(0.008)	(0.019)	(0.012)	(0.016)	(0.011)	(0.034)	(0.025)	(0.031)	(0.019)
Year5AfterPP	0.049***	0.041***	0.053***	0.039***	0.039**	0.035**	0.043**	0.030**	0.079***	0.074***	0.085***	0.070***
	(0.015)	(0.013)	(0.011)	(0.011)	(0.017)	(0.015)	(0.021)	(0.014)	(0.020)	(0.016)	(0.022)	(0.015)
Year10AfterPP	0.077***	0.071***	0.090***	0.068***	0.080**	0.078**	0.091**	0.075**	0.177***	0.163***	0.188***	0.153***
	(0.027)	(0.025)	(0.030)	(0.022)	(0.040)	(0.033)	(0.037)	(0.031)	(0.032)	(0.029)	(0.037)	(0.025)
Year15AfterPP	0.093**	0.089**	0.109**	0.085**	0.102**	0.098**	0.119**	0.093**	0.169***	0.165***	0.209***	0.156***
	(0.047)	(0.040)	(0.057)	(0.038)	(0.049)	(0.042)	(0.048)	(0.046)	(0.042)	(0.037)	(0.051)	(0.034)
Observations	11,220	11,220	14,323	11,250	11,220	11,220	14,323	11,250	11,220	11,220	14,323	11,250
Number of firms	748	748	1,178	750	748	748	1,178	750	748	748	1,178	750
Sample	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched
Pilot region FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No	No	No

(Continues)

Table A.17: Continued

	Log sales (1-4)				Log employees (5-8)				Log TFPR (9-12)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
C. Both transfers												
Year1AfterPP	0.090***	0.084***	0.090***	0.079***	0.045***	0.042***	0.049***	0.038***	0.203***	0.194***	0.206***	0.191***
	(0.021)	(0.015)	(0.017)	(0.017)	(0.015)	(0.012)	(0.013)	(0.011)	(0.041)	(0.037)	(0.049)	(0.011)
Year5AfterPP	0.248***	0.241***	0.272***	0.158***	0.180***	0.178***	0.192***	0.173***	0.348***	0.339***	0.352***	0.338***
	(0.024)	(0.023)	(0.025)	(0.022)	(0.040)	(0.035)	(0.053)	(0.031)	(0.039)	(0.036)	(0.044)	(0.018)
Year10AfterPP	0.307***	0.283***	0.364***	0.323***	0.383***	0.371***	0.422***	0.362***	0.499***	0.495***	0.527***	0.489***
	(0.043)	(0.034)	(0.034)	(0.035)	(0.052)	(0.049)	(0.062)	(0.048)	(0.062)	(0.059)	(0.068)	(0.021)
Year15AfterPP	0.461***	0.455***	0.597***	0.449***	0.525***	0.504***	0.581***	0.498***	0.617***	0.611***	0.697***	0.606***
	(0.062)	(0.060)	(0.055)	(0.051)	(0.077)	(0.071)	(0.081)	(0.068)	(0.049)	(0.046)	(0.081)	(0.032)
Observations	16,230	16,230	20,530	11,250	16,230	16,230	20,530	11,250	16,230	16,230	20,530	11,250
Number of firms	1,082	1,082	1,468	750	1,082	1,082	1,468	750	1,082	1,082	1,468	750
Sample	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched	Balanced	Balanced	Full	Matched
Pilot region FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Time FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	No	Yes	Yes	Yes	No	Yes	Yes	Yes	No	Yes	Yes
Firm FE	No	No	No	No	No	No	No	No	No	No	No	No

Notes. Columns 1-3, 5-7, and 9-11 report the coefficients estimated from equation $\text{outcome}_{iprt} = \alpha + \beta\text{ExpProv}_{ip} + \sum_{t=0}^{15} \delta_t(\text{ExpProv}_{ip} \cdot \text{PostPP}_{it}) + \lambda_r + \zeta_s + \nu_t + \epsilon_{iprt}$ for firms that applied for management transfer (Panel A), firms that applied for technology transfer (Panel B) and firms that applied for both transfers (Panel C). α is a constant term; ExpProv_{ip} is an indicator that equals one if firm i is located in an *experimental province*; PostPP_{it} is an indicator for each year t, after firm i received the Productivity Program assistance; λ_r is *Pilot region* fixed effects; ζ_s is industry fixed effects; and ν_t is time fixed effects. The dependent variable, outcome_{it}, is one of the key performance metrics of logged (deflated) sales, number of employees, and TFPR. Columns 4, 8, and 12 report coefficients estimated from equation 2. In columns 1-2, 5-6, and 9-11 the samples include only that survived in the 15 years after the Productivity Program; in columns 3, 7, and 11 all applicant firms are included; in columns 4, 8 and 12 the samples include only matched firms. Data are provided at firm level. The dependent variables are logged deflated *sales*, converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (columns 9-12). Standard errors are clustered at the province level in columns 1-3, 5-7 and 9-11, and bootstrapped with 250 replications in columns 4, 8 and 12. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

Table A.18: Lee's Tightened Bounds

	A. Management			B. Technology			C. Both transfers		
	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR	Log Sales	Log Employees	Log TFPR
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Lower Bound Year15	0.299***	0.267***	0.321***	0.076***	0.088***	0.122***	0.365***	0.434***	0.534***
	(0.075)	(0.071)	(0.091)	(0.028)	(0.031)	(0.044)	(0.091)	(0.098)	(0.089)
Upper Bound Year15	0.401***	0.358***	0.509***	0.156***	0.198***	0.235***	0.598***	0.606***	0.697***
	(0.079)	(0.067)	(0.089)	(0.045)	(0.055)	(0.059)	(0.101)	(0.122)	(0.113)
Observations	13,902	13,902	13,902	20,213	20,213	20,213	27,870	27,870	27,870
Number of firms	731	731	731	1,178	1,178	1,178	1,468	1,468	1,468

Notes. Tightened Lee (2002)'s bounds calculated for coefficients from equation 1 for firms that applied for management transfer (Panel A), firms that applied for technology transfer (Panel B) and firms that applied for both transfers (Panel C). Data are provided at firm level. The dependent variables are logged deflated *sales*, converted from 1951 Italian lira to 2010 euro and exchanged at 0.780 euro=USD 1 (columns 1-4); logged *employement*, reporting the number of employees per firm (columns 5-8); and logged *TFPR*, estimated using the Ackerberg et al. (2006) method (columns 9-12). Standard errors are clustered at the province level in columns. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.

B Data Collection

The data collection targeted the population of firms eligible to apply for the Productivity Program in 1951. The whole process constituted of three phases.

The first phase was about locating the data. Between September and November 2013, I contacted four Italian historical archives: Confindustria Historical Archive (ASC), the Central Archives of the States (ACS), the Historical Archive of Istituto Mobiliare Italiano (ASI-IMI), and the Bank of Italy Historical Archive (ASBI), all located in Rome, Italy. These archives confirmed they owned the data I needed and granted me access to it.

In the second phase, between December 2013 and March 2014, I visited the archives in order to collect the data. I proceed over three steps. First, I use firm registries at ASC to obtain the list of firms that were eligible to apply for the Productivity Program in 1951. These firms were manufacturing companies, with a number of employees between 15 and 250, required to compile a balance sheet, and located in five Italian regions: Lombardia, Veneto, Toscana, Campania, and Sicilia. The list includes 6,065 firms. Second, for each of them, I took photographic copies of the balance sheets and the statement of profits and losses from 1946 to 1973, stored at ASC. Finally, I linked these firms with the applications' records, stored at ACS and ASI-IMI. I was able to take photographic copies of 60 percent of the applications records. For the remaining 40 percent, I was not allowed taking photographic copies because of archive regulations, so I manually copied them. I also visited the ASBI to obtain institutional data, such as the series of interest rates, GDP and industries deflators. The ASBI material was provided in electronic copy (DVD).

In the third and last phase of the data collection, between April and December 2014, I digitized the photographic copies with the help of freelancers hired on a popular online marketplace. For testing the quality of the freelancers, I prepared a guideline document and test (and pay) them of a portion of data I have digitized. I only hired freelancers who made zero mistake in this phase. The data were transcribed directly into excel spreadsheets. To ensure the quality of the data, I had two freelancers digitizing the same data. This procedure speeds up the search of potential mistake. In particular, I checked all the data by comparing the works of the two freelancers. For each difference found, I manually checked the original document and fixed the mistake. Moreover, I randomly checked 10 percent of the digitized data for which there were no differences. Finally, I manually matched the eligible firms with the applications' records, using firm name, headquarter address and municipality as an identifier.

C Estimation of the Production Function

I assume a Cobb-Douglas production function

$$Y_{it} = A_{it} K_{it}^{\beta_k} L_{it}^{\beta_l} \tag{C.1}$$

where Y_{it} is the value added of firm i in period t, K_{it} and L_{it} are inputs of capital and labor, and A_{it} is the Hicksian-neutral efficiency level. Taking natural logs, equation C.1 results in the linear production function

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + \underbrace{\omega_{it} + \eta_{it}}_{\epsilon_{it}} \tag{C.2}$$

where lower-case letters refer to natural logarithms, β_0 measures the mean efficiency level across firms and over time, ϵ_{it} is is the time- and producer-specific deviation from that mean, which can then be further decomposed into an observable (or at least predictable) ω_{it} and unobservable component η_{it}. ω_{it} is a productivity shock (that may include, for instance, machinery breakdown, demand shock, managerial skills, etc...) and η_t is an i.i.d. component, representing unexpected deviations from the mean due to measurement error, unexpected delays or other external circumstances.

The major econometric issue of estimating equation C.2 is that the firm's optimal choice of inputs k_{it} and l_{it} is generally correlated with the observed productivity shock ω_{it}, which renders OLS estimates of the β's biased and inconsistent.

Possible solutions for this problem are to use instrumental variables estimation techniques or to control for firms fixed effects. In practice, however, these solutions have not worked well. Natural instruments, such as input prices if firms are operating in competitive input markets, are often not observed or do not vary enough across firms and fixed effects estimation requires the strong assumption that the unobservables are constant across time, i.e. $\omega_{it} = \omega_{it-1}\ \forall t$ (Ackerberg et al. (2006)). The dynamic panel literature extends the fixed effects literature to allow for more sophisticated error structures (Bond and Soderbom (2005)). For instance, it is possible to assume that ω follows an AR(1) process, i.e. $\omega_{it} = \rho\omega_{it-1} + \xi_{it}$. Since the innovation in ω_{it}, ξ_{it}, occurs after time $t-1$, it may not be correlated with inputs dated $t-1$ and earlier (Ackerberg et al. (2006)) and this is used to derive the moment conditions.[1]

Other solutions, advocated by Olley and Pakes (1996) and Levinsohn and Petrin (2003), involve a more structural approach and use investment or intermediate inputs to "proxy" for productivity shocks. Specifically, they assume that labor is the non-dynamic input,

[1] In this case, the moment condition is $E\left[(\xi_{it} - \xi_{it-1} + (\epsilon_{it} - \rho\epsilon_{it-1}) - (\epsilon_{it-1} - \rho\epsilon_{it-2}))|\left\{ \begin{array}{c} k_{i\tau} \\ l_{i\tau} \end{array} \right\}_{\tau=1}^{t-2}\right] = 0.$

capital is the dynamic input, and that

$$m_{it} = f_t(k_{it}, \omega_{it}) \tag{C.3}$$

where m_{it} is investment in the Olley and Pakes (1996)'s method and intermediate inputs in the Levinsohn and Petrin (2003)'s method and is function of capital k_{it} and productivity ω_{it}.[2]

Assuming that C.3 is invertible, then

$$\omega_{it} = f_t^{-1}(k_{it}, m_{it}) \tag{C.4}$$

and substituting in equation C.2,

$$y_{it} = \beta_0 + \beta_k k_{it} + \beta_l l_{it} + f_t^{-1}(k_{it}, m_{it}) + \eta_{it} \tag{C.5}$$

where f_t^{-1} is treated as non-parametric. The estimation consists in two steps. In the first step, equation C.5 is estimated by using semi-parametric techniques. This allows estimating β_l, but does not identify β_k, since it is collinear with the non-parametric function. In the second step, assuming that ω follows a first order Markov process implies that

$$\omega_{it} = E[\omega_{it}|m_{it-1}] + \xi_{it} = E[\omega_{it}|\omega_{it-1}] + \xi_{it} \tag{C.6}$$

where ξ is the "innovation" component of ω, such that $E[\xi_{it}|m_{it-1}] = 0$. Since capital at time t is decided at time $t-1$, it implies that $E[\xi_{it}|k_{it}] = 0$.[3] Variation in k_{it} conditional on ω_{it-1} is the exogenous variation used to identify β_k, which is estimated via GMM using the following moment conditions

$$\frac{1}{T}\frac{1}{N}\sum_t \sum_i \xi_{it}(\beta_k) \cdot k_{it} \tag{C.7}$$

In this paper, I use the method proposed by Ackerberg et al. (2006), which is based on the Olley and Pakes (1996) and Levinsohn and Petrin (2003)'s methods, but solves the possible collinearity problem between labor and investment or intermediate inputs. This collinearity problem may arise because labor and investment or intermediate inputs have the same data generation process (DGP). Therefore, it is not possible to simultaneously estimate a fully non-parametric (time-varying) function of (ω_{it}, k_{it}) along with a coefficient

[2] Petrin et al. (2004) propose to use intermediate inputs instead of investment as proxy for productivity shocks, because investment is lumpy due to substantial adjustment costs and, so, it might not smoothly respond to the productivity shock.

[3] Olley and Pakes (1996) also controls for selection, by introducing an exit rule for firms.

on a variable that is only a (time-varying) function of those same variables (ω_{it}, k_{it}). The Ackerberg et al. (2006) method assumes that l_{it} is chosen by firms at time $t-b$ ($0 < b < 1$), after k_{it} was chosen at time $t-1$, but before m_{it} being chosen at time t. In this setup,

$$m_{it} = f_t(\omega_{it}, k_{it}, l_{it})$$

In the first stage, β_l is not identified, but it is possible to estimate $\Phi_t(m_{it,}k_{it}, l_{it}) = \beta_k k_{it} + \beta_l l_{it} + f_t^{-1}(m_{it}, k_{it}, l_{it})$, which represents output net of the untransmitted shock η_{it}. In the second stage, the moment condition on capital is $E[\xi_{it}|k_{it}] = 0$ (which comes from ω following a first order Markov process and implies $E[\xi_{it} \cdot k_{it}] = 0$) and the moment condition on labor is $E\left[\xi_{it}| \begin{array}{c} k_{it} \\ l_{it-1} \end{array}\right] = 0$ (since l_{it-1} was chosen at time $t-b-1$ and this implies $E\left[\xi_{it} \cdot \begin{array}{c} k_{it} \\ l_{it-1} \end{array}\right] = 0$).[4]

Appendix Table C.1 reports the coefficients on labor and capital estimated by using the Ackerberg et al. (2006)'s method, separately for each manufacturing industry. To check the extent to which the Ackerberg et al. (2006)'s estimates differ from other estimates, I also report the labor and capital coefficients estimated with the OLS, the factor shares (Solow's residuals), the Levinsohn and Petrin (2003)'s method, and the dynamic panel method. The OLS and factor shares calculation tend to underestimate the coefficients on capital compared to the Ackerberg et al. (2006)'s coefficients, while the Levinsohn and Petrin (2003) tend to overestimate it. However, the coefficients are roughly comparable across the different estimation method and in each industry I cannot reject the null hypothesis of constant return to scale.[5]

C.1 Definition of the Variables

To estimate the production function in equation C.2, I use the following variables:

- value added: computed as the difference between firm deflated total income and intermediate inputs. The deflator used is the year-industry deflator, with base-year 1946.

[4] Compared with the dynamic panel approach, the Ackerberg et al. (2006) allows estimating ω separately from ϵ. This has two major implications: (1) in the Ackerberg et al. (2006)'s method ω can follow a first order Markov process not necessarily linear; (2) the variance of a GMM estimator is proportional to the variance of the moment condition being used, so the Ackerberg et al. (2006) is more efficient. However, the GMM estimator can allow for a fixed effect α_i in addition to ω_{it}, allows for ϵ_{it} to be correlated over time and allows for ω following a higher than first order Markov process, as long as this process is linear (Ackerberg et al. (2006)).

[5] It is worth noting that I measure firm output by using deflated value added, which might not reflect the ranking of firms in their productivity if they charge different markups.

- labor: measured by number of employees.
- capital: measured by firm capital stock. To obtain a measure of firm capital stock from the fixed gross assets (*fga*) reported in the balance sheets I use the Perpetual Inventory Method (PIM). First, I compute investment I as the difference between the deflated current and the lagged *fga*. This enables to use the PIM formula

$$P_{t+1}K_{t+1} = P_{t+1}(1-\delta)P_tK_t + P_{t+1}I_{t+1} \tag{C.8}$$

where K is the quantity of capital, P is its price (set equal to the interest rate on credit for years 1946-1950 and to the national industry credit rate for years 1951-1970), I is investment, and δ is the depreciation rate (set equal to 6.5%, according to the estimation of average life of machine of 15 years (ISTAT (2012))). However, this procedure is valid only if the base year capital stock (the first year in the data for a given firm) can be written as P_0K_0 , which is not the case here because in the balance sheets *fga* is reported at its historic cost. To estimate its value at replacement cost, I use the R^G factor suggested by Balakrishnan et al. (2000):

$$R^G = \frac{[(1+g)^{\tau+1}-1](1+\pi)^{\tau}[(1+g)(1+\pi)-1]}{g\{[(1+g)(1+\pi)]^{\tau+1}-1\}} \tag{C.9}$$

where τ is the average life of machines (assumed to be 15 years, according to ISTAT (2012)), π is the average capital price $\frac{P_t}{P_{t-1}}$ from 1946 to 1973 (equal to 1.00255), g is the (assumed constant) real investment growth rate $\frac{I_t}{I_{t-1}}$ from 1946 to 1973 (equal to 1.062272). I multiply *fga* in the base year 1946 by R^G to convert capital to replacement costs at current prices, which I then deflate using the price index for machinery and machine tools to express it in real terms. Finally, I apply formula C.8.

Table C.1: Estimation of Production Function

	I. Food			II. Textile			III.Wood		
	β_l	β_k	p-value $\beta_l + \beta_k = 1$	β_l	β_k	p-value $\beta_l + \beta_k = 1$	β_l	β_k	p-value $\beta_l + \beta_k = 1$
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
ACF	0.58***	0.44***	0.367	0.67***	0.35***	0.451	0.55***	0.47***	0.246
	(0.005)	(0.012)		(0.009)	(0.007)		(0.007)	(0.005)	
OLS	0.61***	0.40***	0.281	0.70***	0.33***	0.342	0.56***	0.42***	0.358
	(0.004)	(0.006)		(0.004)	(0.005)		(0.006)	(0.003)	
Factor Shares	0.55	0.45		0.64	0.36		0.57	0.43	
LP	0.56***	0.47***	0.452	0.63***	0.39***	0.246	0.50***	0.51***	0.435
	(0.011)	(0.009)		(0.012)	(0.008)		(0.011)	(0.013)	
DP	0.59***	0.44***	0.498	0.65***	0.36***	0.377	0.57***	0.46***	0.239
	(0.013)	(0.010)		(0.011)	(0.009)		(0.008)	(0.011)	

	IV. Machinery			V. Minerals			VI. Chemicals		
	β_l	β_k	p-value $\beta_l + \beta_k = 1$	β_l	β_k	p-value $\beta_l + \beta_k = 1$	β_l	β_k	p-value $\beta_l + \beta_k = 1$
	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)
ACF	0.62***	0.39***	0.539	0.61***	0.42***	0.371	0.65***	0.34***	0.654
	(0.004)	(0.009)		(0.008)	(0.015)		(0.021)	(0.011)	
OLS	0.64***	0.35***	0.432	0.62***	0.40***	0.254	0.66***	0.32***	0.348
	(0.009)	(0.007)		(0.010)	(0.014)		(0.009)	(0.007)	
Factor Shares	0.65	0.35		0.64	0.36		0.62	0.38	
LP	0.57***	0.42***	0.394	0.63***	0.44***	0.365	0.63***	0.38***	0.493
	(0.011)	(0.013)		(0.014)	(0.017)		(0.013)	(0.015)	
DP	0.61***	0.40***	0.453	0.62****	0.42***	0.410	0.67***	0.34***	0.352
	(0.012)	(0.015)		(0.015)	(0.019)		(0.021)	(0.025)	

Notes. Coefficients on labor (β_l) and capital (β_k) estimated with the Ackerberg et al. (2006) method (ACF), OLS, factor shares (Solow's residuals), Petrin et al. (2004) (LP), and dynamic panel method (DP), separately for each manufacturing industry. Columns 3, 6, 9, 12, 15, and 18 report the p-value of testing constant return to scale (CRS) $\beta_l + \beta_k = 1$. The sample include 6,035 Italian firms eligible to apply for the Productivity Program. Data are provided at firm level. *** denotes 1%, ** denotes 5%, and * denotes 10% significance.