

The Long-Term Effects of Management and Technology Transfers

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Motivation

Large productivity spreads across firms correlated with

- ▶ Management practices (Bloom et al., 2013)
- ▶ Adoption of capital-embodied technologies (Sakellaris and Wilson, 2004)

Little causal evidence (Bloom et al., 2013; Goldberg et al., 2009)

- ▶ Management and technology are endogenous
- ▶ RCTs in the short-run

Open questions

- ▶ Long-run effects?
- ▶ Heterogeneous and spillover effects?

This Paper: The US Productivity Program

Transfer of US management and technology to Europe (1952-1958)

- ▶ Management-training trips for European managers in US firms
- ▶ Loans restricted to purchase technologically-advanced US machines

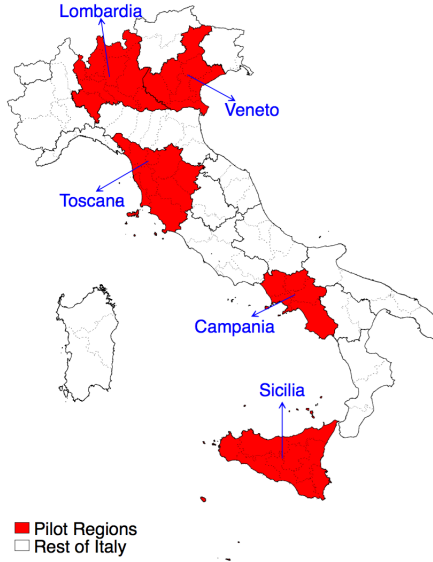
Data: 6,065 Italian firms eligible to participate in the program

- ▶ Balance sheets from 5 years before to 15 after
- ▶ Applications submitted for study trips and/or new machines

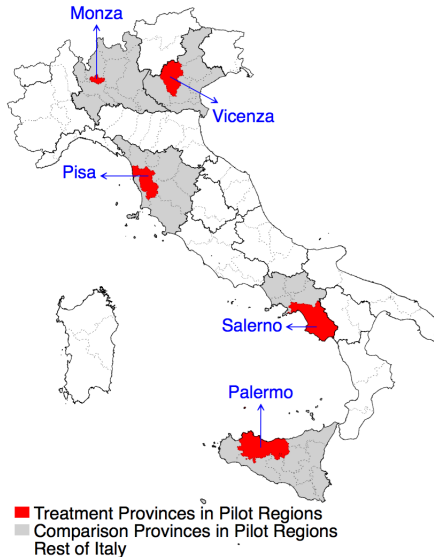
Identification strategy: Unexpected US budget cut and comparison

- ▶ Firms that eventually participated
- ▶ Firms initially eligible, excluded after the cut
- ▶ That applied for the *same* US transfer before the cut

SME Manufacturing Firms Located in 5 Pilot Regions



Unexpected Budget Cut: 5 Treated Provinces



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Preview of the Results

Better management practices

- ▶ Large and persistent effects on survivorship, sales, employment
- ▶ Productivity: +16% after one year, +46% after 15 years

Technologically-advanced capital goods

- ▶ Positive and short-lived effects on survivorship, sales, employment
- ▶ Productivity: materialize after 3 years, +20% after 10 years

Complementary effects

- ▶ Larger effects than the sum of management and technology effects
- ▶ Productivity: additional 19 percentage point increase in 15 years

Mechanisms

Adoption of US management practices

- ▶ More than 90% of firms within 3 years
- ▶ Still in use 15 years later

Firm organization

- ▶ Increase in number of plants and manager-to-worker ratio
- ▶ More professionally-managed businesses

Financing and investment

- ▶ Increase in bank credit, investment, ROA
- ▶ No long-run effects for technology transfer

Contribution to the Literature

Management, organization and firm performance *Management practices/Corporate management*: Bruhn et al. (2018); Bloom et al. (2013); Bloom, Sadun, Van Reenen (2012); Bloom and Van Reenen (2007); Ichinowski, Shaw, and Prenushi (1997); *Individual managers*: Bandiera, Prat, Sadun (2013); Perez-Gonzalez (2006); Bertrand and Schoar (2003)

Technology adoption / know-how diffusion and firm productivity Belderbos, Van Roy, Duvivier (2013); Comin and Bjarnar (2010); Greenstone et al. (2010); Burstein and Monge-Naranjo (2008); Blalock and Gertler (2007); Savvides et al. (2005); Sakellaris and Wilson (2004); Doms et al. (1997)

Economic history: European recovery after WWII and the Marshall Plan Yamazaki and Wooldridge (2013); Lombardo (2010); Fauri (2006); Boel (2003); Eichengreen et al. (1992); De Long and Eichengreen (1991)

Overview

- ▶ Institutional Details
- ▶ Data
- ▶ Empirical Strategy
- ▶ Main Results
- ▶ Mechanisms
- ▶ Indirect Effects
- ▶ Conclusions

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The Marshall Plan Productivity Program in Italy

Plan of aid to help Western Europe recover from WWII

- ▶ Provision of financial aid and in-kind subsidies (1948-1951)
- ▶ Aid for \$130 billion: 5% of US GDP in 1948 (ICA 1958)

Productivity Program (1952-1958)

- ▶ Management training trips for European managers at US firms
- ▶ Loans restricted to purchase technologically-advanced US machines

The implementation in Italy

- ▶ Targeted to small and medium-sized firms in manufacturing sector
- ▶ Participation on a voluntary basis

Management and Capital in Post-WWII Italy

Poor management practices in Italian firms

“[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, that result in frequent breakdown and work interruptions. [...] Modern marketing strategies are undeveloped, and distribution channels are old-fashioned” (BLS, 1949)

“Lack of management is a more severe problem than war damages” (Silberman et al., 1996)

Use of “out-of-date machines” (Hoffman, 1964)

- ▶ 10% of physical capital damaged by WWII (Zamagni, 1997)
- ▶ No capital investment after WWII (Zamagni, 1997)

Management Practices Taught in Study Trips

Training based on *Training Within Industry* (TWI)

1. Factory operations

- ▶ Regular machinery maintenance
- ▶ General maintenance of safety conditions within the firm

2. Production planning

- ▶ Sales and order control

3. Human resources training and management

- ▶ Training and supervision of employees
- ▶ Constant improvement of the production methods

4. Marketing

- ▶ Market research, product requirements, branding, and design
- ▶ Advertising campaigns, modernization of the distribution channels

Description of Management Training Trips

Organization of training trips

- ▶ Teams of 15-20 people from different European countries
- ▶ 8-12 weeks spent in 5/6 US firms

Choice of US firms

- ▶ Operating in the same sector of trainees' firms
- ▶ Scale of operation and product lines reachable in 10 years

Content of training trips

- ▶ Seminars and meetings by US experts
- ▶ Working side by side with US managers
- ▶ 3-year technical assistance in Italy

"In the US, we learned to manage firms the way they did and we brought back those practices to our firms" (Francesco Sartori, 1956)

Firm Financing and Purchase of US Machines

Credit to firms: subsidized loans

- ▶ Restricted to buy US machines
- ▶ Interest rate lower than market's (5.5% vs 9.0%)

US capital goods had more modern technology than European ones

- ▶ 7-fold bottles washed by US bottle-washing machines (Dunning, 1998)
- ▶ 4-5 fold longer life for steel manufacturing US machines (Dunning, 1998)

4-7 weeks study trips for European engineers

- ▶ Know-how transfer needed to use new machines
- ▶ 3-year technical assistance in Italy

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Data Collection

Targeted population: firms *eligible* for Productivity Program

- ▶ SME in manufacturing sector in 5 *pilot regions*

Data collection in three steps

1. Firm registries in 1951 (Confindustria, Rome-Italy)
 - ▶ List of 6,065 *eligible* firms
2. Collection of balance sheets and statements of profits and losses
 - ▶ From 1946 to 1973
3. Collection of applications (IMI and State Central Archives, Rome-Italy)
 - ▶ Management (N=809), technology (N=1,190), combined (N=1,625)

Data Digitization: Example Application for New Machine

Forma 1 (M. L. 22)

FLAM

2/1539

1452

SETTORE INDUSTRIALE 7 194 001. Conto dell'apposizione FLAM

Richiedente LANIFICIO PIETRO CAZZOLA Numero della pratica 5293/687

ISTRUTTORIA SOCIALE S.p.A. Data di arrivo della domanda 28-4-1951

SEDE legale via Schio (vicenza) via Riboli 14 tel. 71 TELEGRAMMI San-Juan Cazzola

STABILIMENTI

ATTIVITÀ esercitata

DOMANDA DI MUTUO in data 29/4/51 pervenuta tramite Rit. P. Banca sua lettera 19/4/51 L. 15.000.000 per L. 15.000.000

variazioni richieste

Destinazione importo per l'acquisto di macchinari

Durata e ammortamento

Garanzie offerte fiduciaria - Banca di Schio

Altri dati della domanda

OSSERVAZIONI

ISTRUTTORIA PRELIMINARE

	A	B	C	D	E	F	G	
1	Firm ID	Firm	Headquarter	Province	Address	Application	Amount	
2	1	Lanificio Pietro Cazzola	Schio	Vicenza	Via Riboli 24	30/4/1951	15,000,000	
3								
4								

Summary Statistics of 6,065 Eligible Firms

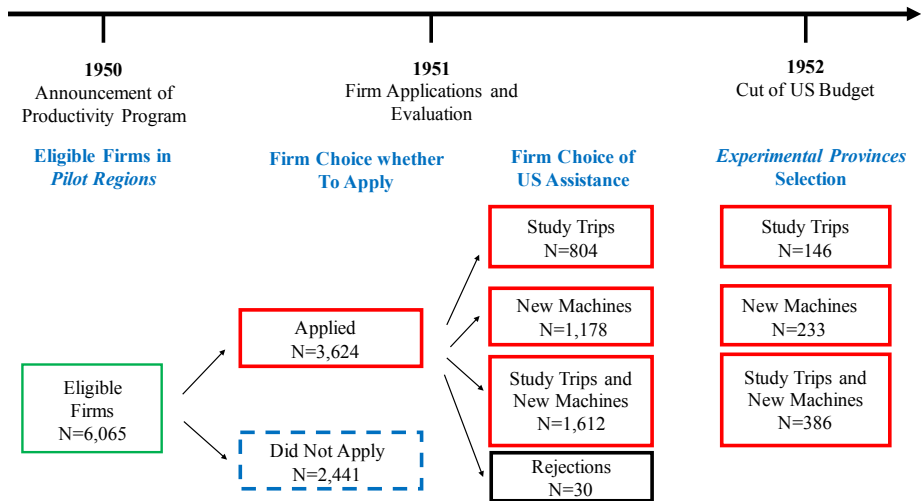
	Mean	St. Dev.	Min	Max
Plants per firm	1.33	1.58	1	5
Employees per firm	47.67	56.39	15	250
Current assets (k USD)	1,632.59	2,355.67	356.72	9,432.76
Annual sales (k USD)	1,015.63	1,956.78	193.46	7,487.91
Value added (k USD)	491.55	773.45	60.93	3,945.09
Age	12.41	7.44	4	43
Productivity (log TFPR)	2.48	0.51	1.98	3.71
Export	0.13	0.33	0	1
Family-managed	0.43	0.50	0	1
N	6,065	6,065	6,065	6,065

Notes. Summary statistics for the 6,065 firms eligible to apply for the Productivity Program in 1951. Data are provided at firm level. *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 Akerberg et al. (2006) method.

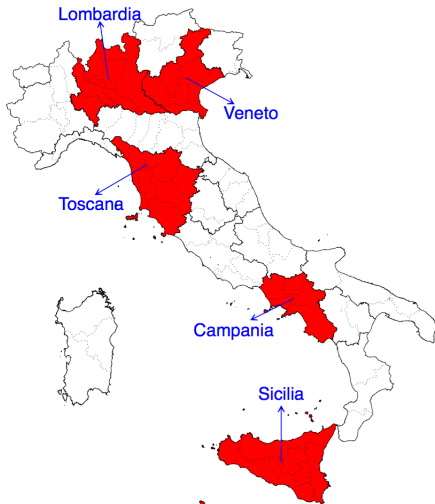
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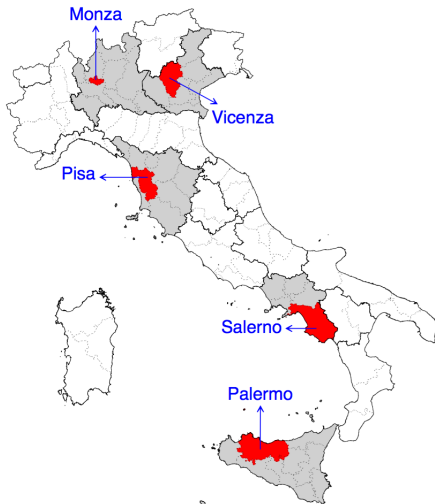
Research Design



Pilot Regions (1950) and Treated Provinces (1952)

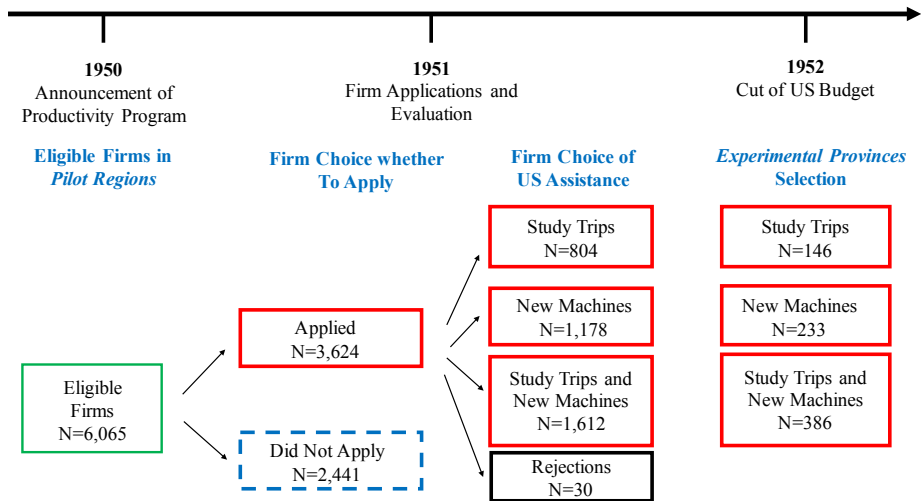


■ Pilot Regions
□ Rest of Italy



■ Treatment Provinces in Pilot Regions
■ Comparison Provinces in Pilot Regions
□ Rest of Italy

Research Design



Selection of Treated Provinces

Selection made by committee of US and Italian experts

- ▶ Reproduce the initial program on a smaller scale
- ▶ Treated provinces chosen to “middle” in each region

“The chosen provinces will have average economic characteristics of each pilot region” (CNP, 1960)

“The most or the least developed provinces will be excluded” (CNP, 1960)

“For Veneto, Vicenza was selected because its structure reproduces Veneto’s structure very well” (Bianchi, 1993)

Province Characteristics in 1951

	Lombardia		Veneto		Toscana	
	All	Monza	All	Vicenza	All	Pisa
Manufacturing Firms (k)	14.7	14.1	10.5	10.8	9.6	10.1
People per Km ²	179.6	176.2	152.9	158.0	196.3	190.1
Employment/Population	0.57	0.59	0.53	0.55	0.49	0.51
Manufacturing Labor Share	0.39	0.39	0.36	0.35	0.34	0.35
	Campania		Sicilia			
	All	Salerno	All	Palermo		
Manufacturing Firms (k)	6.9	7.5	5.7	5.6		
People per Km ²	199.3	206.8	238.5	231.7		
Employment/Population	0.30	0.33	0.31	0.35		
Manufacturing Labor Share	0.30	0.31	0.32	0.30		

Notes. Characteristics of *pilot regions* and treated provinces in 1951.

Empirical Specification: DID Estimation + Event Study

Comparison between firms that applied and participated in the program and firms that applied and were excluded due to budget cut

$$\text{outcome}_{it} = \alpha_i + \nu_t + \sum_{\tau=-5}^{15} \delta_{\tau} (\text{Treat}_i \cdot \text{Years After Treat}=\tau) + \epsilon_{it}$$

- ▶ Separately for management, technology and combined transfers samples
- ▶ Outcome_{it} : logged (deflated) sales, employment, TFPR
- ▶ Treat_i : indicator for firms in treated provinces
- ▶ $\text{Years After Treat}=\tau$: difference between calendar year t and year of program participation
- ▶ α_i : firm fixed effect
- ▶ ν_t : year fixed effects
- ▶ Block-bootstrapped standard errors

Identification Assumptions

Firm performance

- ▶ In the two groups of provinces
 - ▶ Separately for management, technology and combined transfers samples
- would have been the same without the program

Supporting empirical evidence

- ▶ Balancing tests for firm characteristics in 1951
- ▶ Time trends in 1946-1951

Firms that Applied for Management Transfer, 1951

	Treated	Comparison	Difference
Employees per firm	37.06 (39.87)	42.52 (40.63)	-5.89 (15.69)
Current assets (k USD)	1,943.21 (2,678.91)	1,894.39 (2,741.57)	47.39 (98.74)
Annual sales (k USD)	946.71 (1,672.39)	915.69 (1,655.78)	30.92 (78.95)
Productivity (log TFPR)	2.63 (0.47)	2.70 (0.45)	0.07 (0.22)
Family-managed	0.25 (0.44)	0.25 (0.43)	0.02 (0.05)
% applications	0.11 (0.32)	0.14 (0.34)	-0.03 (0.04)
Observations	146	658	804

Notes. Mean of firm characteristics in treated and comparison provinces and coefficients from regressing each variable on a dummy for treated provinces and *pilot regions* fixed effects. Standard errors are block-bootstrapped with 200 replications.

Firms that Applied for Technology Transfer, 1951

	Treated	Comparison	Difference
Employees per firm	57.66 (44.65)	61.20 (46.54)	-3.67 (12.33)
Current assets (k USD)	1,497.58 (2,453.12)	1,581.78 (2,333.94)	-98.58 (156.01)
Annual sales (k USD)	958.43 (1,709.43)	954.67 (1,679.19)	3.45 (4.94)
Productivity (log TFPR)	2.55 (0.61)	2.58 (0.59)	-0.05 (0.12)
Family-managed	0.35 (0.43)	0.33 (0.47)	-0.03 (0.06)
% applications	0.18 (0.39)	0.20 (0.40)	-0.02 (0.05)
Observations	233	945	1,178

Notes. Mean of firm characteristics in treated and comparison provinces and coefficients from regressing each variable on a dummy for treated provinces and *pilot regions* fixed effects. Standard errors are block-bootstrapped with 200 replications.

Firms that Applied for Combined Transfers, 1951

	Treated	Comparison	Difference
Employees per firm	69.26 (47.85)	66.30 (49.82)	2.33 (8.76)
Current assets (k USD)	2,037.45 (2,671.82)	1,920.07 (2,891.01)	115.34 (167.23)
Annual sales (k USD)	1,263.07 (1,908.45)	1,316.72 (1,782.33)	-55.61 (89.13)
Productivity (log TFPR)	2.67 (0.88)	2.74 (0.93)	-0.06 (0.56)
Family-managed	0.22 (0.41)	0.29 (0.45)	-0.09 (0.11)
% applications	0.30 (0.46)	0.26 (0.44)	0.05 (0.08)
Observations	386	1,226	1,612

Notes. Mean of firm characteristics in treated and comparison provinces and coefficients from regressing each variable on a dummy for treated provinces and *pilot regions* fixed effects. Standard errors are block-bootstrapped with 200 replications.

Management: Time Trend, 1946-1951

	Log Employees		Log Sales		Log TFPR	
Time Trend	0.031** (0.015)	0.027** (0.013)	0.043*** (0.011)	0.036*** (0.013)	0.016*** (0.003)	0.014*** (0.003)
Trend × EP	0.013 (0.013)	0.011 (0.015)	0.012 (0.017)	0.009 (0.015)	0.014 (0.015)	0.010 (0.012)
Treat	0.011 (0.013)	0.014 (0.012)	-0.009 (0.014)	-0.012 (0.016)	0.020 (0.026)	0.018 (0.022)
N	3,141	3,141	3,141	3,141	3,141	3,141
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Reg × time	No	Yes	No	Yes	No	Yes

OLS regressions predicting outcomes in the pre-Productivity Program period. Logged *employees* is the total number of employees per firm; logged *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; logged *TFPR* is the logarithm of total factor productivity revenue, estimated using the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Technology: Time Trend, 1946-1951

	Log Employees		Log Sales		Log TFPR	
Time Trend	0.039** (0.017)	0.035*** (0.013)	0.055* (0.033)	0.054* (0.032)	0.015*** (0.004)	0.011*** (0.003)
Trend x EP	-0.006 (0.010)	-0.003 (0.009)	0.006 (0.008)	0.005 (0.008)	-0.005 (0.008)	-0.005 (0.010)
Treatment	0.014 (0.021)	0.016 (0.019)	-0.013 (0.019)	-0.012 (0.015)	-0.006 (0.009)	-0.003 (0.007)
N	4,678	4,678	4,678	4,678	4,678	4,678
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Reg x time	No	Yes	No	Yes	No	Yes

OLS regressions predicting outcomes in the pre-Productivity Program period. Logged *employees* is the total number of employees per firm; logged *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; logged *TFPR* is the logarithm of total factor productivity revenue, estimated using the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Combined: Time Trend, 1946-1951

	Log Employees		Log Sales		Log TFPR	
Time Trend	0.046*** (0.009)	0.041*** (0.008)	0.045*** (0.009)	0.041*** (0.008)	0.018*** (0.005)	0.016*** (0.004)
Trend × EP	0.008 (0.011)	0.010 (0.013)	-0.007 (0.011)	-0.008 (0.010)	-0.008 (0.015)	-0.008 (0.011)
Treatment	-0.017 (0.022)	-0.015 (0.019)	0.011 (0.013)	0.014 (0.021)	0.017 (0.020)	0.014 (0.019)
N	6,238	6,238	6,238	6,238	6,238	6,238
Region FE	Yes	Yes	Yes	Yes	Yes	Yes
Reg × time	No	Yes	No	Yes	No	Yes

OLS regressions predicting outcomes in the pre-Productivity Program period. Logged *employees* is the total number of employees per firm; logged *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; logged *TFPR* is the logarithm of total factor productivity revenue, estimated using the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

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 - ▶ Extensive Margin
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 - ▶ Complementarity Effects
 - ▶ Heterogenous Effects
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Extensive Margin: Firm Survival

Estimation of Kaplan-Meier survival function separately for

- ▶ Management transfer
- ▶ Technology transfer

Estimated survival probability

$$\hat{S}(t) = \prod_{t_\tau \leq t} \left(1 - \frac{d_\tau}{n_\tau} \right)$$

where

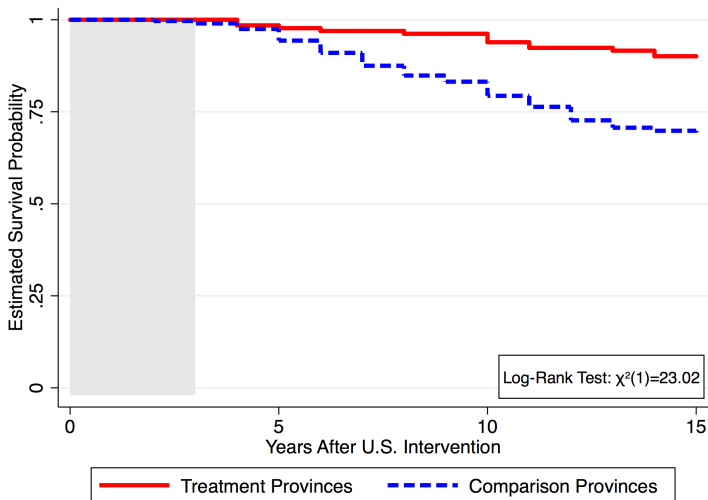
- ▶ d_τ number of firms that closed down at time τ
- ▶ n_τ number of firms that survived until time τ
- ▶ Intervention year normalized to zero

Management: 97% vs 94% Survival Probability, 5 Years



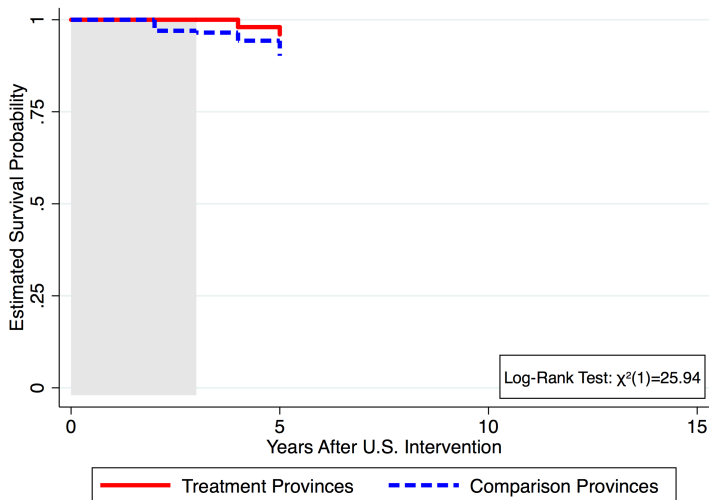
Notes. Kaplan-Meier survivor function. Data are provided at firm level. The gray shaded area corresponds to the three-year follow-up period after the US intervention.

Management: 90% vs 68% Survival Probability, 15 Years



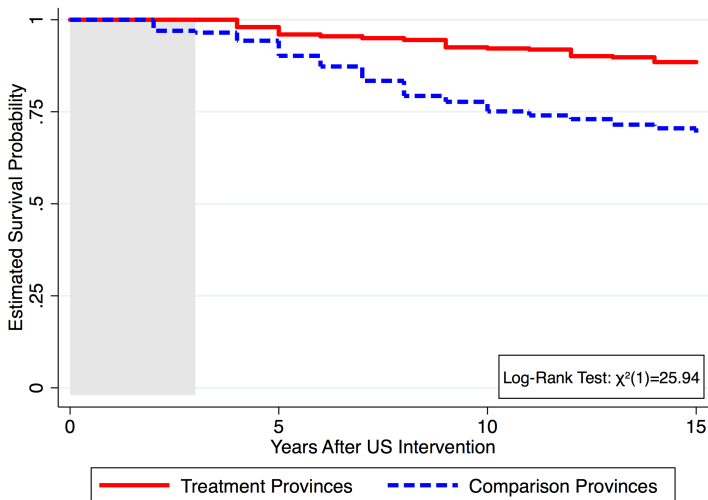
Notes. Kaplan-Meier survivor function. Data are provided at firm level. The gray shaded area corresponds to the three-year follow-up period after the US intervention.

Technology: 96% vs 90% Survival Probability, 5 Years



Notes. Kaplan-Meier survivor function. Data are provided at firm level. The gray shaded area corresponds to the three-year follow-up period after the US intervention.

Technology: 89% vs 69% Survival Probability, 15 Years



Notes. Kaplan-Meier survivor function. Data are provided at firm level. The gray shaded area corresponds to the three-year follow-up period after the US intervention.

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Intensive Margin: Sales, Employment, TFPR

DID estimation

- ▶ Separately for management, technology and combined transfers samples

$$\text{outcome}_{it} = \alpha_i + \nu_t + \sum_{\tau=-5}^{15} \delta_{\tau} (\text{Treat}_i \cdot \text{Years After Treat}=\tau) + \epsilon_{it}$$

- ▶ Outcome_{it}: logged (deflated) sales, employment, TFPR ▶ TFPR Estimation
- ▶ Treat_i: indicator for firms in treated provinces
- ▶ Years After Treat=τ: difference between calendar year *t* and year of program participation
- ▶ α_i: firm fixed effect
- ▶ ν_t : year fixed effects
- ▶ Block-bootstrapped standard errors

Management: 6.1% Increase in Sales after 1 Year

	Log Sales		
Year1AfterPP	0.059*** (0.015)	0.057*** (0.012)	0.063*** (0.011)
Year5AfterPP	0.110*** (0.027)	0.099*** (0.025)	0.122*** (0.0327)
Year10AfterPP	0.194*** (0.041)	0.155*** (0.039)	0.215*** (0.055)
Year15AfterPP	0.336*** (0.059)	0.289*** (0.056)	0.376*** (0.071)
Observations	11,298	13,902	13,902
Number of firms	538	731	731
Sample	Balanced	Bounds	Unbalanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. The dependent variable is logged deflated *sales*. Standard errors are block-bootstrapped with 200 replications.

Management: 40.0% Increase in Sales after 15 Years

	Log Sales		
Year1AfterPP	0.059*** (0.015)	0.057*** (0.012)	0.063*** (0.011)
Year5AfterPP	0.110*** (0.027)	0.099*** (0.025)	0.122*** (0.0327)
Year10AfterPP	0.194*** (0.041)	0.155*** (0.039)	0.215*** (0.055)
Year15AfterPP	0.336*** (0.059)	0.289*** (0.056)	0.376*** (0.071)
Observations	11,298	13,902	13,902
Number of firms	538	731	731
Sample	Balanced	Bounds	Unbalanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. The dependent variable is logged deflated *sales*. Standard errors are block-bootstrapped with 200 replications.

Management: No Increase in Employees after 1 Year

	Log Employees		
Year1AfterPP	0.008 (0.008)	0.007 (0.005)	0.011 (0.006)
Year5AfterPP	0.063*** (0.018)	0.060*** (0.017)	0.076*** (0.024)
Year10AfterPP	0.201*** (0.031)	0.189*** (0.038)	0.246*** (0.054)
Year15AfterPP	0.300*** (0.045)	0.281*** (0.047)	0.344*** (0.081)
Observations	11,298	13,902	13,902
Number of firms	538	731	731
Sample	Balanced	Bounds	Unbalanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

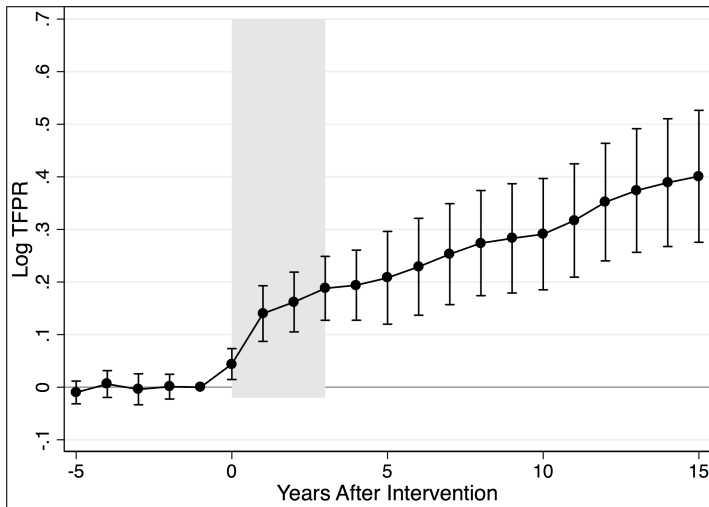
Notes. The dependent variable is logged *employment*. Standard errors are block-bootstrapped with 200 replications.

Management: 34.9% Increase in Employees after 15 Years

	Log Employees		
Year1AfterPP	0.008 (0.008)	0.007 (0.005)	0.011 (0.006)
Year5AfterPP	0.063*** (0.018)	0.060*** (0.017)	0.076*** (0.024)
Year10AfterPP	0.201*** (0.031)	0.189*** (0.038)	0.246*** (0.054)
Year15AfterPP	0.300*** (0.045)	0.281*** (0.047)	0.344*** (0.081)
Observations	10,760	10,760	13,902
Number of firms	538	538	731
Sample	Balanced	Bounds	Unbalanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

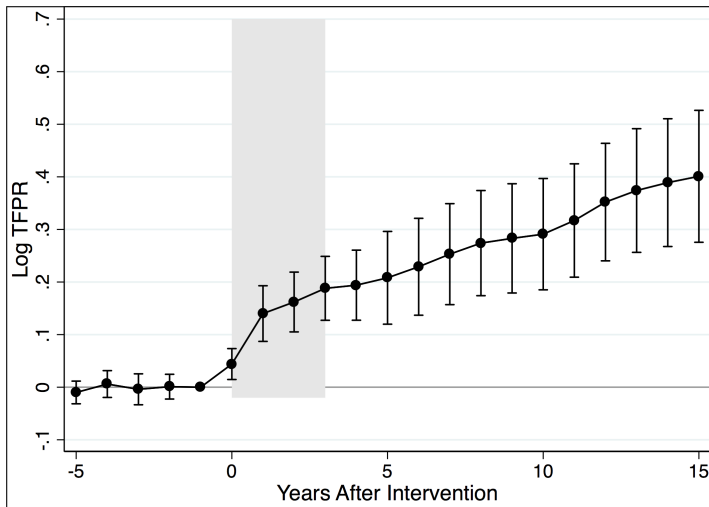
Notes. The dependent variable is logged *employment*. Standard errors are block-bootstrapped with 200 replications.

Management: 15.0% Increase in TFPR after 1 Year



Notes. The dependent variables are logged TFPR, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Management: 49.3% Increase in TFPR after 15 Years



Notes. The dependent variables are logged TFPR, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Magnitude of the Results

No other evidence of *long-run* effects

- ▶ Max follow-up: 8 years

Effects found in literature

- ▶ Bloom et al. (2013): large Indian textile firms
 - ▶ +17% in TFP vs +16% in TFPR within one year
 - ▶ +9% vs +7% in sale within one year
 - ▶ Persistent effects after 8 years
- ▶ Bruhn et al. (2018): small Mexican firms
 - ▶ +26% in TFP vs +16% in TFPR within one year
 - ▶ +44% vs +7% in employment after 5 year
 - ▶ +70% vs +13% in sales after 5 year

Technology: 7.1% Increase in Sales after 15 Years

	Log Sales		Log Employees	
Year1AfterPP	0.007 (0.006)	0.006 (0.005)	0.015 (0.011)	0.009 (0.012)
Year5AfterPP	0.042*** (0.015)	0.038*** (0.013)	0.037*** (0.012)	0.033*** (0.011)
Year10AfterPP	0.070** (0.031)	0.059** (0.026)	0.079** (0.039)	0.068** (0.029)
Year15AfterPP	0.069** (0.032)	0.056* (0.031)	0.078** (0.035)	0.064** (0.030)
Observations	15,708	20,213	15,708	20,213
Number of firms	748	1,053	748	1,053
Sample	Balanced	Unbalanced	Balanced	Unbalanced
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

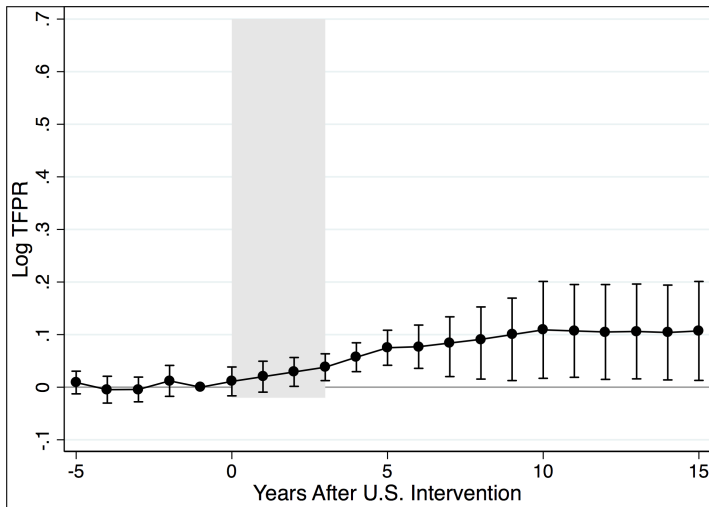
Notes. The dependent variables are logged deflated *sales* and logged *employment*. Standard errors are block-bootstrapped with 200 replications.

Technology: 8.1% Increase in Employees after 15 Years

	Log Sales		Log Employees	
Year1AfterPP	0.007 (0.006)	0.006 (0.005)	0.015 (0.011)	0.009 (0.012)
Year5AfterPP	0.042*** (0.015)	0.038*** (0.013)	0.037*** (0.012)	0.033*** (0.011)
Year10AfterPP	0.070** (0.031)	0.059** (0.026)	0.079** (0.039)	0.068** (0.029)
Year15AfterPP	0.069** (0.032)	0.056* (0.031)	0.078** (0.035)	0.064** (0.030)
Observations	15,708	20,213	15,708	20,213
Number of firms	748	1,053	748	1,053
Sample	Balanced	Unbalanced	Balanced	Unbalanced
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

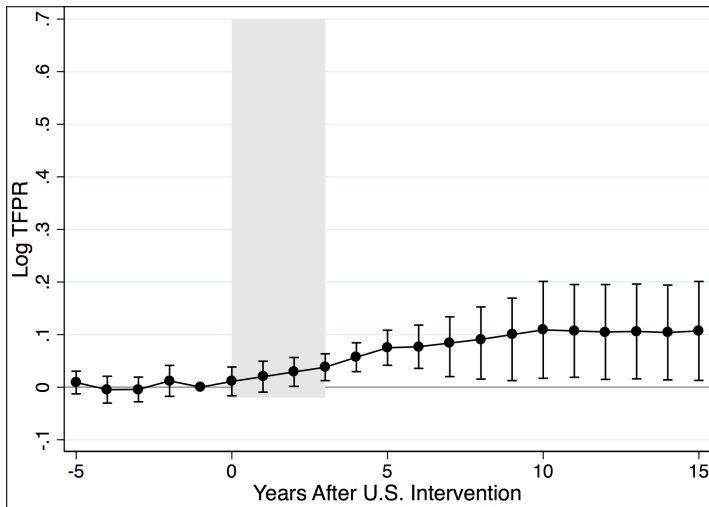
Notes. The dependent variables are logged deflated *sales* and logged *employment*. Standard errors are block-bootstrapped with 200 replications.

Technology: No Significant Increase in TFPR after 1 Year



Notes. The dependent variables are logged TFPR, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Technology: 11.2% Increase in TFPR after 15 Years



Notes. The dependent variables are logged TFPR, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

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 - ▶ Intensive Margin
 - ▶ **Complementarity Effects**
 - ▶ Heterogenous Effects
 - ▶ Exports and Imports
- ▶ Mechanisms
- ▶ Indirect Effects
- ▶ Conclusions

Are Management and Technology Complementary?

Issue: firms self-selected into a given transfer

- ▶ No comparison across different transfers

Inverse probability of treatment weighting (IPTW) method:

1. Compute propensity score as probability of choosing a U.S. intervention
 - ▶ Covariates: size, assets, sales, productivity, exports, ownership
2. Re-weight observations by inverse of propensity score
 - ▶ Creation of a synthetic sample
 - ▶ Distribution of covariates independent of U.S. intervention chosen
3. Estimation on the synthetic sample

Complementarity Effects: Estimation

$$\text{outcome}_{it} = \alpha_i + \nu_t + \sum_{j=1}^3 \sum_{\tau=-5}^{15} \delta_{j,\tau} [\text{Trans} \cdot \text{Treat}_i \cdot (\text{Years After Treat}=\tau)] + \epsilon_{it}$$

Complementary effects: $\delta_{\text{COMBINED}} - (\delta_{\text{MANAGEMENT}} + \delta_{\text{TECHNOLOGY}})$

- ▶ Outcome_{it} : logged (deflated) sales, employment, TFPR
- ▶ Trans_i^j : indicator for firms applying for management transfer (j=1), technology transfer (j=2), combined transfers (j=3)
- ▶ Treat_i : indicator for firms in treated provinces
- ▶ $\text{Years After Treat}=\tau$: difference between calendar year t and year of program participation
- ▶ α_i : firm fixed effect
- ▶ ν_t : year fixed effects
- ▶ Block-bootstrapped standard errors

Complementarity: 14.2% Additional TFPR Increase

	Log Sales	Log Employees	Log TFPR
Year1AfterPP	0.088*** (0.017)	0.036*** (0.010)	0.193*** (0.029)
Year5AfterPP	0.241*** (0.032)	0.169*** (0.034)	0.327*** (0.047)
Year10AfterPP	0.292*** (0.057)	0.341*** (0.048)	0.454*** (0.051)
Year15AfterPP	0.445*** (0.061)	0.481*** (0.064)	0.609*** (0.065)
Observations	22,722	22,722	22,722
Number of firms	1,082	1,082	1,082
Sample	Synthetic	Synthetic	Synthetic
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. The dependent variables are logged deflated *sales*, logged *employment* and logged *TFPR*, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

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Allowing for Heterogeneous Effects

By firm productivity wrt national industry mean [▶ Results](#)

- ▶ Management transfers: larger effects on less productive firms
- ▶ Technology transfer: larger effects on more productive firms

By firm size [▶ Results](#)

- ▶ Management transfer:
 - ▶ Short run: larger effects on firms with 50+ employees
 - ▶ Long run: smaller firms catch up
- ▶ Technology transfer: larger effects on bigger firms in short and long run

By local economic conditions [▶ Results](#)

- ▶ Larger in Northern Italy for all transfers
- ▶ Results significant and persistent also in Center and Southern Italy

By treatment year: little heterogeneity [▶ Results](#)

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Higher Probability of Exporting

	Management		Technology	
	Pr (Export)	Exports	Pr (Export)	Exports
Year1AfterPP	0.024*** (0.009)	0.015*** (0.004)	0.013** (0.006)	0.004 (0.006)
Year5AfterPP	0.155*** (0.026)	0.075*** (0.014)	0.026** (0.012)	0.046 (0.053)
Year10AfterPP	0.221*** (0.039)	0.121*** (0.044)	0.047*** (0.008)	0.037 (0.044)
Year15AfterPP	0.290*** (0.044)	0.155*** (0.051)	0.051*** (0.013)	0.041 (0.047)
Observations	10,760	1,400	14,960	1,800
Sample	Balanced	Exporters	Balanced	Exporters
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications. ▶ Non-Exporters

Higher Probability of Importing

	Management		Technology	
	Pr (Import)	Log $\frac{\text{Inputs}}{\text{Imports}}$	Pr (Import)	Log $\frac{\text{Inputs}}{\text{Imports}}$
Year1AfterPP	0.011*** (0.004)	0.005 (0.008)	0.008 (0.006)	0.002 (0.003)
Year5AfterPP	0.084*** (0.031)	0.022** (0.011)	0.011 (0.008)	0.015* (0.009)
Year10AfterPP	0.096*** (0.033)	0.045*** (0.017)	0.017* (0.010)	0.028** (0.014)
Year15AfterPP	0.151*** (0.049)	0.074*** (0.022)	0.022* (0.013)	0.033* (0.018)
Observations	10,760	2,160	14,960	3,280
Sample	Balanced	Importers	Balanced	Importers
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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What Explains the Effects of Management Training?

What changed in management of such firms?

- ▶ Technical reports from US experts for 3 years after the program

Did improved firm performance amplify the effects?

- ▶ Increase of plants, manager-to-worker ratio, professionally-managed firms
- ▶ Higher loans, investments and ROA

Implementation of Management Practices

	Year1	Year2	Year3	Year5	Year10	Year15
1) Human Resource Training	73%	85%	95%	95%	95%	95%
1a) Training for Leaders	59%	78%	90%	n/a	n/a	n/a
1b) Training for Workers	73%	85%	95%	n/a	n/a	n/a
1c) Introduction of Bonuses	68%	81%	89%	n/a	n/a	n/a
2) Marketing	79%	88%	98%	98%	98%	98%
2a) Market Research	65%	75%	88%	n/a	n/a	n/a
2b) Advertising Campaigns	79%	88%	98%	n/a	n/a	n/a
3) Factory Operations						
3a) Maintenance of Machines	65%	79%	87%	n/a	n/a	n/a
3b) Maintenance of Safety	71%	82%	92%	n/a	n/a	n/a
4) Production Planning						
Sales and Orders Control	75%	87%	95%	n/a	n/a	n/a

Notes. Percentage of firms that adopted US managerial practices 1, 2, 3, 5, 10 and 15 years after the Productivity Program.

Management: More Plants and Managers/Workers

	Plants	Man./Wor.	Governance
Year1AfterPP	0.005 (0.006)	0.003 (0.005)	0.001 (0.001)
Year5AfterPP	0.044*** (0.012)	0.010*** (0.003)	0.022*** (0.008)
Year10AfterPP	0.071*** (0.020)	0.074*** (0.019)	0.151*** (0.014)
Year15AfterPP	0.122*** (0.031)	0.099*** (0.027)	0.240*** (0.037)
Observations	11,2980	11,2980	11,2980
Number of firms	538	538	538
Sample	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

Technology: No Effects

	Plants	Man./Wor.	Prof. Managed
Year1AfterPP	0.004 (0.005)	-0.013 (0.019)	0.010 (0.013)
Year5AfterPP	0.003 (0.007)	0.012 (0.013)	-0.011 (0.016)
Year10AfterPP	0.008 (0.007)	0.009 (0.009)	0.006 (0.007)
Year15AfterPP	0.007 (0.006)	-0.013 (0.016)	-0.008 (0.009)
Observations	15,708	15,708	15,708
Number of firms	748	748	748
Sample	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

Management: Increase in Investment

	Loans	Investment	ROA
Year1AfterPP	0.003 (0.004)	0.005 (0.006)	0.009*** (0.003)
Year5AfterPP	0.048*** (0.012)	0.057*** (0.010)	0.017*** (0.006)
Year10AfterPP	0.125*** (0.037)	0.111*** (0.031)	0.105*** (0.022)
Year15AfterPP	0.177*** (0.044)	0.154*** (0.036)	0.149*** (0.022)
Observations	11,298	11,298	11,298
Number of firms	538	538	538
Sample	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

Technology: No Long-Run Effects

	Loans	Investment	ROA
Year1AfterPP	0.110*** (0.030)	0.0991*** (0.017)	0.004** (0.002)
Year5AfterPP	0.077** (0.034)	0.094*** (0.026)	0.007** (0.003)
Year10AfterPP	0.048* (0.028)	0.061* (0.032)	0.017 (0.019)
Year15AfterPP	0.037 (0.041)	0.049 (0.051)	0.013 (0.018)
Observations	15,708	15,708	15,708
Number of firms	748	748	748
Sample	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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Why Didn't All Firms Apply?

No desire to grow

- ▶ Less productive firms content with their current size
- ▶ Low competition

Selection on the benefit of the program

- ▶ Firms too far from the frontier
- ▶ Minimum level of productivity to gain benefit

Liquidity constraints

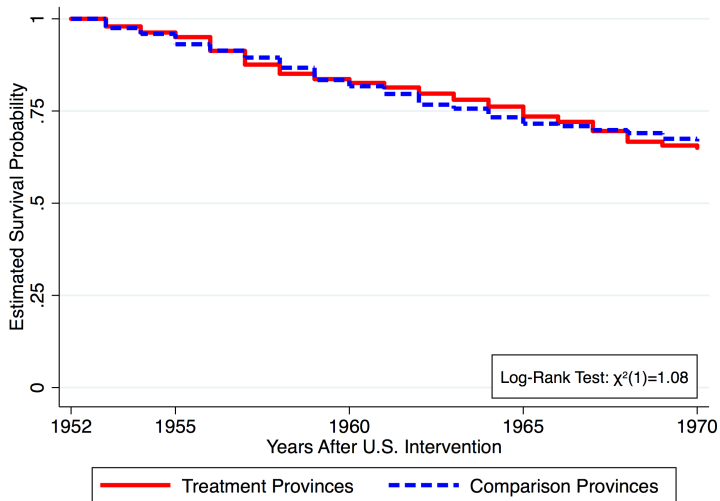
- ▶ No monetary costs
- ▶ Opportunity cost: managers away / loans to be repaid

Multinomial Logit Model of Firm Decision to Apply

	Choice of US Transfer		
	Management	Technology	Combined transfers
Plants per firm	0.012** (0.006)	0.027*** (0.009)	0.033*** (0.011)
Employees per firm	0.008*** (0.003)	0.017*** (0.003)	0.028*** (0.09)
Number of managers	0.003 (0.005)	0.005 (0.008)	0.007 (0.012)
Annual sales (k USD)	0.015*** (0.004)	0.013*** (0.005)	0.022*** (0.008)
TFPR	0.021*** (0.006)	0.016*** (0.004)	0.025*** (0.008)
Family-managed	-0.151*** (0.032)	-0.127*** (0.025)	-0.176*** (0.034)
Number of firms / % total	804 (13.25)	1,178 (19.42)	1,612 (26.57)

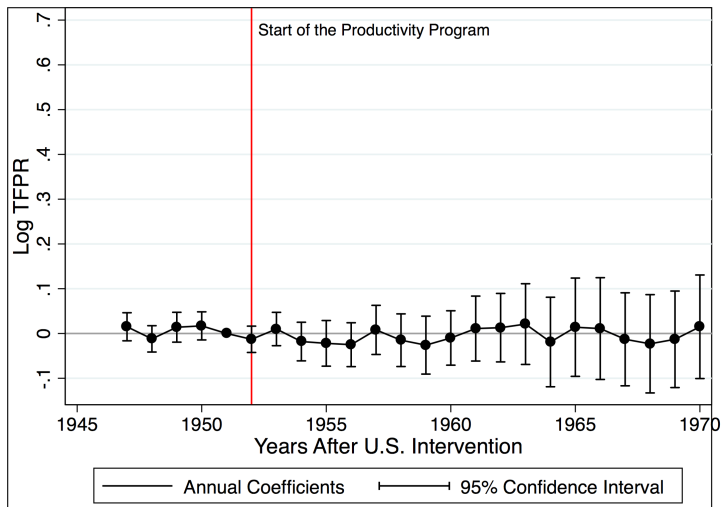
Notes. Marginal effects from a multinomial logit model, where the choice is either applying for management transfer, technology transfer, combined transfers or not to apply, used as baseline.

Did Not Apply: No Differences in Survival Probability



Notes. Kaplan-Meier survivor function. Data are provided at firm level.

Did Not Apply: No Differences in Firm Performance



Notes. The dependent variables are logged TFPR, estimated with the Akerberg et al. (2006) method. Standard errors are block-bootstrapped with 200 replications.

Localized Spillovers

$$\text{outcome}_{it} = \alpha_i + \nu_t + \sum \mu_j \text{Diff Ind}_i^j \cdot \text{Post}_t + \sum_{j=1}^3 \lambda_j \text{Same Ind}_i^j \cdot \text{Post}_t + \epsilon_{it}$$

- ▶ Outcome_{it} : logged (deflated) sales, employment, TFPR
- ▶ Diff Ind_i^j : count of firms that received U.S. transfer j in different industry than firm i and within 5, 10, 20 km
- ▶ Same Ind_i^j : count of firms that received U.S. transfer j in same industry than firm i and within 5, 10, 20 km
- ▶ Treat_i : indicator for firms in treated provinces
- ▶ $\text{Years After Treat}=\tau$: difference between calendar year t and year of program participation
- ▶ α_i : firm fixed effect
- ▶ ν_t : year fixed effects
- ▶ Block-bootstrapped standard errors

Limited Negative Spillovers

	Shut Down (1)	Sales (2)	Employees (3)	TFPR (4)
Manag·PostPP·Different	0.002 (0.004)	-0.004 (0.006)	0.006 (0.009)	0.009 (0.014)
Techn·PostPP·Different	0.001 (0.004)	0.005 (0.007)	-0.011 (0.015)	0.002 (0.005)
Combined ·PostPP·Different	0.004 (0.006)	-0.006 (0.008)	0.014 (0.017)	0.008 (0.012)
Manag·PostPP·Same	0.012* (0.007)	-0.032* (0.019)	-0.007 (0.012)	-0.017** (0.008)
Techn·PostPP·Same	0.015* (0.009)	-0.024* (0.014)	-0.004 (0.009)	-0.013** (0.006)
Combined ·PostPP·Same	0.014* (0.008)	-0.035* (0.020)	-0.005 (0.008)	-0.022** (0.010)
Observations	105,400	73,780	73,780	73,780

Notes. Standard errors are block-bootstrapped with 200 replications.

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Conclusions and Implications

Long-run effects of management and technology

- ▶ Better management practices
 - ▶ Large and persistent effects
 - ▶ Affect firm capital and labor choice
- ▶ Technologically-advanced capital goods: short-lived effects
- ▶ Complementarity between management and technology

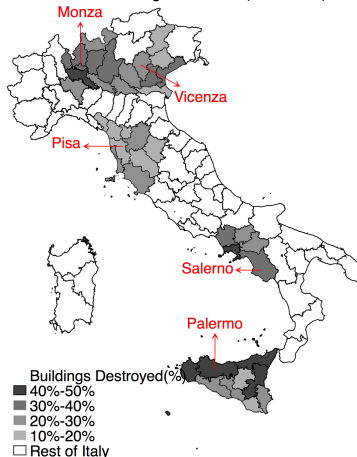
Implication for public policies

- ▶ Business training programs very popular in developing countries
- ▶ Italy after WWII comparable to some developing countries today

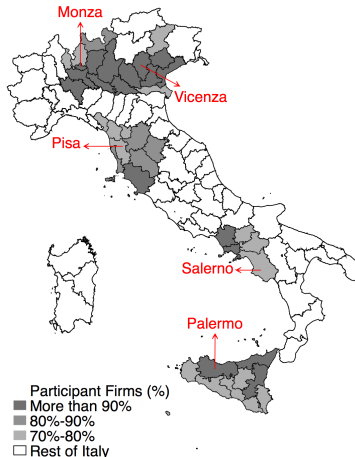
Back-Up Slides

Treated and Comparison Provinces in 1951

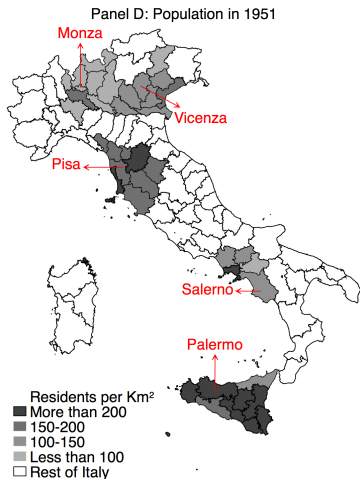
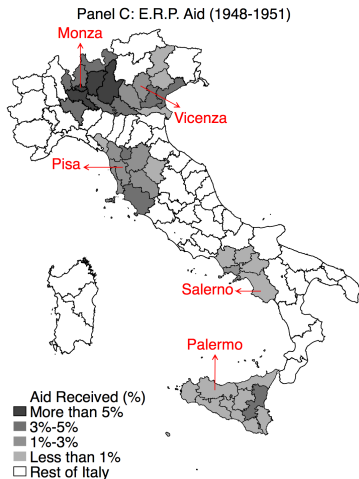
Panel A: Bombing Destruction (1940-1945)



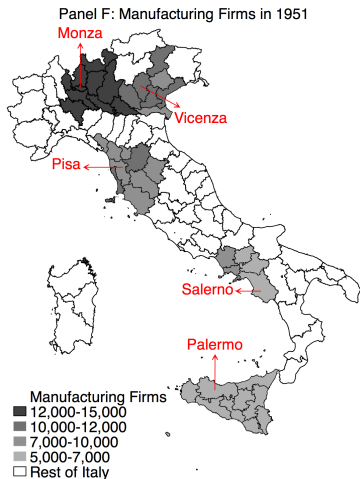
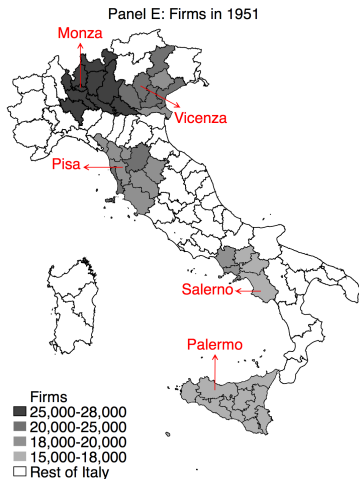
Panel B: Firms on Strike in 1948



Treated and Comparison Provinces in 1951

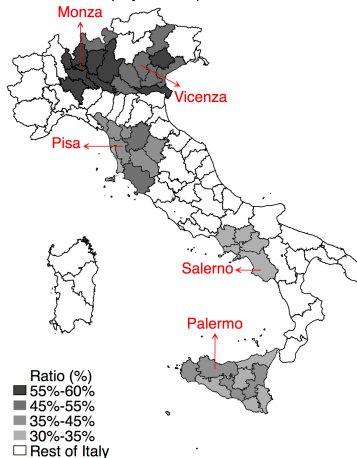


Treated and Comparison Provinces in 1951

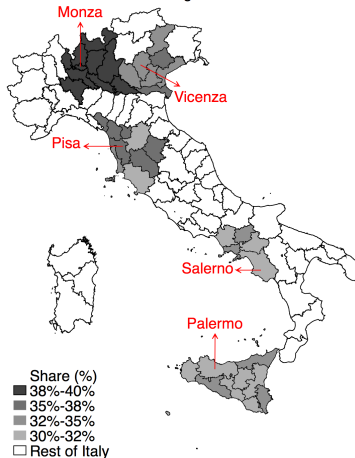


Treated and Comparison Provinces in 1951

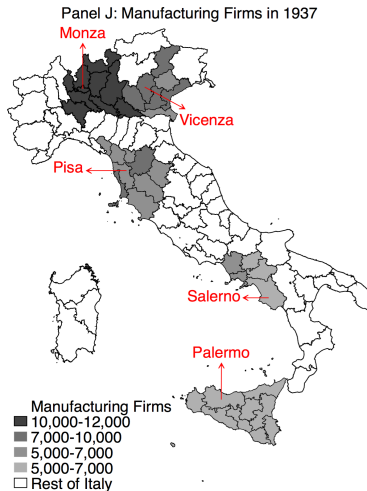
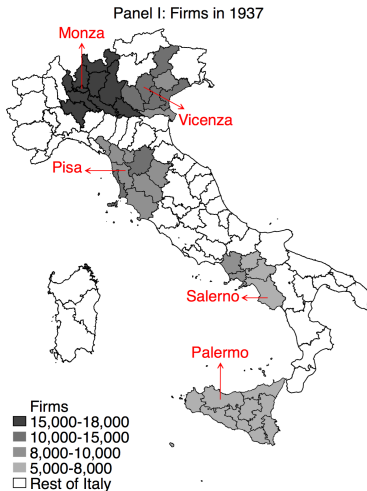
Panel G: Employment-Population Ratio in 1951



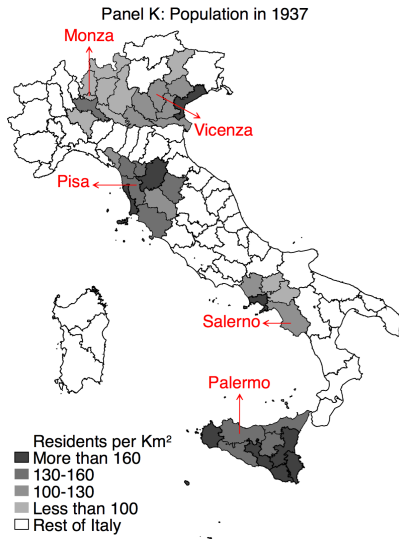
Panel H: Manufacturing Labor Share in 1951



Treated and Comparison Provinces in 1937



Treated and Comparison Provinces in 1937



Production Function

Assume Cobb-Douglas production function

$$Y_{it} = A_{it} L_{it}^{\beta_l} K_{it}^{\beta_k}$$

- Y : Deflated value added
- A : Hicksian neutral efficiency level
- L : Number of employees
- K : Deflated assets

Taking logs

$$\ln(Y_{it}) = \beta_l \ln(L_{it}) + \beta_k \ln(K_{it}) + \underbrace{\omega_{it} + \eta_{it}}_{\epsilon_{it}}$$

Endogeneity issue:

- ▶ Optimal choice of inputs correlated with ω_{it}

TFPR Estimation Techniques

Structural models (Olley and Pakes, 1996 and Levinsohn and Petrin, 2003)

- ▶ Use intermediate goods as proxy for shocks in ω_{it}
- ▶ Control for collinearity between labor and intermediate goods (Akerberg et al., 2006)

Robustness checks

- ▶ OLS
- ▶ Factor shares: Solow's residuals
- ▶ Dynamic panel method (Bond and Soderbom, 2005)

Estimation of TFPR (1)

	I. Food			II. Textile		
	β_l	β_k	CRS	β_l	β_k	CRS
ACF	0.58*** (0.005)	0.44*** (0.012)	0.367	0.67*** (0.009)	0.35*** (0.007)	0.451
OLS	0.61*** (0.004)	0.40*** (0.006)	0.281	0.70*** (0.004)	0.33*** (0.005)	0.342
FS	0.55	0.45		0.64	0.36	
LP	0.56*** (0.011)	0.47*** (0.009)	0.452	0.63*** (0.012)	0.39*** (0.008)	0.246
DPM	0.59*** (0.013)	0.44*** (0.010)	0.498	0.65*** (0.011)	0.36*** (0.009)	0.377

Notes. Coefficients on labor (β_l) and capital (β_k). CRS column tests for constant return to scale. Data are provided at firm level for 6,035 firms eligible for the Productivity Program.

Estimation of TFPR (2)

	III. Wood			IV. Machinery		
	β_l	β_k	CRS	β_l	β_k	CRS
ACF	0.55*** (0.007)	0.47*** (0.005)	0.246	0.62*** (0.004)	0.39*** (0.009)	0.539
OLS	0.56*** (0.006)	0.42*** (0.003)	0.358	0.64*** (0.009)	0.35*** (0.007)	0.432
FS	0.57	0.43		0.65	0.35	
LP	0.50*** (0.011)	0.51*** (0.013)	0.435	0.57*** (0.011)	0.42*** (0.013)	0.394
DPM	0.57*** (0.008)	0.46*** (0.011)	0.239	0.61*** (0.012)	0.40*** (0.015)	0.453

Notes. Coefficients on labor (β_l) and capital (β_k). CRS column tests for constant return to scale. Data are provided at firm level for 6,035 firms eligible for the Productivity Program.

Estimation of TFPR (3)

	V. Minerals			VI. Chemicals		
	β_l	β_k	CRS	β_l	β_k	CRS
ACF	0.61*** (0.008)	0.42*** (0.015)	0.371	0.65*** (0.021)	0.34*** (0.011)	0.654
OLS	0.62*** (0.010)	0.40*** (0.014)	0.254	0.66*** (0.009)	0.32*** (0.007)	0.348
FS	0.64	0.36		0.62	0.38	
LP	0.63*** (0.014)	0.44*** (0.017)	0.365	0.63*** (0.013)	0.38*** (0.015)	0.493
DPM	0.62**** (0.015)	0.42*** (0.019)	0.410	0.67*** (0.021)	0.34*** (0.025)	0.352

Notes. Coefficients on labor (β_l) and capital (β_k). CRS column tests for constant return to scale. Data are provided at firm level for 6,035 firms eligible for the Productivity Program.

By Productivity Level Before the Program

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
Below Mean						
Year1	0.065*** (0.017)	0.010 (0.008)	0.152*** (0.025)	0.005 (0.004)	0.008 (0.009)	0.015 (0.0135)
Year15	0.367*** (0.062)	0.337*** (0.071)	0.443*** (0.068)	0.051* (0.030)	0.055* (0.030)	0.083** (0.042)
Above Mean						
Year1	0.047*** (0.015)	0.005 (0.006)	0.135*** (0.034)	0.010* (0.006)	0.018 (0.014)	0.027** (0.012)
Year15	0.341*** (0.067)	0.288*** (0.073)	0.386*** (0.081)	0.082*** (0.0235)	0.095*** (0.027)	0.121*** (0.036)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications. [◀ Back](#)

By 1951 Firm Size (1)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
<30 empl.						
Year1	0.040*** (0.019)	0.006 (0.007)	0.103*** (0.027)	0.005 (0.007)	0.006 (0.005)	0.012 (0.015)
Year15	0.389*** (0.073)	0.345*** (0.065)	0.441*** (0.072)	0.048* (0.025)	0.057** (0.029)	0.094*** (0.041)
30-49 empl.						
Year1	0.041** (0.020)	0.005 (0.006)	0.125*** (0.031)	0.004 (0.005)	0.008 (0.009)	0.014 (0.015)
Year15	0.361*** (0.078)	0.322*** (0.062)	0.433*** (0.078)	0.057** (0.027)	0.062* (0.032)	0.099** (0.044)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications. [◀ Back](#)

By 1951 Firm Size (2)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
50-99 empl.						
Year1	0.063*** (0.023)	0.010 (0.009)	0.153*** (0.035)	0.010* (0.006)	0.016 (0.010)	0.023* (0.013)
Year15	0.234*** (0.081)	0.281*** (0.067)	0.312*** (0.080)	0.073*** (0.0261)	0.083*** (0.030)	0.116*** (0.033)
>100 empl.						
Year1	0.078*** (0.027)	0.013 (0.008)	0.161*** (0.037)	0.016* (0.009)	0.019 (0.016)	0.025* (0.015)
Year15	0.212*** (0.079)	0.249*** (0.065)	0.300*** (0.073)	0.082*** (0.026)	0.091*** (0.032)	0.125*** (0.035)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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Northern vs Southern Italy (1)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
Lombardia						
Year1	0.075*** (0.019)	0.012 (0.009)	0.162*** (0.031)	0.012 (0.010)	0.016 (0.013)	0.025 (0.020)
Year15	0.376*** (0.086)	0.325*** (0.092)	0.431*** (0.087)	0.083** (0.040)	0.085** (0.039)	0.125** (0.059)
Veneto						
Year1	0.064*** (0.015)	0.009 (0.006)	0.156*** (0.034)	0.010 (0.007)	0.014 (0.013)	0.022 (0.015)
Year15	0.333*** (0.083)	0.306*** (0.088)	0.419*** (0.093)	0.078** (0.036)	0.079** (0.033)	0.111** (0.052)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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Northern vs Southern Italy (2)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
Toscana						
Year1	0.051** (0.027)	0.007 (0.005)	0.137*** (0.027)	0.005 (0.006)	0.011 (0.010)	0.015 (0.010)
Year15	0.301*** (0.067)	0.292*** (0.084)	0.402*** (0.081)	0.066** (0.028)	0.070** (0.032)	0.100* (0.059)
Campania						
Year1	0.043** (0.027)	0.005 (0.004)	0.129*** (0.029)	0.004 (0.005)	0.009 (0.006)	0.011 (0.010)
Year15	0.294*** (0.059)	0.278*** (0.071)	0.391*** (0.065)	0.051* (0.029)	0.063** (0.029)	0.094** (0.046)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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Northern vs Southern Italy (3)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
Sicilia						
Year1	0.039*** (0.015)	0.004 (0.004)	0.122*** (0.018)	0.004 (0.009)	0.007 (0.007)	0.009 (0.010)
Year15	0.288*** (0.062)	0.261*** (0.059)	0.375*** (0.061)	0.055* (0.033)	0.059* (0.031)	0.081* (0.048)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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By Year of Productivity Program (1)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
1952						
Year1	0.060*** (0.020)	0.008 (0.008)	0.142*** (0.030)	0.009 (0.010)	0.016 (0.013)	0.024 (0.015)
Year15	0.335*** (0.062)	0.306*** (0.089)	0.401*** (0.091)	0.063** (0.025)	0.077** (0.036)	0.105** (0.046)
1953						
Year1	0.061*** (0.015)	0.009 (0.008)	0.139*** (0.034)	0.005 (0.006)	0.014 (0.017)	0.017 (0.019)
Year15	0.333*** (0.071)	0.301*** (0.065)	0.409*** (0.068)	0.071** (0.035)	0.082** (0.040)	0.109** (0.050)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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By Year of Productivity Program (2)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
1954						
Year1	0.059*** (0.022)	0.011 (0.009)	0.141*** (0.034)	0.007 (0.009)	0.011 (0.012)	0.021 (0.016)
Year15	0.340*** (0.087)	0.303*** (0.092)	0.402*** (0.096)	0.073** (0.036)	0.079** (0.035)	0.108** (0.053)
1955						
Year1	0.058*** (0.015)	0.012 (0.008)	0.138*** (0.024)	0.008 (0.009)	0.012 (0.014)	0.016 (0.011)
Year15	0.335*** (0.049)	0.309*** (0.056)	0.411*** (0.052)	0.066* (0.036)	0.078** (0.039)	0.111** (0.049)
Sample Firm FE	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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By Year of Productivity Program (3)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
1956						
Year1	0.057*** (0.016)	0.009 (0.006)	0.140*** (0.033)	0.009 (0.009)	0.019 (0.017)	0.020 (0.010)
Year15	0.334*** (0.081)	0.295*** (0.079)	0.395*** (0.088)	0.072* (0.039)	0.081* (0.042)	0.112** (0.049)
1957						
Year1	0.061*** (0.021)	0.008 (0.005)	0.142*** (0.034)	0.010 (0.008)	0.018 (0.015)	0.018 (0.014)
Year15	0.339*** (0.087)	0.299*** (0.092)	0.408*** (0.099)	0.063** (0.029)	0.082* (0.042)	0.107** (0.045)
Sample Firm FE	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes	Balanced Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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By Year of Productivity Program (4)

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
1958						
Year1	0.057*** (0.016)	0.009 (0.006)	0.140*** (0.033)	0.009 (0.009)	0.019 (0.017)	0.020 (0.010)
Year15	0.334*** (0.081)	0.295*** (0.079)	0.395*** (0.088)	0.072* (0.039)	0.081* (0.042)	0.112** (0.049)
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.

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Large and Significant Results on Non-Exporters Only

	Management			Technology		
	Log Sales	Log Empl	Log TFPR	Log Sales	Log Empl	Log TFPR
Year1	0.049*** (0.013)	0.005 (0.009)	0.095*** (0.020)	0.005 (0.004)	0.007 (0.010)	0.013 (0.011)
Year 5	0.087*** (0.020)	0.047*** (0.016)	0.165*** (0.021)	0.034*** (0.013)	0.025** (0.011)	0.062*** (0.015)
Year10	0.122*** (0.028)	0.194*** (0.028)	0.232*** (0.031)	0.062** (0.030)	0.067** (0.027)	0.094*** (0.031)
Year15	0.211*** (0.035)	0.287*** (0.037)	0.302*** (0.041)	0.059** (0.028)	0.070** (0.033)	0.089** (0.036)
Observations	3,500	3,500	3,500	7,240	7,240	7,240
Firms	175	175	175	362	362	362
Sample	Balanced	Balanced	Balanced	Balanced	Balanced	Balanced
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

Notes. Standard errors are block-bootstrapped with 200 replications.