The Role of the Marshall Plan in the Italian Post-WWII Recovery*

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Abstract

This paper studies the effects of international aid on long-term economic growth. It exploits plausibly exogenous differences between Italian provinces in the amount of grants disbursed through the Marshall Plan for the reconstruction of public infrastructures. Provinces that received more reconstruction grants experienced a larger increase in the number of industrial firms and workers after 1948. Individuals and firms in these areas also started developing more patents. The same provinces experienced a faster mechanization of the agricultural sector. Motorized machines, such as tractors, replaced workers and significantly boosted agricultural production. Finally, we present evidence that shows how reconstruction grants induced economic growth by allowing Italian provinces to modernize their transportation and communication network.

JEL Classification: H84, N34, N44, O12, O33
Keywords: international aid, economic growth, reconstruction grants, Marshall Plan, innovation

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1 Introduction

International aid is one of the main sources of revenues for many developing countries. Starting in 1970, the United Nations set an explicit target for member countries of OECD's Development Assistance Committee (DAC): 0.7 percent of national income spent for development assistance.[1] In recent years, the UN re-endorsed this target by including it in the 2005 Millennium Development Goals and the subsequent 2015 Sustainable Development Goals. Between 1960 and 2013, DAC members transferred at least $3.5 trillion (2009 USD) to poorer countries (Qian, 2014).

Does foreign aid help the growth process of developing countries? There are several challenges to empirically answer this question. The main issue is that foreign aid is often endogenously distributed across and within countries. The relationship between international grants and economic outcomes might therefore capture the effect of other omitted factors. Moreover, foreign aid usually includes a number of interventions, such as the construction of public or private infrastructures, the distribution of food or drugs, and the provision of health assistance. These elements might have different, even opposite, consequences on growth. It is therefore important to isolate these different effects, especially to make it possible to compare different interventions. Finally, due to data availability, most studies focus only on the short term. Some interventions, however, might require several years to fully exert their positive influence. Possibly as a consequence of these issues, the existing empirical evidence has produced mixed results on the relationship between aid and economic outcomes (Qian, 2014).

This paper studies the long-run consequences of international aid on economic growth. Specifically, it uses evidence from the Marshall Plan in Italy to estimate the effect of the reconstruction and modernization of public infrastructures on a wide array of economic outcomes. The Marshall Plan was an economic and financial aid program sponsored by the US, that between 1948 and 1952 transferred approximately $130 billion (2010 USD) to Western and Southern Europe. Getting more than 10% of total aid, Italy was the third largest recipient (Fauri, 2006).

We estimate the causal effects of the Marshall Plan aid by exploiting the geographical distribution of Allied bombings in Italy during the last stages of World War II (March 1944-April 1945). Specifically, we instrument the amount of reconstruction grants received by each Italian province with the amount of bombings dropped by Allied forces against the invading Nazi troops. This variable has two features that make it suitable to be a good instrumental variable. First, the Allies dropped these explosives when Italy had already quit the war by

[1] Resolution 2625 adopted by the UN General Assembly during its twenty-fifth session on October 24, 1970.

signing the Armistice of Cassibile (September 3, 1943). The geographical distribution of these air attacks, therefore, mostly followed the land battles between Allied and German troops on the Italian soil, which were plausibly not correlated with other factors (such as prewar economic conditions) that might have affected postwar growth. Second, some of the preferred targets were railways and roads, because many of these bombings intended to stop reinforcements and supplies from Germany. By targeting public infrastructures, these air attacks drew a large amount of reconstruction grants from the Marshall Plan. However, other types of aid, such as food and drugs, did not increase significantly.

We first collected and digitized new data on the quantity of Marshall Plan aid received by each Italian province between 1948 and 1952. We then combined this dataset with province-level industrial and economic outcomes digitized from the Industrial Census, the Population Census, the Annals of Agricultural Statistics, and official lists of patents issued by the Italian Patent Office. Finally, we matched these sources with granular data on Allied bombings compiled by the US Air Force. In the resulting dataset, we can study how grants from the Marshall Plan and the reconstruction of public infrastructures affected industrial and agricultural growth. Specifically, we estimate reduced-form regressions in which we compare how economic outputs varied before and after the Marshall Plan, and between provinces with different amount of bombings (and therefore post-war reconstruction grants). Moreover, we directly measure the effects of aid on growth by instrumenting reconstruction grants with the province-level amount of Allied bombings.

We find three main results. First, in provinces that received more grants, industrial and agricultural outputs increased more after the implementation of the Marshall Plan. Second, growth in industry and agriculture had different characteristics. The Italian industry experienced the entry of many new firms and an expansion of its labor force. The agricultural sector, instead, increased production, but sustained a stark decrease in labor force. Third, the adoption of newer technologies increased disproportionately in provinces with more grants and higher growth. In agriculture, for example, we observe a larger increase in the use of motorized tractors in provinces that received more international aid. Similarly, firms and individuals in provinces that received more grants started developing more patents after 1948.

Did provinces with more bombings during the Italian Campaign merely recover faster from WWII? Or did they experience a larger economic expansion? We find that most outcomes surpassed their pre-war levels between 1952 and 1971 (the second Census available after the conclusion of the Marshall Plan in 1952). The data also indicate that provinces in the top quintile of the bombing distribution experienced a quicker and larger economic expansion, well beyond recovery from the disruption generated by WWII.

Finally, we leverage the detailed data on the projects funded through the Marshall Plan to draw a tighter connection between international aid and growth. We estimate event studies in which the post-treatment period does not start with the implementation of the Marshall Plan (1949 for all provinces), but with the province-specific completion of the first large infrastructures (varying from 1953 to 1957). These estimates are generally larger than the baseline and confirm that the modernization of public infrastructures played a direct role in the economic expansion. We repeat this analysis separately for different project types. Compared with railways, roads are correlated with a larger increase in economic outcomes (between 1 percent and 9 percent).

This paper contributes to four strands of the literature. First, it is related to the literature that studies the effects of international aid on economic growth. Existing empirical analyses have found mixed results (see Easterly (2003) and Qian (2014) for an overview). Burnside and Dollar (2000) found the existence of a positive correlation between growth and international aid in developing countries with sound economic policies. Easterly, Levine and Roodman (2004) and Roodman (2007), however, pointed out how this finding might change with slight variations in the empirical specification and in the estimating sample. In a recent paper, Galiani et al. (2017) compared countries around the World Bank's threshold for eligibility to receive international aid. Their results confirm the existence of a positive relationship between aid and economic growth. In addition to mixed evidence on the relationship between international grants and growth, several papers suggest that aid might have other unintended consequences on the economy of receiving countries. International aid, in fact, has been associated to a decrease in the level of democracy (Djankov, Montalvo and Reynal-Querol, 2008), an increase in conflicts (Nunn and Qian, 2014) and corruption level (Svensson, 2000), and negative effects on infrastructure (Rajan and Subramanian, 2011). Our paper contributes to this literature by proposing a new strategy to identify the effect of international aid. In the analysis we exploit plausibly exogenous differences in aid between Italian provinces. By focusing on a single country, we compare geographical units with similar unobservable factors that can affect the relationship between international aid and growth. Moreover, we focus on one specific type of aid, grants for the reconstruction and modernization of infrastructures, instead of bundling multiple interventions. Finally, the historical setting allows us to track the effect of international aid in the long-run, for many decades after the implementation of the policy.

Second, this paper contributes to the literature on the economic effects of the Marshall Plan. Defined as "history's most successful structural adjustment program" (De Long and Eichengreen, 1993), the Marshall Plan has been under the scrutiny of economists for many decades. Early work highlighted how the implementation of the Marshall Plan coincided with

a long period of sustained growth in Europe (Jones, 1955; Mayne, 1970; Arkes, 1972). More recent papers, however, argued that the Marshall Plan alleviated the post-war shortage and created an environment in which free institutions could grow (opposite to the communist system), but its impact on investments in industrial capacity and infrastructure repairs was overall modest (Eichengreen et al., 1992; Casella and Eichengreen, 1994; De Long and Eichengreen, 1993). Our paper contributes to this set of findings by using newly-digitized data on grants for infrastructural development and by proposing a new identification strategy based on Allied bombings.

Finally, this paper contributes to the literature on the economic consequences of bombings. Previous work examined the effects of aerial bombings on urban development (Davis and Weinstein, 2002), poverty rates (Miguel and Roland, 2011), military and political activities (Dell and Querubin, 2017), and education (Akbulut-Yuksel, 2014).[2] Our paper shows how aerial attacks can be used as an empirical tool to identify the effects of international aid on economic outcomes.

The rest of the paper is organized as follows: Section 2 describes the historical setting. Section 3 describes the data. Section 4 outlines the identification strategy, and Section 5 documents the effects of reconstruction grants on several economic outcomes. Section 6 presents several robustness checks. Section 7 analyzes whether international aid led to recovery from war destruction or expansion beyond pre-war economic levels. Section 8 provides additional evidence on the relationship between the completion of large infrastructures and economic growth. Section 9 concludes.

2 Historical Background

Nazi Germany's invasion of Poland on September, 1 1939 marked the beginning of World War II (Evans, 2009). Despite being an Axis power, Italy remained non-belligerent until June 10, 1940, when it declared war on France and Great Britain (Overy and Wheatcroft, 1989). The country experienced the first bombing episode the night between June 11 and 12, 1940, when Great Britain hit the northwestern city of Torino. The last bombing attack occurred in the first days of May 1945, when the Allied bombed the railways and roads near the Brenner pass, on the border with Austria, in order to destroy German troops fleeing the country (Baldoli, 2010).

Bombing in Italy can be divided into two periods: before and after the Italian armistice with the Allied forces. During the first phase of the war, between June 11, 1940 and

[2] In Italy, Fontana, Nannicini and Tabellini (2017) showed how a more prolonged Nazi occupation led to higher support for the Communist Party after the war.

September 3, 1943, air raids targeted industries in largely populated areas, "where the effects of air attack will be brought home to the largest portion of the population".[3] By destroying jobs and homes, in fact, the Allies wanted to depress the moral of the urban population, generate dissatisfaction against the Fascist regime, and wreck industrial firms that had been readapted to produce military equipments. The British War Cabinet was convinced that "even a limited offensive against Italy would have a big moral effect".[4]

On September 3, 1943, Italy signed the Armistice of Cassibile with the Allied forces (McGaw Smyth, 1948). The armistice, made public on September 8, 1943, dramatically changed the nature of the conflict on the Italian soil. First, Italy ceased to be a direct enemy of the Allied forces. Second, the Allies moved into mainland Italy from the southern island of Sicily. Third, Nazi troops, which had arrived in Italy in July 1943 to fight the Allied invasion of Sicily, military occupied the country and disarmed the Italian soldiers. As a consequence, the Italian Campaign, which refers to the successful Allied invasion of Italy, entered its most heated phase. In this period, the intense Allied bombing was directed to facilitate ground operations and to destroy the occupying Nazi troops. Preferred targets were troop concentrations, railways, and roads (Baldoli and Knapp, 2012).

The war in Italy formally ended on May 2, 1945 (Blaxland, 1979). In 1945, Italian GDP per capita was 38 percent lower than the value observed in 1938, while industrial production was 66 percent lower (Lombardo, 2000). Immediately after the end of the war, damages to public infrastructures represented the main challenge towards recovery: 70 percent of the roads had been damaged and 45 percent of the railroad system was no longer usable (Fauri, 2006). It was therefore difficult for firms to obtain raw materials from suppliers and to distribute their products to clients (Eichengreen et al., 1992 and Fauri, 2006). By contrast, firm physical capital had been only marginally affected by bombing: estimates suggest that between 80 and 90 percent of the Italian industrial capacity survived the war (Grindrod, 1955; Zamagni, 1997; Fauri, 2006).

In spite of an urgent need for new infrastructures, Italy and many other European countries did not have the funds to start reconstruction. This situation changed when the US Secretary of State George C. Marshall, in the commencement speech at Harvard University on June 5, 1947, announced a comprehensive program of assistance to Europe in the form of capital transfers, as well as financing for investment and import purposes (Boel, 2003). This program was formally passed by the US Congress on March 1948 through the approval of the Economic Cooperation Act and was named the European Recovery Program (E.R.P.), informally known as the Marshall Plan. The main goals of the E.R.P. were (1) rebuilding

[3] TNA AIR 20/5304, Note by C.A.S., 29 April 1940.
[4] TNA CAB 65/6/50, War Cabinet conclusion, 27 April 1940.

and repairing European infrastructures; (2) increasing production, expanding foreign trade, and controlling inflation; (3) facilitating European economic cooperation and integration; and (4) preventing the expansion of communism (Boel, 2003). The E.R.P. remained in operation between March 1948 and June 1952,[5] and granted $130 billion (in 2010 USD) to 17 Western and Southern European countries.[6] The countries that received more money from the program were France (20.8%), Italy (10.9%), and Germany (10.6%) (ECA, 1951).

3 Data

We collected and digitized data on the quantity of E.R.P. aid that each Italian province received from 1948 to 1952.[7] We also digitized Population Census, annual industrial statistics and agricultural data. We matched these sources with information on Allied bombings compiled by the US Air Force.

3.1 E.R.P. Aid

Between May 1948 and June 1952, Italy received around $1.2 billion from the US (in 2010 US dollars), making it the second largest European recipient after France (Boel, 2003). In total, E.R.P. aid accounted for 33.6 percent of Italian imports between March 1948 and June 1950, and 21.3 percent between July 1950 and June 1952 (Fauri, 2006).

Italy received three types of aid: in-kind subsidies, financial grants, and loans. We collected data on in-kind subsidies received by each Italian province from *"Missione Americana E.R.P. in Italia"* (American E.R.P Mission in Italy), a report compiled by the US Bureau of Labor Statistics that lists physical quantities and monetary value of the transferred goods. The in-kind subsidies shipped to Italy were food (mainly flour and wheat), medications, raw materials (coal, oil, and cotton), and machineries. They represented 27 percent of total E.R.P. aid received between March and December 1948 (in-kind subsidies stopped after this period).

[5] The end of the E.R.P. did not mean the end of US aid to Europe. In 1952, the Economic Cooperation Act was substituted by the Mutual Security Program (MSP), which pursued both economic and military goals. The MSP sponsored the US Technical Assistance and Productivity Program (USTA&P), a program designed to transfer US managerial and technological knowledge from the US to Europe. The long term effects of the USTA&P in Italy are analyzed in Giorcelli (2017).

[6] The participating countries were Austria, Belgium and Luxembourg, Denmark, France, West Germany, Greece, Iceland, Ireland, Italy and Trieste, Netherlands, Norway, Portugal, Sweden, Switzerland, Turkey, and United Kingdom. The participation to the program was voluntary. Soviet countries could have joined, but refused to participate.

[7] Provinces are Italian administrative divisions that are comparable to US counties.

Data on financial grants come from the "Mutual Security Agency" bulletins. In addition to the amount of grants paid to the Italian government, these reports describe the type, cost, and location of each reconstruction project financed through E.R.P. aid. Financial grants represented 45 percent of E.R.P. aid and were used to finance 14,912 different reconstruction projects.

Finally, we hand-collected and digitized data on loans received by each Italian firm from 1948 to 1952, whose records are stored at the historical archive of the *Istituto Mobiliare Italiano* (IMI).[8] For each grantee, the data specify the amount of the loan, the origination date, and the repayment schedule. Loans represented 10.4 percent of US aid and were allocated across 1,101 large Italian firms.[9]

Each year the Economic Cooperation Administration (ECA) and the Italian government elaborated an annual program, divided in four quarters. Each quarter the ECA approved the projects to be financed with ERP funds and sent a letter of commitment (LOC) which represented a formal commitment to pay. Within 20 days from issuing the LOC, the ECA had to transfer the grants to the Italian government, which in turn had to start the projects within 4 months (Fauri, 2006). The average Italian province received $163 million (in 2010 US dollars) through the Marshall Plan. Out of all E.R.P. funds, 48 percent or $79 million were directed to reconstruction of key infrastructures, 26 percent or $42 million were in the form of food or drugs, and 1.2 percent or $2 million were loans to private firms.

3.2 Italian Censuses

The *Censimento dell'Industria e dei Servizi* (Industrial Census) provides information on the number of firms and workers in different industries. In the analysis, we focus on 9 major industries in the Italian economy—food, paper, chemistry, construction, mining, mechanics, metallurgy, textile, clothing—, which employed 59 percent of the total industrial workforce in 1937. Two pre-war observations in 1927 and 1937 indicate that on average each province had 704 active firms and 3,969 employed workers per industry (Table 1, panel B, column 1). Six post-war observations (each 10 years between 1951 and 2001) indicate a large increase in the size of the Italian industry. Since 1951, in fact, each province had on average 863 active firms (+23 percent) and 5,883 employed workers (+48 percent) per industry (Table 1, panel B, column 2). This recovery was accompanied by an increase in the use of technology.

[8] The *Istituto Mobiliare Italiano* (IMI) was a public institution created in 1931 (Legge 11/13/1931, n. 1398) with the goal of providing financing to private firms for medium and long-term investment projects. After WWII, IMI played a central role in rebuilding Italy by managing and assigning the financial resources received through international aid.

[9] Out of 1,101 loans granted, 89% were repaid within 15 years.

The average amount of power per industry increased by almost 300 percent from 5,912 total horsepower before the war to 23,211 units after the war. The bulk of this increase came from electrical engines, which were closer to the technological frontier. In the analysis, we will study the relationship between this growth in the industrial sector and the reconstruction grants assigned through the Marshall Plan.

The expansion of the industrial workforce came at the expenses of the agricultural sector. The average number of agricultural workers by province decreased by 53 percent from 96,447 individuals before the war to 45,206 individuals between 1951 and 2001. The yearly *Annuari di Statistica Agraria* (Annals of Agricultural Statistics) provide additional information on the production of different crops, as well as the adoption of various inputs. In spite of a decrease in the size of the workforce, the agricultural sector increased its production after the end of WWII. The production of wheat and corn increased by 7 percent from 123,423,700 kilos (kg) per province between 1937 and 1939 to 132,325,100kg per province between 1946 and 1969. Similarly, the production of wine increased by 27 percent from 45,934,700 liters (L) per province between 1937 and 1939 to 58,216,100L per province between 1946 and 1969. This increase in production was accompanied by the adoption of newer technology. The average number of tractors per province, for example, increased by more than 600 percent from 454 units between 1937 and 1939 to 3,420 units between 1946 and 1969.

We also digitized the yearly *Bollettini della Proprietà Intellettuale* (Bulletins of Intellectual Property) from 1940 to 1955. These documents contain information about all patents issued by the Italian patent office to domestic and foreign investors. We utilize this dataset to test how the development of new technology responded to the assignment of reconstruction grants.

Finally, the *Censimento Generale della Popolazione* (Population Census) provides information on the number and characteristics of individuals living in each Italian province. The average number of residents in each Italian province increased by 27 percent from 461,828 individuals before the war (1931 and 1936) to 588,300 individuals after the war (one observation each 10 years between 1951 and 2001).

3.3 Allied Bombing

We retrieved detailed information about Allied bombings in Italy from the Theater History of Operations Reports (T.H.O.R.; Lt Col Robertson, Burr and Barth, 2013) compiled by the Air Force Research Institute. For each Allied air strike executed in Italy during WWII, this database lists the location, the date, the type of target, and the amount of explosives.

Bombings affected most geographical areas, including the islands. Panel A of Figure 1 shows the distribution of air attacks across Italian provinces. The province of Roma, the Italian capital, received the maximum amount of explosives (25,748 tons), while the province of Vercelli in the northwestern region of Piemonte received the minimum amount (16 tons). Overall, the Allied forces used 402,045 tons of explosives against targets on Italian soil in 5,771 different attacks (Table 1, panel C, column 1). Considering that the conflict lasted 1,788 days, Italy was hit on average by 225 tons of explosives per day.

By using the date of the attack and the type of target, we could isolate the air strikes that were executed in support of ground operations against the German troops during the Italian Campaign. We first considered only attacks that took place after February 1944, because in this period support to land battles in Italy became the top priority of the Allied Tactical Air Forces.[10] We then selected target types linked to operations against the German Army: direct cooperation with ground forces; troop concentrations; radar installations; gun emplacements; weapon launching sites; tactical targets; supply dumps; tracks and marshaling yards; moving trains; highways and vehicles; transportation facilities.

The distribution of these bombings followed the land battles of the Italian campaign and the progressive retreat of the Nazi troops towards Austria. As shown in Panel B of Figure 1, the most heavily affected areas connect the central provinces in the Lazio region on the Gustav line (a series on German fortifications around the town of Monte Cassino), the provinces in the Toscana and Emilia Romagna regions on the Gothic line (a second German entrenchment), and the provinces leading to the Brenner pass on the Italian northeastern border. In the later stages of the Italian Campaign, the Allied air forces used 82,520 tons of explosives against targets on Italian soil in 1,332 different attacks (Table 1, panel C, column 2). Out of 57,722 total tons of explosives used in support of ground operations, 44,308 tons (77 percent) were dropped after February 1944. Similarly, out of 74,332 total tons of explosives against transport infrastructures, 38,212 tons (51 percent) were used during the Italian Campaign.

4 Identification

We exploit the geographical distribution of Allied bombing during the Italian Campaign to measure the causal effect of E.R.P. aid on the Italian recovery. These air attacks have two important features for the empirical analysis. First, their geographical distribution was not driven by pre-existing economic conditions, but followed the confrontations between Allied and German troops. As a consequence, two adjacent provinces with similar economic condi-

[10]TNA WO 204/ 930, Allied Force Headquarters, Inter-Services Supply Committee Paper, 3 March 1944.

tions might have received vastly different amount of Allied air strikes during the later stages of the war, if one province hosted more prolonged land battles. Second, some of the preferred targets of these air attacks were railways and roads in order to stop reinforcements and supplies from Germany. By targeting public infrastructures, these bombings subsequently drew a large amount of reconstruction grants from the E.R.P. Section 4.1 describes the pre-war characteristics of provinces with different amount of bombings. Section 4.2 explores the correlation between Allied bombings and post-war international aid. Section 4.3 describes the empirical specification used in the analysis, while section 4.4 provides evidence on pre-war trends in agricultural output.

4.1 The Distribution of Allied Bombing Across Italian Provinces

The Allied military strategy against Italy dramatically changed after the Armistice of Cassibile on September 3, 1943. Before this date, US and British air forces mainly targeted factories in densely populated areas to destroy military production and to weaken the population's morale. As a consequence, these first air strikes focused on the richest and more economically developed Italian provinces.

There is a positive relationship between tons of explosives dropped before the armistice in each province and its pre-war economic development. Out of 16 proxies for pre-war economic characteristics, 13 variables are significantly correlated with the amount of explosives dropped by Allied forces before the armistice (Table 2, column 1). A one standard deviation (σ) difference in the number of industrial firms before the war (1,255 firms), for example, is associated with 583 (standard error=269) additional tons of explosives before the armistice. Similarly, a one σ difference in population before the war (341,561 individuals) correlates with 1,025 (se=342) more tons of explosives before the armistice.

Even if more bombings between the start of WWII and the armistice brought more E.R.P. aid after the end of the war, we do not use this source of variation in the empirical analysis. The stark differences in pre-war economic conditions between more and less bombed provinces would not allow us to isolate the role of the Marshall Plan on post-war recovery. Provinces that were more economically successful before the war, in fact, might have flourished after the end of the conflict for a variety of reasons, not only thanks to E.R.P. aid.

The empirical analysis, instead, exploits the change in military strategy that followed the signing of the Armistice of Cassibile. After the Italian surrender, the German troops militarily occupied the country to fight against the Allied forces, which had started their Italian Campaign by invading Sicily in June 1943. When Italy became one of the active

warfronts of WWII, air strikes were employed to help ground operations against the German Army, instead of striking factories and urban areas. As a consequence, economic conditions did not drive the amount of explosives dropped in the later stages of conflict, differently from what observed for pre-armistice bombs. In column 2 of Table 2, we test whether pre-war economic conditions are correlated with the amount of bombings used during the Italian Campaign. Several variables measuring population, size of the province, number of industrial firms, and agricultural output before the war cannot explain significant variations in the severity of air strikes.[11]

This change in strategy is well reflected by the geographical distribution of the air attacks (Figure 1, panel B). In this phase, US and British air forces were not targeting anymore the richest Italian provinces, but the areas in which either land battles were fought or supplies from Germany were transiting. Consider the case of the two northerner provinces of Aosta and Bolzano, which in 1937 had similar population size (227,500 vs 277,720), population density (47 residents per squared km vs 43), number of industrial firms (6,239 vs 7,728), number of industrial workers (37,566 vs 39,907), and number of agricultural workers (75,572 vs 69,399). They also both hosted major mountain passes. In the province of Aosta, the Great Saint Bernard Pass connected Italy to Switzerland, a neutral country during WWII. In the province of Bolzano, the Brenner Pass was used to deliver supplies to German troops in Italy. As a result, the Allied air forces heavily bombed the province of Bolzano during the Italian Campaign (3,561 tons against troops, railways, or roads; 4,000 tons total), but not the province of Aosta (0 tons against troops, railways, or roads; 66 tons total).

4.2 The Correlation Between Allied Bombing and E.R.P. Aid

In this section, we test how the amount of bombings during the Italian Campaign correlates with the subsequent distribution of E.R.P. aid between 1948 and 1952. The air strikes left many casualties on the ground. A one σ increase in the tons of explosives (1,681 tons) correlates with 1,309 (se=316) additional deaths in a province (Table 3, column 1, panel A). This finding is robust if we focus on civilian casualties. A one σ increase in the tons of explosives correlates with 1,029 (se=213) additional civilian deaths (Table 3, column 2, panel A). Even if we do not directly observe data on damages to buildings and infrastructures, these results suggest that the air raids brought widespread destruction in the most affected areas.

The data on the assignment of E.R.P. aid indicate that provinces with more bombings during the Italian Campaign received significantly larger amounts of reconstruction grants.

[11] Out of 16 regressions, only in one case (number of tractors used in agriculture) the correlation between pre-war output and tons of explosives is positive and statistically significant (Table 2).

This finding is not surprising if we consider that many of these air attacks were targeting public infrastructures, like railways and highways. A one σ increase in the tons of explosives correlates with additional \$16,992,619 (se=2,924,958) assigned for reconstruction projects, a 22 percent increase from the mean (Table 3, column 3, panel A). It is interesting to note that heavily bombed provinces received more reconstruction grants at the expenses of other forms of aid, such as in-kind subsidies. A one σ increase in the tons of explosives, for example, decreases the value of food and drugs received through E.R.P. by \$11,628,682 (se=7,172,042) (Table 3, column 4, panel A). This correlation becomes larger and statistically significant at the 5 percent level, if we control for province characteristics (Table 3, column 4, panel B). The tons of explosives are also positively correlated with the amount of loans given to private firms, but the relationship is small and not robust to the inclusion of province characteristics (Table 3, column 5, panel A and B).

We conclude that the air strikes during the Italian Campaign raised the amount of reconstruction grants distributed between 1948 and 1952 through the E.R.P. This is the only form of aid that was disproportionately assigned to the most heavily bombed provinces. We will therefore be able to focus on the reconstruction projects funded by the E.R.P. in order to isolate the mechanisms behind the post-war Italian recovery.

4.3 Empirical Specifications

We first compare economic outcomes before and after the Marshall Plan between provinces that received different amount of bombings during the Italian Campaign. We employ the following difference-in-differences specification:

$$y_{pit} = \alpha_p + \beta_i + \gamma_{rt} + \delta \text{IC Bombs}_p \times \text{Post } 1948_t + \sum_{z=1}^{3} \text{trend}_t^z \times X_p + \epsilon_{pit}, \tag{1}$$

where the unit of observation is an industry i (either food, paper, chemistry, construction, mining, mechanics, metallurgy, textile, or clothing) in province p and census year t. The dependent variable y_{pit} is one of many measures of industrial output from the Italian Industrial Census. For most outcomes, there are two pre-war observations in 1927 and 1937 and six decennial post-war observations between 1951 and 2001. When the dependent variable measures an agricultural outcome, most outputs are observed every year between 1938 and 1969. The estimating sample drops provinces in the regions of Sicilia and Sardegna due to the lack of bombings during the Italian Campaign, but the results are robust to the inclusion of these provinces (Table (A2), panel C).

The variable IC Bombs$_p$ measures the tons of explosives dropped by Allied forces during the Italian Campaign in province p. As described in section 3.3, we isolate these air strikes using both the date of the attack (after February 1944) and the type of target (against troops, railways, roads, transportation facilities). The results are robust to extending the range of dates back to the announcement of the armistice (September 9, 1943) or to modifying the list of targets (Table A2, panel A and B). Post 1948$_t$ is a dummy variable equal to one for every post-E.R.P. census year. If the coefficient of interest δ is positive, the data indicate that provinces with more bombings during the Italian Campaign experienced larger increases in industrial output after the implementation of the Marshall Plan.

The regressions control for non-linear differences in industrial outcomes by including fixed effects for provinces (α_p), industries (β_i, not included in the agricultural regressions), and region-census years combinations (γ_{rt}). In addition, to control for other provincial changes in industrial output over time, this specification includes interactions between baseline provincial characteristics (population density, employment rate, industrial horsepower, share of industrial workers, and share of agricultural workers in 1937) and trends up to the third order. The standard errors are clustered at the province level.

When the dependent variable measures an agricultural outcome, equation (1) undergoes two main changes. First, the fixed effects for different industries are dropped. Second, because these variables come from yearly agricultural reports, most outcomes are observed every year between 1938 and 1969, instead of only in the census years.

We then directly estimate the effect of reconstruction grants on the industrial and agricultural recovery:

$$y_{pit} = \alpha_p + \beta_i + \gamma_{rt} + \delta \text{Reconstr. grants}_p \times \text{Post } 1948_t + \sum_{z=1}^{3} \text{trend}_t^z \times X_p + \epsilon_{pit}. \qquad (2)$$

The OLS estimate of coefficient δ in equation (2) could be biased, because the amount of reconstruction grants assigned to a province could be related to unobservable characteristics in ϵ_{pit}. The level of political connection with the central government, for example, could be correlated with both the amount of reconstruction grants and its economic outcomes.

We therefore instrument the amount of reconstruction grants in province p with the amount of explosives dropped by Allied forces in the same province during the Italian Campaign. As described in section (4.2), in fact, the first stage of this instrumental variable regression is strong and precisely estimated: provinces with more bombings received a disproportionate amount of reconstruction grants between 1948 and 1952. Moreover, section (4.1) showed how the amount of explosives is not correlated with a long list of pre-war economic conditions, because the air strikes followed the ground battles between German

and Allied Armies. As an instrumental variable, therefore, IC Bombs$_p$ exploits variation in reconstruction grants that should be plausibly exogenous with respect to concurrent trends in industrial and agricultural outcomes.

4.4 Pre-WWII Trends in Agricultural Outputs

The identification assumption of equation (1) requires the economic outcomes to follow a similar pre-war trend between provinces with different level of bombing. In section (4.1), we found that the pre-war level of many economic variables was not significantly different between provinces that were hit by a different amount of explosives during the Italian Campaign. In this section, we show the existence of parallel linear and non-linear pre-war trends in economic outcomes. We focus on agricultural outputs because for these variables we have three consecutive observations before WWII in 1937, 1938, and 1939.

We first regress several agricultural variables on IC Bombs$_p$, a linear trend, and the interaction of these two variables (Table 4, panel A). The coefficient of the interaction indicates whether agricultural outputs in provinces with more bombings were on a different linear trend before the start of the conflict. In most cases, the agricultural outcomes followed a linear trend in the three years preceding WWII, but this trend was the same in provinces with different amount of bombing. The coefficient of the interaction between the treatment variable and the linear trend is always small and not statistically significant.

The situation does not change if we replace the linear trend with two dummy variables for years 1938 and 1939 (Table 4, panel B). The data indicate that agricultural outputs followed similar nonlinear trends in provinces with different amount of bombings during the Italian Campaign. Even in the case of tractors, the only variable that is correlated with the amount of bombings, the interactions between the treatment variable and the two year dummies are small and not statistically significant (Table 4, panel B, column 4).

5 The Effects of Reconstruction Grants on the Italian Recovery

Industrial and agricultural outcomes increased more after the implementation of the Marshall Plan in provinces that had been more heavily bombarded during the Italian Campaign. We also find evidence that the development and adoption of newer technologies increased disproportionately in the same provinces. Instrumental variable regressions suggest that the reconstruction grants distributed through the E.R.P. played a direct role in the Italian post-war recovery.

5.1 Industrial Outcomes

We first compare changes in industrial outcomes before and after the Marshall Plan, between provinces hit by a varying amount of explosives during the Italian Campaign (equation 1). The number of industrial firms per industry, province, and census year increased by 121 units (se=40) for each one σ increase in the tons of bombs (Table 5, panel A, column 1). Compared with a pre-war mean of 704 firms per industry, province, and year, the estimated effect indicates a 17 percent increase. This change is mostly driven by small establishments with less than 10 employees, while larger firms did not change differentially (Table 5, panel A, column 2 and 3).

More firms translated into more industrial workers. A one σ difference in bombings increased the post-E.R.P. number of industrial employees by 1,024 (se=303) individuals or 26 percent per industry, province, and census year (Table 5, panel A, column 4). This increase is more pronounced among white collar and managerial positions, even if the effect is large and statistically significant for blue collar jobs as well (Table 5, panel A, column 5 and 6).

We find similar results when the regressions include nonlinear trends for provinces with similar pre-war characteristics, such as population density, employment rate, industrial horsepower, share of industrial workers, and share of agricultural workers (Table 5, panel B). When controlling for these provincial trends, a one σ difference in bombings is associated with 84 (se=33) additional firms after 1948, a 12 percent increase. Overall, these results indicate that concurrent provincial trends are not responsible for the observed changes in industrial outcomes. This should be expected, because the bombings during the Italian Campaign did not target provinces based on their level of economic prosperity.

Difference-in-differences estimates for each census year provide more insights on the timing of the effects (Figure 2). In 1951, 3 years into the active implementation of the Marshall Plan, provinces with different amount of bombings during the Italian Campaign had similar levels of industrial outputs. In 1961, nine years after the full distribution of grants through the E.R.P., province with more bombings had significantly more industrial firms and workers. The effect peaked in 1971 and decreased in the following decades, suggesting that the initial divergence between provinces might have been only temporary. In the case of industrial firms, for example, a one σ difference in bombings during the Italian Campaign is associated with 23 (se=15) additional firms per industry and province in 1951, 91 (se=22) in 1961, 185 (se=42) in 1971, 108 (se=54) in 1981, 84 (se=50) in 1991, and 153 (se=82) in 2001 (Figure 2, panel A).

The fact that the positive effects on the industrial outcomes started only after 1951 suggests that the Marshall Plan might have played a fundamental role in driving the observed

economic growth. In the instrumental variable regressions, we further explore the direct link between reconstruction grants and industrial output (Table 5, panel C). As described in section 4.3, we instrument the amount of reconstruction grants received by each province through the E.R.P. with the tons of bombs dropped during the Italian Campaign. Section 4.2 showed that the relationship between these two variables is statistically and economically significant (Table 3, column 3). The F-statistics produced by the instrumental variable regressions confirm this finding.

The data indicate that a one σ difference in reconstruction grants ($29,083,077) increased the number of firms by 205 (se=90) units or 29 percent per industry, province, and census year (Table 5, panel C, column 1). Similarly, a one σ difference in reconstruction grants is associated with 1,986 (se=652) additional workers or 50 percent per industry, province, and census year (Table 5, panel C, column 4).

5.2 Agricultural Outcomes

Provinces with more bombings during the Italian Campaign experienced a disproportionate increase in agricultural production after 1948 (Table 6, panel A). As seen for the industrial outcomes, the inclusion of the interaction between nonlinear trends and pre-war characteristics does not modify the findings (Table 6, panel B).

A one σ difference in the tons of explosives is associated with 10,679,729 (se=2,992,348) additional kilos of wheat and corn per province and post-E.R.P. year (Table 6, panel A, column 1). This effect represents a 9 percent increase from a pre-war average of 123,423,700 kilos. Similarly, the production of wine increased by 9,151,364 (se=3,546,574) liters or 20 percent for each one σ increase in the tons of explosives, while the production of grape increased by 10,600,722 (se=4,485,580) kilos or 15 percent (Table 6, panel A, column 2 and 3).

It is interesting to notice how this disproportionate growth in agricultural output did not take place for crops more concentrated in provinces that were not heavily affected by air strikes during the Italian Campaign. The production of olive oil, for example, did not increase significantly after 1948 in provinces with more bombs during the war. The coefficient indicates an increase of 67,744 (se=90,102) kilos of olive oil for each one σ difference in the treatment, but is imprecisely estimated (Table 6, panel A, column 4). The three provinces that produced the highest amount of olive oil before WWII were Bari, Lecce, and Brindisi, all three in the southeastern region of Puglia. All these provinces received only small amount of explosives during the Italian Campaign: 213 tons were dropped in Bari, while 0 tons in both Lecce and Brindisi. In the ranking of pre-war oil production, the first province with

a substantial amount of bombings during the Italian Campaign is Roma, whose olive oil production was only 12 percent of Bari's oil output.

The increase in production was not accompanied by an increase in the size of the agricultural workforce, as we observed in the Italian industry. A one σ difference in the tons of explosives is associated with 9,098 (se=2,409) fewer individuals employed in agriculture, a 9-percent shrink in the pre-war workforce (Table 6, panel A, column 5). In addition, a one σ difference in the tons of explosives did not change significantly the number of agricultural firms after WWII (Table 6, panel A, column 6).

Difference-in-differences estimates for single years describe precisely the timing of the previous results, because agricultural outputs are observed every year between 1938 and 1969 (Figure 3). A one σ difference in bombings did not affect significantly the production of wheat and corn during the war or in the post-war years preceding the Marshall Plan. After 1948, the production of wheat and corn increased disproportionately in provinces with more bombings. More specifically, the estimates become positive and statistically significant at the 5 percent level only in 1952, the year following the full distribution of E.R.P. aid (Figure 3, panel A). The production of wine and grape followed a similar pattern (Figure 3, panel B and C). Yearly estimates on the number of workers in agriculture, which is observed only in the census years, suggest that the larger decrease of the agricultural workforce in provinces with more bombings during the Italian Campaign persisted at least throughout 2001 (Figure 3, panel D).

As seen for the industrial outcomes, the instrumental variable regressions are qualitatively consistent with the reduced form estimates (Table 6, panel C). A one σ difference in the amount of reconstruction grants increased wheat and corn production by 31,445,568 (se=10,450,344) kilos, wine production by 25,765,826 (se=12,037,375) liters, grape production by 30,684,691 (se=14,239,784) kilos, and decreased the number of agricultural workers by 24,614 (se=9,865) individuals.

5.3 Development and Adoption of New Technology

In this section, we show evidence that provinces with more reconstruction grants invested more in the development and adoption of new technologies. There results can explain why reconstruction grants had long-lasting effects on economic growth.

Although we do not have detailed information on all technologies adopted by industrial firms, we observe the amount of horsepower generated by different types of motors. A one σ difference in bombings increased the post-E.R.P. engine power by 908 (se=829) horsepower per industry, province, and census year (Table 5, panel B, column 7, and Figure 2, panel E).

Considering that on average an industry generated 5,912 horsepower per pre-war year and province before, a one σ difference in the treatment is associated with an 15 percent increase in the amount of engine power. This effect can be attributed to a large increase in the power generated by electrical engines, not combustion motors. In the case of electrical motors, a one σ difference in bombings increased the post-war engine power by 1,081 (se=622) horsepower, a 24 percent increase per industry, province, and census year (Table 5, panel B, column 8, and Figure 2, panel F).

The previous results indicated the economic growth in post-WWII Italy led to a migration of workers from agricultural fields to industrial factories. The mechanization of agricultural work might have played a direct role in this process. Large productivity gains through the adoption of newer technology allowed farmers to increase production with less labor.[12] The workers who were not longer needed in agriculture moved to the growing industrial sector.

In support of this hypothesis, the data indicate that provinces with more bombings experienced a more widespread technological adoption after 1948. Motorized tractors played an increasingly important role in agriculture during the post-WWII years. A one σ difference in the tons of explosives increased the number of tractors after 1948 by 1,000 (se=301) units per province and year, a 220 percent increase from the pre-war baseline (Table 6, panel B, column 7, and Figure 3, panel E). Non-motorized threshers, instead, became obsolescent during the 20th century, when the progressive introduction of combine harvesters allowed farmers to replace several machines with a single one. Not surprisingly, the number of threshers did not increase significantly after WWII in provinces with more bombings (Table 6, panel A, column 8, and Figure 3, panel F).[13]

Patent data confirm that individuals and firms in provinces with more reconstruction grants invested more in the development of newer technologies. A one σ difference in the tons of explosives led to 13 (se=3) additional patents issued to domestic inventors per province and year, a 27 percent increase from the 1940 baseline (Table 7, panel B, column 1).

In alternative specifications, we study how patenting changed in different technological areas. One observation represents a province, a patent class, and a year. In addition, the regressions include patent class fixed effects. In this case, a one σ difference in the tons of explosives led to 1.68 (se=0.34) additional patents issued to domestic inventors per province, class, and year, a 28 percent increase from the 1940 baseline (Table 7, panel B, column 2). Yearly estimates show that the number of patents issued in provinces with more bombings decreased significantly during the conflict (Figure 4, panel A). In this period, the local patent

[12] We also find weak evidence in favor of the hypothesis that the overall agricultural land decreased disproportionately in provinces with more bombing (Table A1, column 5 and 6).

[13] The amount of bombing is not correlated with the number of cotton gins (Table A1, column 7), but increased the number of other agricultural machines (not tractors, threshers, or gins; Table A1, column 8).

offices were less likely to operate in areas that received more air attacks. Immediately after the end of WWII, however, the number of patents issued to domestic inventors increased in the same areas. This growth might be due to the longer queue of unprocessed patent applications that had gathered during the war. After this initial effect subsided, the number of patents issued in provinces with more reconstruction grants started raising again after 1952.

We then isolate the effect of reconstruction grants on specific technological areas. A one σ difference in the tons of explosives led to 3.36 (se=1.51) additional agricultural patents (Table 7, panel B, column 3, and Figure 4, panel B), 5.04 (se=1.55) additional industrial patents (Table 7, panel B, column 4, and Figure 4, panel C), and 1.68 (se=0.46) additional patents for the construction industry (Table 7, panel B, column 5, and Figure 4, panel D). The increase from the 1940 baseline varies between 56 percent for construction patents and 18 percent for industrial patents.

Finally, the instrumental variable regressions allows to link directly the amount of reconstruction grants to the adoption of new technology. A one σ difference in the amount of reconstruction grants ($29,083,077) led to 2,276 (se=2,170) additional horsepower (Table 5, panel C, column 7), 2,362 (se=890) additional tractors (Table 6, panel C, column 7), and 31 (se=10) additional patents (Table 7, panel C, column 1).

6 Other Outcomes and Robustness Checks

6.1 Population and Education

In spite of a disproportionate increase in the industrial sector, we do not observe strong evidence suggesting that individuals migrated to provinces with more bombings after 1948. A one σ difference in the tons of bombs increased the provincial population by 141,007 (se=78,686) individuals or 31 percent (Table A1, panel A, column 1). The effect is large, but imprecisely estimated. When the regressions include nonlinear trends interacted with pre-war characteristics, the estimate decreases in magnitude and loses its statistical significance (Table A1, panel B, column 1). We also do not observe a differential increase in average salaries, which might partially explain why more people did not move after 1948 into provinces with more bombings (Table A1, panel A, column 3).

Did the faster replacement of agricultural jobs with industrial positions induce more investment in education? We find only weak results in support of this thesis. A one σ difference in the tons of bombs decreased the number of illiterates, the only available measure of education, by 8,560 (se=3,308) individuals or 12 percent per province (Table A1, panel A,

column 4). This finding is not robust to the inclusions of nonlinear trends interacted with pre-war characteristics (Table A1, panel B, column 4). Overall, these results do not conclusively rule out the possibility that individuals responded to the expansion of the industrial sector by investing more in education. Changes in the number of illiterates, in fact, can only capture new entries in school (the extensive margin), not different education choices among the individuals who were already inside the education system (intensive margin).

6.2 Alternative Specifications of Bombings

In this section, we show that the choices made in the construction of the treatment variable do not affect the results. First, we compute the tons of explosives dropped on targets related to the Italian Campaign from September 9, 1943—the day in which the Armistice of Cassibile was publicly announced—instead of March 1944 (Table A2, panel A). In the main results, we selected March 1944 as the starting date, because in this period official documents formally ranked the Italian warfront against the German troops as the top priority for Allied Tactical Air Forces. The results suggest that including the air attacks since September 1943 does not change the main findings. A one σ difference in the tons of bombs dropped since the armistice (2,063 tons), for example, increased the number of industrial firms after WWII by 109 (se=35) units or 15 percent in the average industry, province, and census year (Table A2, panel A, column 1). This estimate is 30 percent larger than the baseline (Table 5, panel B, column 1). We observe similar differences for all the other industrial and agricultural outcomes.

Second, we can extend the amount of targets included in the treatment variable (Table A2, panel B). The original list isolates air attacks against targets that are closely related to land battles against German troops: direct cooperation with ground forces; troop concentrations; radar installations; gun emplacements; weapon launching sites; tactical targets; supply dumps; tracks and marshaling yards; moving trains; highways and vehicles; transportation facilities. We can add air strikes against bridges, tunnels, airdromes, and waterways. The results still indicate that the provinces with more bombings experienced larger increases in industrial and agricultural outputs. A one σ difference in the tons of bombs (3,074 tons), for example, increased the number of industrial firms after WWII by 117 (se=37) units or 17 percent (Table A2, panel B, column 1).

Third, we can include the provinces in the regions of Sardegna and Sicilia, even if the two regions did not receive any airstrike related to the Italian Campaign (Table A2, panel C). The results in this larger sample are quantitatively similar to the baseline estimates for all outcomes. A one σ difference in the tons of bombs (1,604 tons), for example, increased the

number of industrial firms after WWII by 83 (se=32) units in this larger sample (Table A2, panel C, column 1) and by 84 units in the baseline regressions (Table 5, panel B, column 1).

6.3 Excluding War Years

The empirical analysis compares changes in agricultural outcomes between provinces with different amount of bombings, before and after the implementation of the Marshall Plan. In the pre-period, the estimating sample contains the five years between June 1940 and April 1945 during which Italy participated in the conflict. Because provinces with more bombings received a larger negative shock during the war, they could have experienced a more pronounced recovery after WWII even without E.R.P. aid. The yearly estimates in Figure 3, however, seem to contradict this hypothesis. The increases in agricultural outputs, in fact, become large and statistically significant only after the full implementation of the Marshall Plan.

To provide additional proof that the inclusion of war years in the pre-period does not affect the results, we re-estimate equation (1) without the observations between 1940 and 1945 (Table A3). In this alternative specification, the results do not differ from the baseline. A one σ difference in the tons of bombs, for example, increased the production of wheat and corn after 1948 by 10,203,670 (se=3,125,651) kilos in this sample without war years (Table A3, panel A, column 1) and by 10,679,729 kilos in the baseline regressions (6, panel A, column 1).

7 Recovery and Expansion

Did provinces with more bombings during the Italian Campaign merely recover faster from WWII? Or did they experience a larger economic expansion? The previous difference-in-differences estimates cannot distinguish between the two scenarios. In this section, we show how the levels of industrial and agricultural outputs changed over time for provinces in the top and bottom quintile of the bombing distribution (Figure 5). Most outcomes surpassed their pre-war levels by 1971. The data also indicate that provinces in the top quintile of the bombing distribution experienced a quicker and larger economic expansion, beyond recovery from the disruption generated by WWII.

Overall, industrial variables show a slower path to recovery and expansion, compared with agricultural outputs. In heavily bombed provinces, the number of industrial firms exceeded the 1937 level only in 1971 (Figure 5, panel A). The provinces in the bottom quintile, instead, experienced a lack of growth in the number of industrial firms until 1991 and never reached their pre-war average in the period under consideration. The number

of industrial workers, instead, surpassed the 1937 level in the 1961 census for provinces in the top quintile of bombing distribution and in the 1971 census for provinces in the bottom quintile (Figure 5, panel B). The amount of power generated by industrial motors followed an ever increasing pattern between 1927 and 1971 (Figure 5, panel C). As shown in the baseline results, provinces with more bombings experienced larger increases in horsepower.

The agricultural variables show full recovery already during the implementation of the Marshall Plan between 1948 and 1952. After this period, they increased beyond their pre-war levels for both provinces in the top and bottom quintile, although the increase is larger for the former. The production of wheat and corn, for example, reached the 1939 level by 1952 among provinces in the top quartile and by 1953 among provinces in the bottom quartile (Figure 5, panel D). After this period, it expanded significantly beyond the pre-war level in provinces in the top quintile, while the trend stayed flatter in the other group of provinces. The adoption of tractors followed an increasing trend between 1948 and 1969 with a larger expansion among provinces in the top quintile (Figure 5, panel F).

8 The Completion of Large Infrastructures

In this section, we provide further evidence that the completion of public infrastructures with E.R.P. aid led to economic growth. The analysis exploits the fact that the completion year of the first large infrastructures differed across Italian provinces. We can therefore perform an event study in which the first treatment period does not coincide with 1949 for every province, but with the calendar year in which the initial projects were completed. This specification can disconnect the treatment effect from potential confounding factors that took place starting from 1949, the first full year of E.R.P. implementation.

8.1 Event Study Analysis

The "Mutual Security Agency" bulletins contain information on the 14,912 different reconstruction projects that were funded through the Marshall Plan. We exploit this rich dataset to show that there is significant geographical variation in the year in which the initial important infrastructures were executed.

The first 5 large infrastructures—each amounting to at least 5 percent of the total grants received by a province—were completed by 1953 in 37 provinces, by 1954 in 11 provinces, by 1955 in 34 provinces, by 1956 in 7 provinces, and by 1957 in 3 provinces (Figure A3, panel A). Although the overall distribution is similar across project type (Figure A3, panel B and C), the first roads and railways had a different execution year in 17 provinces (18 percent).

We use this variation to explore whether different infrastructures have varying effects on economic outcomes.

We perform an event study analysis by estimating the following specifications:

$$y_{pk} = \alpha_p + \beta_t + \gamma_{rk} + \delta \text{IC Bombs}_p \times \text{Post}_k + \sum_{z=1}^{3} \text{trend}_k^z \times X_p + \epsilon_{pk}, \tag{3}$$

where the unit of observation is a province p in the event period k. The dependent variable y_{pk} is a measure of agricultural output from the Annals of Agricultural Statistics. We restrict the analysis to agricultural outputs because they are the only variables available every year between 1938 and 1969.[14]

As seen in the main specification, the variable IC Bombs_p measures the tons of explosives dropped by Allied forces during the Italian Campaign in province p. Post_k, instead, is equal to 1 for every period after the completion of the first 5 large infrastructures, each amounting to at least 5 percent of the total E.R.P. grants assigned to a province.[15] Their interaction measures how the reconstruction of public infrastructures affected agricultural outcomes in provinces with more bombings during the Italian Campaign.

The regressions control for confounding time-varying factors by including fixed effects for calendar years (β_t) and for region-event period combinations (γ_{rt}), as well as interactions between baseline provincial characteristics (population density, employment rate, industrial horsepower, share of industrial workers, and share of agricultural workers in 1937) and trends up to the third order. Fixed effects for provinces (α_p) capture permanent geographical differences in agricultural outputs. The standard errors are clustered at the province level.

In this setting, we also study the direct relationship between agricultural outputs and reconstruction grants by estimating the following IV specifications:

$$y_{pk} = \alpha_p + \beta_t + \gamma_{rk} + \delta \text{Reconstr. grants}_p \times \text{Post}_k + \sum_{z=1}^{3} \text{trend}_k^z \times X_p + \epsilon_{pk}. \tag{4}$$

We instrument the amount of reconstruction grants in province p with the amount of explosives dropped by Allied forces in the same province during the Italian Campaign.

As an additional test for the possible influence of omitted factors, we estimate placebo treatment effects starting from equation (3). Specifically, we restrict the sample to periods that preceded the completion of the first large infrastructures in each province. We then create the variable Post_k by randomizing the first period in which this dummy variable takes

[14] Outputs from the Industrial Census are observed only in 1927, 1937 1951, 1961, 1971, 1981, 1991, and 2001. For this reason, an event study analysis would lead to the same results described in Section 5.1.

[15] The results are robust to alternative definitions of the Post_k variable (Table A6).

value 1. The data indicate that there is not a significant correlation between the placebo treatment variable and the agricultural outcomes (Table A4).

8.2 Results

The event study analysis indicates that agricultural outputs increased after the initial reconstruction of large public infrastructures (Table 8, panel A). A one σ difference in the tons of explosives is associated with 11,690,178 (se=3,488,411) additional kilos of wheat and corn, 12,522,105 (se=4,137,782) additional liters of wine, 14,481,479 (se=4,889,189) additional kilos of grape, and 1,094 (se=276) additional tractors per province and year. With the exception of wheat and corn (12 percent smaller), these effects are between 9 percent and 15 percent larger than the baseline estimates (Table 6, panel B). Our previous specifications might have slightly underestimated the effect of the Marshall Plan by including in the post-treatment period several years before the completion of the first reconstruction projects. The event studies also confirm that the reconstruction grants did not have any significant effect on crops concentrated in provinces that were not heavily affected by air strikes during the Italian Campaign (like olives), as well as on the adoption of obsolete technologies such as manual threshers.

Difference-in-differences estimates for single event periods reveal how most agricultural outputs increased only after the completion of the first large infrastructures (between 1953 and 1957), instead of immediately after receiving the E.R.P. grants between 1949 and 1952. This trend is especially clear for tractors (Figure A4, panel E). A one σ difference in bombings did not increase significantly the number of tractors used in a province before the completion of the first 5 large infrastructures. The effect becomes positive, statistically significant, and increasing only in the post-treatment phase.

Compared with railways (Table 8, panel C), roads (Table 8, panel B) appear to have a stronger impact on agricultural outputs, but the differences are not large. In the case of grape, for example, a one σ difference in the tons of explosives is associated with 15,940,251 (se=5,156,468) additional kilos per province and year after the completion of the first 5 large roads (Table 8, panel B, column 3), but only 14,440,967 (se=4,843,129) additional kilos after the completion of the first 5 large railways (Table 8, panel C, column 3). The estimated effects for other crops are between 1 percent and 9 percent larger when Post_k is equal to 1 for every period after the completion of the first 5 large roads (instead of railways).

We then assess the direct relationship between agricultural outputs and reconstruction grants by estimating IV equations (4). In the event study, the estimated effect of reconstruction grants are between 66 percent and 131 percent larger than the baseline (Table 6,

panel C). In the case of tractors, for example, a one σ difference in reconstruction grants ($29,083,077) increased units by 5,444 (se=1,807) per province and year after the completion of the first 5 large infrastructures (Table A5, panel A, column 5). In the baseline specification, a one σ difference in reconstruction grants increased units only by 2,362 (se=890) after 1948 (Table 6, panel C, column 5).

Finally, we show how alternative definitions of project completion do not change the main findings. The results are robust, for example, if Post_k identifies the completion of the first large project (instead of the first 5) amounting to at least 5 percent of all funds assigned to a province (Table A6). A one σ difference in the tons of explosives is associated with 12,774,423 (se=3,569,772) additional kilos of wheat and corn, 11,869,373 (se=4,226,202) additional liters of wine, 13,821,350 (se=4,907,007) additional kilos of grape, and 960 (se=287) additional tractors per province and year (Table A6, panel A).

9 Conclusions

In this paper, we use evidence from the Marshall Plan in Italy to examine the effects of reconstruction grants on long-run economic outcomes. Our causal estimates exploit variation in the geographical distribution of Allied bombings in Italy during the last stages of World War II (March 1944–April 1945).

Our findings indicate how the Marshall Plan shaped the economic development of postwar Italy. The construction and modernization of public infrastructures might have helped industrial and agricultural firms obtaining raw materials from suppliers and distributing their products to clients. Although we do not directly observe sales and input purchases, our event studies indicate that increases in production happened only after the completion of the first large infrastructures. This result suggests that the positive effects on economic outcomes are directly tied to the use of reconstruction grants, instead of depending on other unobserved interventions.

In provinces that received more reconstruction grants, firms became more likely to adopt new technologies, such as motorized tractors, and to develop patents. The mechanization of the agricultural production can explain the opposite growth pattern observed in industrial and agricultural firms. The newly adopted agricultural machines increased agricultural productivity and replaced manual work. The number of agricultural workers starkly decreased, while the number of industrial workers increased. These two elements—technological development and migration of workers from the agricultural fields to the industrial factories—characterize the Italian postwar development, which historians often refers to as the "economic boom" or the "Italian economic miracle" (Castronovo, 2010).

In the longstanding debate over the effectiveness of international aid (Sachs, 2005; Easterly, 2006), our results corroborate the hypothesis that aid can be associated with long-term economic growth. There are, however, two important caveats. First, our analysis focuses on a specific type of aid, reconstruction grants, in a geographical setting that was in dire need of new and modern infrastructures. As a consequence, our results might be informative about the benefits of building new infrastructures in many developing countries with poor public assets, but cannot speak about the effectiveness of other types of interventions. Second, our empirical exercise uses within-country variation by comparing nearby provinces with different levels of reconstruction grants. This setting limits the possibility of attributing to reconstruction grants the effect on economic outcomes generated by omitted factors. Our analysis, however, cannot inform about the role of institutions in determining the effectiveness of international aid. By comparing Italian provinces in the same region, we examine geographical units with plausibly similar levels of corruption and political accountability.

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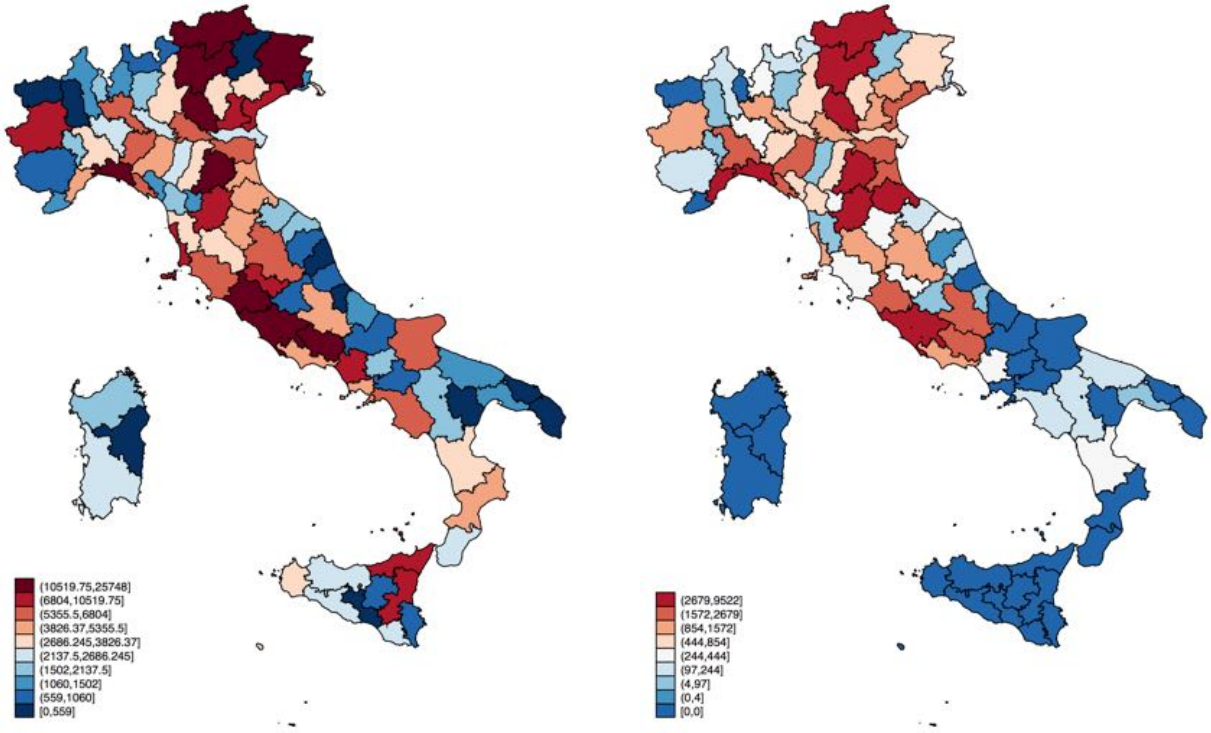
Figures and Tables

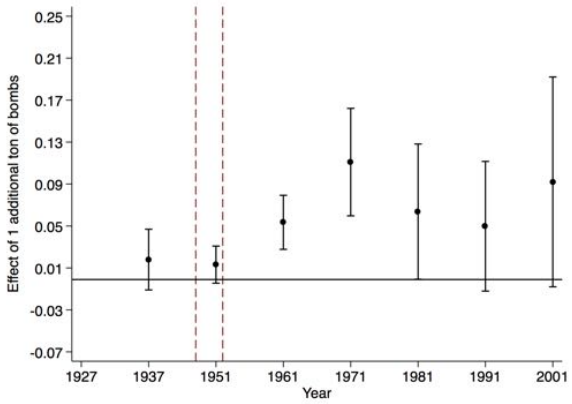
Figure 1: Maps of Allied Bombing



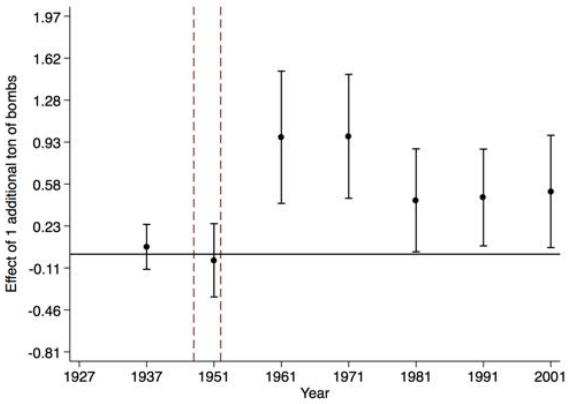
A. All bombs B. Italian Campaign

Notes: This figures shows the distribution of Allied bombings across Italian provinces. Panel A shows all bombings. Panel B shows only the Allied bombings associated with the Italian Campaign: these air strikes happened after March 1944 and focused on targets related to the land battles against the German forces.
Sources: USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

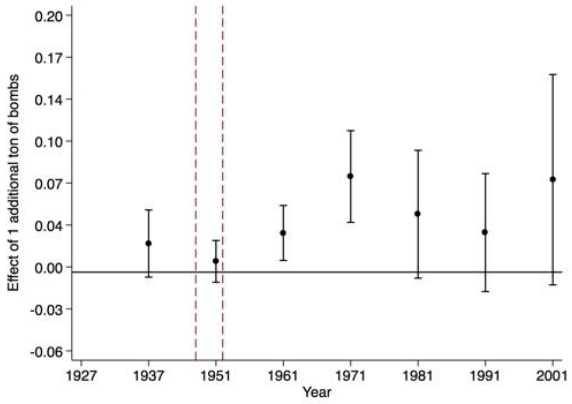
Figure 2: Recovery in the Industrial Sector



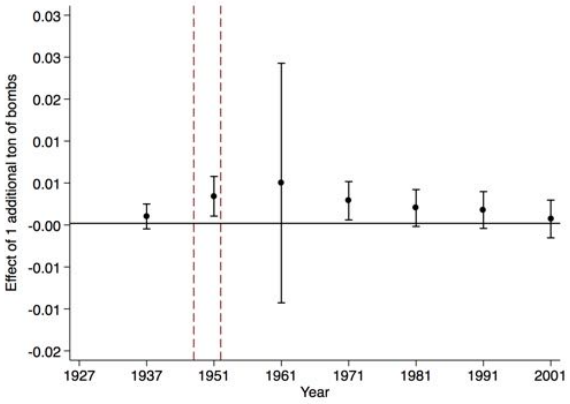
A. Industrial firms



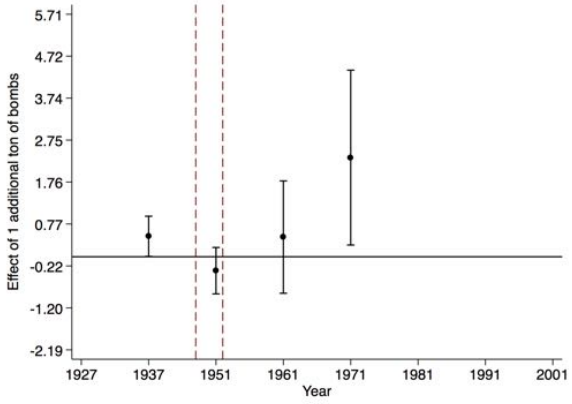
B. Industrial workers



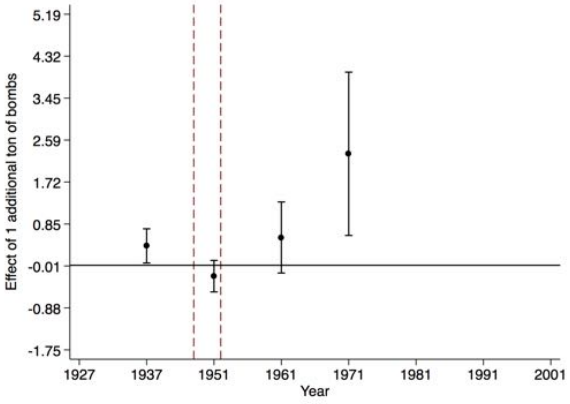
C. Industrial firms < 10 employees



D. Industrial firms > 10 employees



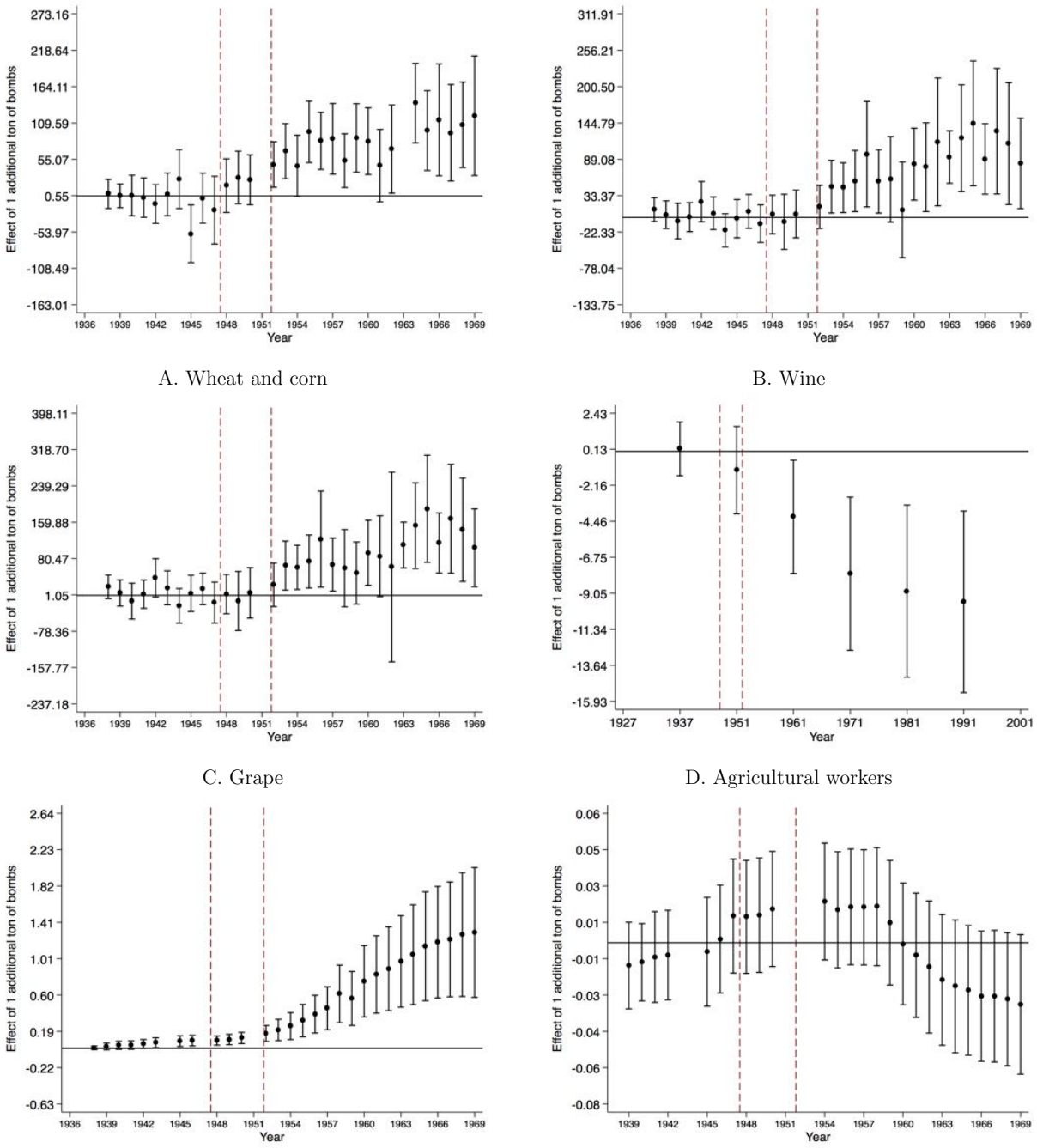
E. Horsepower



F. Horsepower from electrical engines

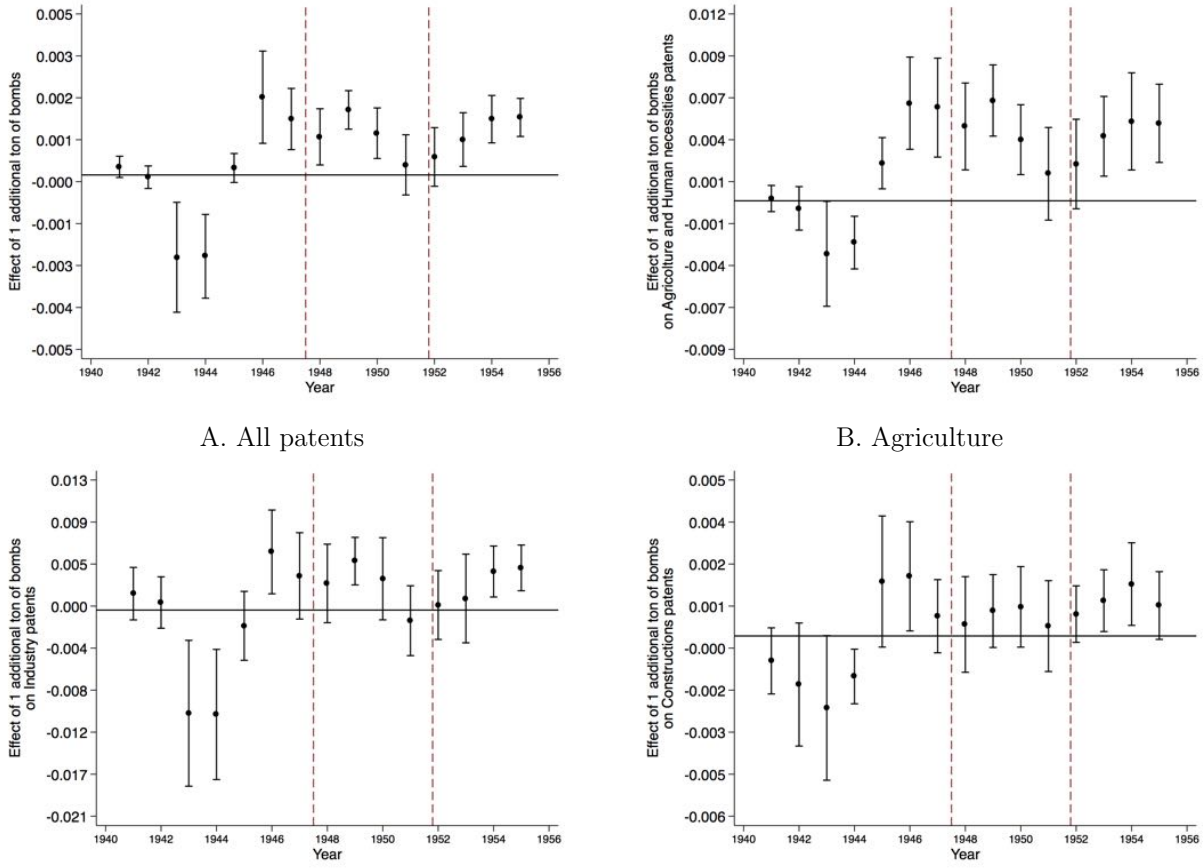
Notes: These graphs show the effect of 1 ton of IC bombs on different outcomes. The regressions also include province fixed effects, industry fixed effects, region-year fixed effects, as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the amount of firms active in each province, industry, and year (panel A), the number of employed workers (panel B), the number of firms with less than 10 workers (panel C), the number of firms with more than 10 workers (panel D), the total amount of horsepower (panel E), and the amount of horsepower coming from electrical engines (panel F). Source: Censimento dell'Industria e dei Servizi, Istituto Nazionale di Statistica. USAF THOR Database, available at www.afri.au.af.mil/thor.

Figure 3: Recovery in the Agricultural Sector



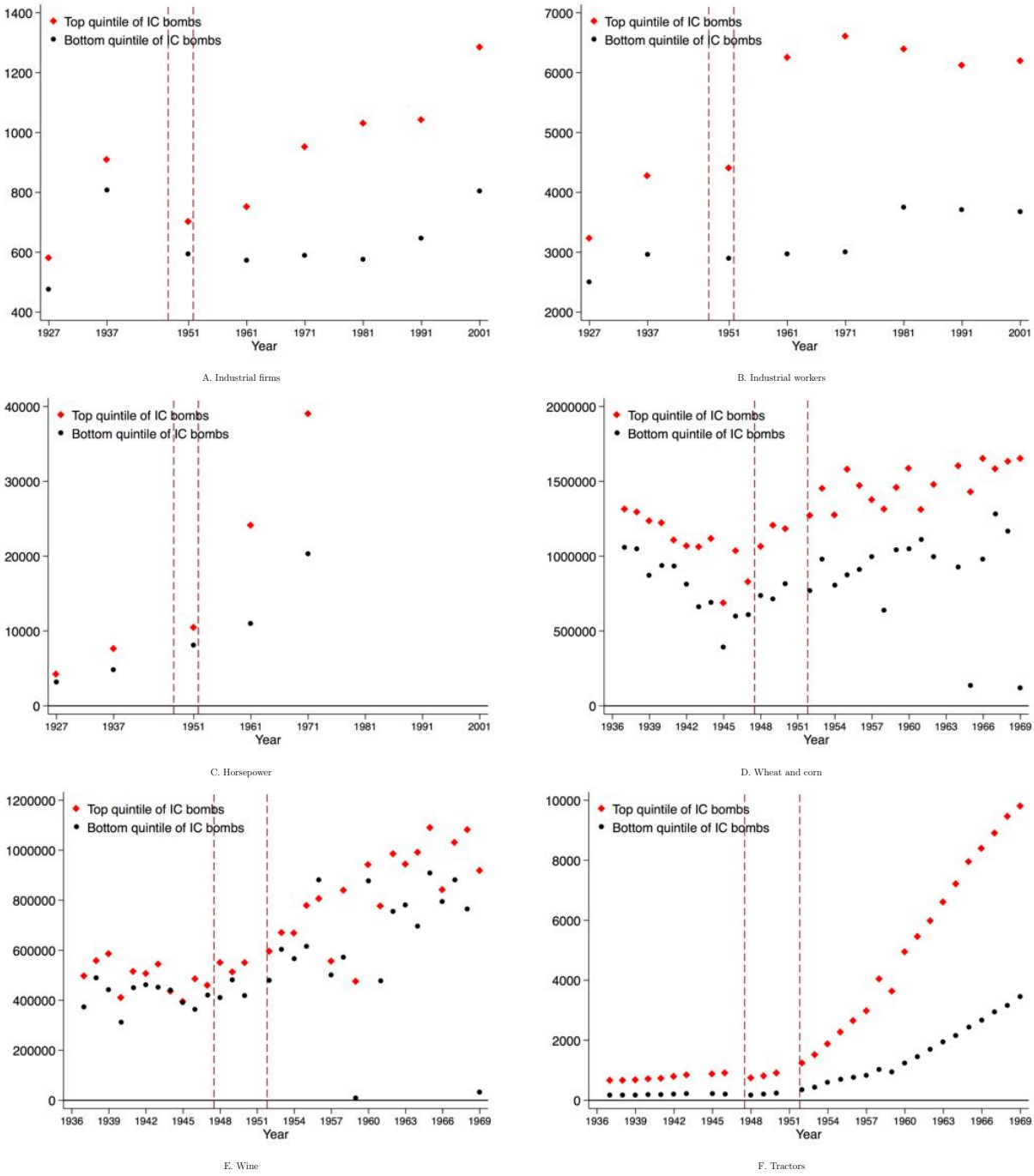
Notes: These graphs show the effect of 1 ton of IC bombs on different agricultural outcomes. The regressions also include province fixed effects, region-year fixed effects, as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the production of wheat and corn in each province, and year (100kg, panel A), the production of wine in (100L, panel B), the production of grapes (100kg, panel C), the amount of agricultural workers (panel D), the number of tractors (panel E), and the number of threshers (panel F). Source: Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Figure 4: Development of Intellectual Property



Notes: These graphs show the effect of 1 ton of IC bombs on different types of patents. The regressions also include province fixed effects, region-year fixed effects, patent class fixed effects (panel A), as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the number of patents per province, class, and year. Panel A includes all classes, while panels B to D isolates different technological areas. Source: Bollettino della Proprietà Intellettuale, Ministero dell'Agricoltura, dell'Industria, e del Commercio. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Figure 5: Recovery versus Expansion



Notes: These graphs show the trends in average outcomes between provinces in the top and bottom quintile of bombing during the Italian Campaign. The outcomes are the amount of industrial firms (panel A), the number of industrial workers (panel B), the total amount of horsepower (panel C), the production of wheat and corn (100kg, panel D), the production of wine in (100L, panel E), the number of tractors (panel F). Source: Censimento dell'Industria e dei Servizi, Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Table 1: Summary Statistics

Panel A: Census Data

	Before WWII	After WWII
	(1)	(2)
Number of industrial firms	704	863
Number of industrial workers	3,969	5,883
Horsepower	5,912	23,211
Horsepower from electrical eng.	4,427	18,250
Number of agricultural workers	96,447	45,206
Wheat and corn production (100kg)	1,234,237	1,323,251
Wine production (100L)	459,347	582,161
Grape production (100kg)	694,159	857,406
Tractors	454	3,420
Population	461,828	588,300

Panel B: Bombings

	All bombs	Italian Campaign
	(1)	(2)
Number of attacks	5,771	1,332
All attacks (tons of explosives)	402,045	82,520
Support to ground operations (tons)	57,722	44,308
Transport infrastructures (tons)	74,332	38,212

Notes: Panel A shows summary statistics on the Italian industry and agriculture. Column 1 shows averages per province and industry before WWII (1927 and 1937 for industrial census; 1937, 1938, 1939 for agricultural annals), while column 2 shows averages after WWII (every 10 years from 1951 to 2001 for industrial census; every year from 1946 to 1969 for agricultural annals). Panel B shows summary statistics of Allied bombings (all bombings in column 1 and the Italian Campaign bombings in column 2). The air strikes associated with the Italian Campaign happened after March 1944 and focused on targets related to the land battles against the German forces.
Sources: Censimento dell'Industria e dei Servizi, Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica (panel A). USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor (panel B).

Table 2: Correlation between Pre-War Characteristics and Bombing

	Pre-armistice bombs	IC bombs	Standard deviation	Source
	(1)	(2)	(3)	(4)
Industrial firms	0.476**	0.207	1,255	Industrial census: 1927, 1937
	(0.214)	(0.134)		
Industrial workers	0.037**	0.014	9,856	Industrial census: 1927, 1937
	(0.018)	(0.012)		
Horsepower	0.019***	0.006	16,663	Industrial census: 1927, 1937
	(0.006)	(0.005)		
Horsepower from electrical eng.	0.022***	0.006	14,628	Industrial census: 1927, 1937
	(0.008)	(0.005)		
Blue collar workers	0.040*	0.015	8,574	Industrial census: 1927, 1937
	(0.020)	(0.013)		
Management and white collar	0.399*	0.171	1,481	Industrial census: 1927, 1937
	(0.209)	(0.142)		
Agricultural area (ha^2)	0.006***	0.001	148,878	Agricultural statistics: 1938-1939
	(0.002)	(0.001)		
Agricultural firms	0.032***	-0.003	24,259	Agricultural census: 1929, 1961, 1971
	(0.011)	(0.006)		
Wheat and corn production (100kg)	0.016***	0.000	844,060	Agricultural statistics: 1937-1939
	(0.005)	(0.000)		
Wine production (100L)	0.002	0.001	342,153	Agricultural statistics: 1937-1939
	(0.001)	(0.001)		
Grape production (100kg)	0.001	0.001	507,567	Agricultural statistics: 1937-1939
	(0.001)	(0.000)		
Tractors	0.246	1.242**	484	Agricultural statistics: 1937-1939
	(0.612)	(0.540)		
Agricultural workers	0.019***	0.006	43,959	Population census: 1931, 1936
	(0.007)	(0.005)		
Size (km^2)	0.522**	0.163	1,691	Population census: 1931, 1936
	(0.227)	(0.125)		
Population density	3.244*	1.504	113	Population census: 1931, 1936
	(1.632)	(1.505)		
Population	0.003**	0.001	341,561	Population census: 1931, 1936
	(0.001)	(0.001)		
Tons of bombs - mean	1,533	1,045		
Tons of bombs - std. dev.	2,419	1,681		

Notes: Each row-column combination shows the coefficient β_1 from a different regression of the tonnage of bombs in a province on a pre-war variable: $\text{Tons}_p = \beta_0 + \beta_1 \cdot \text{Pre-war characteristic}_{pt} + \varepsilon_{pt}$, where $t < 1940$. Column 1 uses the tons of explosive dropped by Allied forces before the armistice of September 8, 1943 as dependent variable. Column 2 uses the tons of explosives launched during the Italian campaign as dependent variable. When the independent variable comes from the Industrial census, the regression also includes industry fixed effects. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Source: Censimento dell'Industria e dei Servizi, Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Table 3: Bombings and E.R.P. Aid

	All deaths	Civilian deaths	Reconstruction grants	Food & drugs	Loans	All grants
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Italian Campaign bombs, No controls						
Tons of IC bombs	0.778***	0.612***	10,108.637***	-6,917.717	323.085**	-3,667.318
	(0.188)	(0.127)	(1,740.011)	(4,266.533)	(154.548)	(9,866.659)
Observations	78	78	79	78	79	78
R^2	0.374	0.416	0.341	0.018	0.031	0.001
Panel B: Italian Campaign bombs, Province controls						
Tons of IC bombs	0.517***	0.465***	6,776.236***	-11,589.643**	37.339	-16,078.844
	(0.137)	(0.125)	(1,327.345)	(5,051.757)	(94.113)	(10,196.982)
Observations	74	74	75	74	75	74
R^2	0.804	0.794	0.736	0.698	0.864	0.722
Panel C: Pre-armistice bombs, No controls						
Tons of PA bombs	0.523***	0.371***	6,596.193***	11,050.957	316.875**	28,514.969**
	(0.119)	(0.076)	(1,066.935)	(6,928.172)	(123.670)	(13,381.763)
Observations	78	78	79	78	79	78
R^2	0.349	0.317	0.301	0.095	0.080	0.142
Panel D: Pre-Armistice bombs, Province controls						
Tons of PA bombs	0.314***	0.465***	3,291.359**	-598.153	130.436	2,620.765
	(0.077)	(0.125)	(1,361.375)	(6,151.922)	(96.037)	(12,340.120)
Observations	74	74	75	74	75	74
R^2	0.755	0.794	0.689	0.673	0.868	0.712
Mean outcome	2,338	1,641	78,745,789	41,623,094	1,910,392	162,751,795
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681
Tons of PA bombs - mean	1,533	1,533	1,533	1,533	1,533	1,533
Tons of PA bombs - std. dev.	2,419	2,419	2,419	2,419	2,419	2,419

Notes: Data on funding from the Marshall Plan come from *"Missione Americana E.R.P. in Italia",* "Mutual Security Agency" bulletins, and the historical archive of the *Istituto Mobiliare Italiano.* Province controls in Panel B and D include region fixed effects, population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 4: Pre-War Trends in Agricultural Output

	Wheat and corn production	Wine production	Grape production	Tractors	Other machines	Wheat and corn area
	(1)	(2)	(3)	(4)	(5)	(6)
			Panel A: Linear trend			
Tons of IC bombs	59.501	26.673	43.631	0.091***	0.009	0.801
	(53.598)	(24.039)	(37.468)	(0.022)	(0.015)	(2.238)
Linear trend	-57,734.244***	31,831.162***	41,687.428***	8.973	43.342***	428.589
	(16,307.483)	(8,965.873)	(12,537.358)	(6.489)	(11.016)	(315.455)
Tons of IC bombs x Linear trend	4.942	2.203	3.307	0.006	0.000	-0.022
	(5.409)	(4.141)	(4.956)	(0.007)	(0.003)	(0.162)
Observations	235	235	235	235	235	235
R^2	0.022	0.030	0.033	0.129	0.009	0.001
			Panel B: Year dummies			
Tons of IC bombs	62.632	28.677	45.676	0.099***	0.009	0.812
	(49.578)	(25.216)	(39.396)	(0.021)	(0.016)	(2.263)
Year 1938	-85,301.160**	45,604.113**	37,813.019	14.862	31.377***	-836.149**
	(38,694.574)	(21,702.114)	(29,380.180)	(9.633)	(9.508)	(361.584)
Year 1939	-115,532.845***	63,712.104***	83,381.896***	17.934	86.646***	852.373
	(32,764.730)	(18,010.045)	(25,188.877)	(13.035)	(22.123)	(632.460)
Tons of IC bombs x Year 1938	10.375	2.800	7.093	-0.000	0.000	-0.121
	(10.241)	(7.235)	(9.340)	(0.007)	(0.004)	(0.141)
Tons of IC bombs x Year 1939	9.869	4.418	6.616	0.012	-0.000	-0.045
	(10.861)	(8.316)	(9.952)	(0.013)	(0.007)	(0.325)
Observations	235	235	235	235	235	235
R^2	0.037	0.031	0.033	0.129	0.009	0.001
Mean outcome	1,234,237	459,348	694,159	454	319	69,992
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681

Notes: Panel A estimates linear trends in agricultural outputs before WWII. Panel B estimates non-linear trends by including dummy variables for year 1938 and 1939. Tons of IC bombs measures the tons of explosives dropped by Allied air forces against targets related to the Italian Campaign against German troops. The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the number of tractors (column 4), the number of other agricultural machines (column 5), the hectares used for wheat and corn production (column 6). Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.
Source: Censimento dell'Industria e dei Servizi, Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Table 5: Effects on Industrial Outcomes

	Industrial firms (1)	Firms < 10 employees (2)	Firms > 10 employees (3)	Industrial workers (4)	Blue collar (5)	Mgmt & white (6)	Horsepower (7)	Electrical engines (hp) (8)
Panel A: Baseline								
Tons of bombs x Post 1948	0.072***	0.046**	0.001	0.609***	0.212**	0.317***	3.032**	2.556**
	(0.024)	(0.018)	(0.001)	(0.180)	(0.106)	(0.105)	(1.338)	(1.062)
Observations	5,652	5,641	5,641	5,641	2,790	2,097	3,510	3,510
R^2	0.384	0.335	0.240	0.449	0.409	0.405	0.268	0.272
Panel B: Province controls								
Tons of bombs x Post 1948	0.050**	0.030*	0.003	0.488***	0.199**	0.176***	0.540	0.643*
	(0.020)	(0.015)	(0.002)	(0.137)	(0.078)	(0.060)	(0.493)	(0.370)
Observations	5,526	5,515	5,515	5,515	2,745	2,052	3,447	3,447
R^2	0.390	0.342	0.244	0.476	0.415	0.448	0.335	0.334
Panel C: Instrumental variable with province controls								
Reconstr. grants (M) x Post 1948	7.033**	4.156*	0.375	68.295***	31.240**	28.470**	78.262	93.056
	(3.107)	(2.267)	(0.304)	(22.426)	(13.781)	(12.177)	(74.612)	(57.690)
Observations	5,526	5,515	5,515	5,515	2,745	2,052	3,447	3,447
R^2	0.390	0.342	0.244	0.476	0.415	0.447	0.335	0.334
F-statistic	39.168	39.131	39.131	39.131	23.781	18.825	34.711	34.711
Mean outcome	704	638	36	3,969	3,068	782	5,912	4,427
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681

Notes: Regressions in Panel A include province fixed effects, industry fixed effects, and region-year fixed effects. In addition to these controls, regressions in Panel B include pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). Panel C shows instrumental variable regressions in which the reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. The dependent variables are the number of firms in a province, industry, and census year (column 1), the number of firms with less than 10 employees (column 2), the number of firms with more than 10 employees (column 3), the number of employees (column 4), the number of blue collar workers (column 5), the number of managers and white collar workers (column 6), the total horsepower (column 7), the horsepower from electrical engines (column 8). The industries are food, paper, chemistry, construction, mining, mechanics, metallurgy, textile, and clothing. The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Effects on Agricultural Outcomes

	Wheat & corn production (1)	Wine production (2)	Grape production (3)	Oil production (4)	Agricultural workers (5)	Agricultural firms (6)	Tractors (7)	Threshers (8)
				Panel A: Baseline				
Tons of bombs x Post 1948	63.532***	54.440**	63.062**	0.403	-5.412***	1.822	0.549***	-0.014**
	(17.801)	(21.098)	(26.684)	(0.536)	(1.433)	(1.515)	(0.149)	(0.006)
Observations	2,347	2,452	2,452	2,482	535	232	2,324	2,106
R^2	0.939	0.878	0.883	0.889	0.928	0.748	0.877	0.842
				Panel B: Province controls				
Tons of bombs x Post 1948	79.195***	64.976***	77.381***	0.923	-6.042***	1.930	0.595***	-0.001
	(21.886)	(24.226)	(29.091)	(0.725)	(1.868)	(2.135)	(0.179)	(0.008)
Observations	2,270	2,369	2,369	2,396	523	225	2,245	2,025
R^2	0.949	0.885	0.889	0.895	0.946	0.759	0.900	0.863
				Panel C: Instrumental variable with province controls				
Reconstr. grants (M) x Post 1948	10,812.325***	8,859.388**	10,550.703**	125.553	-846.339**	287.073	81.210***	-0.182
	(3,593.273)	(4,138.962)	(4,896.619)	(104.244)	(339.199)	(308.364)	(30.593)	(1.025)
Observations	2,270	2,369	2,369	2,396	523	225	2,245	2,025
R^2	0.948	0.864	0.873	0.895	0.928	0.771	0.891	0.863
F-statistic	39.131	39.131	23.781	18.825	39.168	39.131	34.711	34.711
Mean outcome	1,234,237	459,348	694,159	27,196	96,445	45958	454	383
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681
Source	Yearly statistics	Yearly statistics	Yearly statistics	Yearly statistics	Decennial census	Decennial census	Yearly statistics	Yearly statistics

Notes: Regressions in Panel A include province fixed effects, and region-year fixed effects. In addition to these controls, regressions in Panel B include pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). Panel C shows instrumental variable regressions in which the reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of agricultural workers (column 5), the number of agricultural firms (column 6), the number of tractors (column 7), the number of threshers (column 8). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 7: Effects on Patents

	All classes (1)	All classes (2)	Agriculture (3)	Industry (4)	Construction (5)
Panel A: Baseline					
Tons of bombs x Post 1948	0.015***	0.002***	0.004***	0.006***	0.002***
	(0.003)	(0.000)	(0.001)	(0.001)	(0.000)
Observations	1,248	10,240	1,248	1,248	1,248
R^2	0.929	0.414	0.868	0.940	0.859
Panel B: Province controls					
Tons of bombs x Post 1948	0.008***	0.001***	0.002**	0.003***	0.001***
	(0.002)	(0.000)	(0.001)	(0.001)	(0.000)
Observations	1,200	9,856	1,200	1,200	1,200
R^2	0.952	0.424	0.934	0.952	0.899
Panel C: Instrumental variable with province controls					
Reconstr. grants (M) x Post 1948	1.072***	0.134***	0.313**	0.393***	0.139***
	(0.361)	(0.040)	(0.132)	(0.140)	(0.044)
Observations	1,200	9,856	1,200	1,200	1,200
R^2	0.951	0.424	0.932	0.952	0.895
F-statistic	36.367	45.480	36.367	36.367	36.367
Mean outcome	49	6	8	28	3
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681
Sample	Prov–year	Prov–class–year	Prov–class–year	Prov–class–year	Prov–class–year
Class fixed effects	No	Yes	No	No	No

Notes: Regressions in Panel A include province fixed effects, and region-year fixed effects. In addition to these controls, regressions in Panel B include pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). Panel C shows instrumental variable regressions in which the reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. The dependent variables are the number of patents issued between 1940 and 1955 to Italian firms and individuals by province and year (column 1) or by province, patent class, and year (columns 2 to 5). Column 3 isolates agricultural patents, column 4 industrial patents, and column 5 patents for the construction industry. The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table 8: Event Study on Infrastructure Development

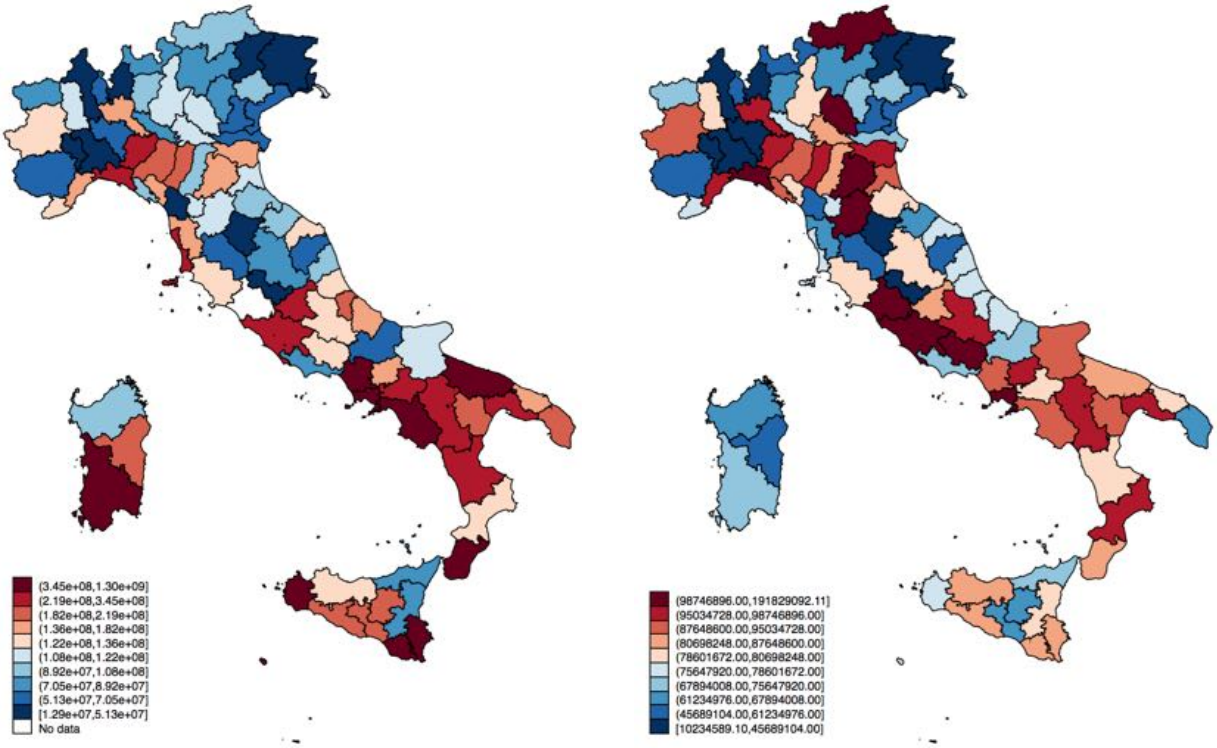
	Wheat & corn production (1)	Wine production (2)	Grape production (3)	Oil production (4)	Tractors (5)	Threshers (6)
			Panel A: Top 5 projects			
Tons of bombs x Post event	69.543***	74.492***	86.148***	0.314	0.651***	-0.008
	(20.752)	(24.615)	(29.085)	(0.948)	(0.164)	(0.008)
Observations	1,960	2,065	2,065	2,079	1,918	1,752
R^2	0.952	0.864	0.883	0.856	0.913	0.894
			Panel B: Top 5 roads			
Tons of bombs x Post event	70.179***	81.061***	94.826***	0.427	0.658***	-0.009
	(20.834)	(26.116)	(30.675)	(0.967)	(0.157)	(0.008)
Observations	1,961	2,065	2,065	2,078	1,915	1,749
R^2	0.951	0.865	0.881	0.855	0.912	0.895
			Panel C: Top 5 railways			
Tons of bombs x Post event	69.187***	74.266***	85.907***	0.330	0.646***	-0.008
	(20.464)	(24.376)	(28.811)	(0.910)	(0.160)	(0.008)
Observations	1,959	2,065	2,065	2,079	1,916	1,754
R^2	0.953	0.864	0.882	0.879	0.914	0.894
Mean outcome	1,234,237	459,348	694,159	27,196	454	383
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681

Notes: This table shows results from event studies that isolate the completion of large infrastructures funded by E.R.P. aid. Post event in panel A is 1 after the first 5 large projects, each costing at least 5 percent of the total reconstruction budget, were completed. Post event in panel B is 1 after the first 5 large roads, each costing at least 5 percent of the total reconstruction budget, were completed. Post event in panel C is 1 after the first 5 large railways, each costing at least 5 percent of the total reconstruction budget, were completed. Regressions also include province fixed effects, region–event period fixed effects, calendar year fixed effects, pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of tractors (column 5), and the number of threshers (column 6). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Online Appendix - Not For Publication

A Additional Figures and Tables

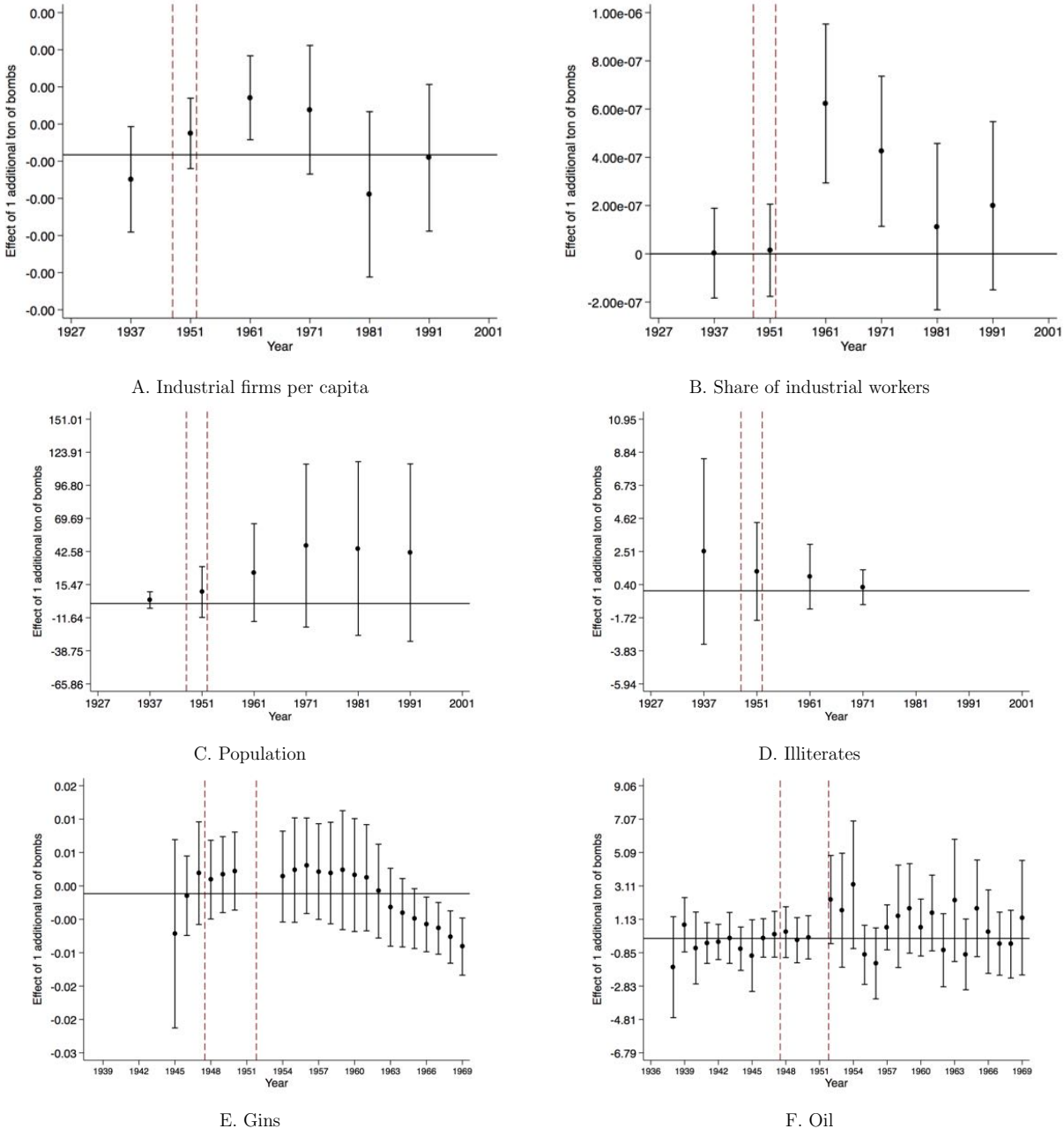
Figure A1: Maps of Reconstruction Grants



A. All E.R.P. aid B. Reconstruction grants

Notes: This graph shows the distribution of E.R.P. aid across the Italian provinces. Panel A shows all E.R.P. aid. Panel B focuses on reconstruction grants.
Source: *"Missione Americana E.R.P. in Italia",* "Mutual Security Agency" bulletins, and historical archive of the *Istituto Mobiliare Italiano.*

Figure A2: Other Graphs on Italian Recovery



A. Industrial firms per capita

B. Share of industrial workers

C. Population

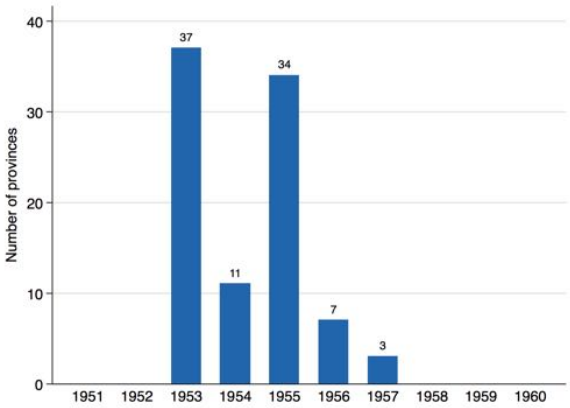
D. Illiterates

E. Gins

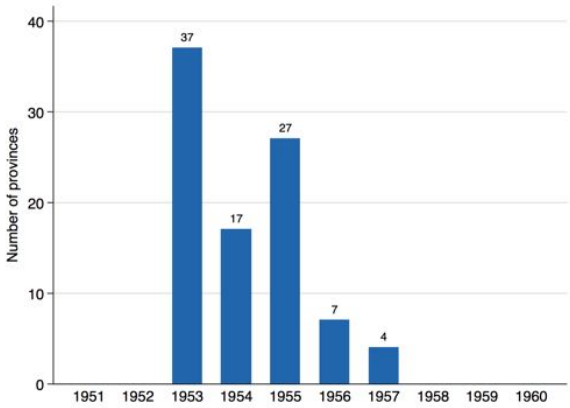
F. Oil

Notes: These graphs show the effect of 1 ton of IC bombs on different outcomes. The regressions also include province fixed effects, industry fixed effects (in panel A and B), region-year fixed effects, as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the per-capita number of firms in each province, industry, and year (panel A), the share of industrial workers in the population (panel B), the residential population (panel C), the number of illiterates (panel D), the number of gins (panel E), and the production of oil (100L, panel F). Source: Censimento dell'Industria e dei Servizi, Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

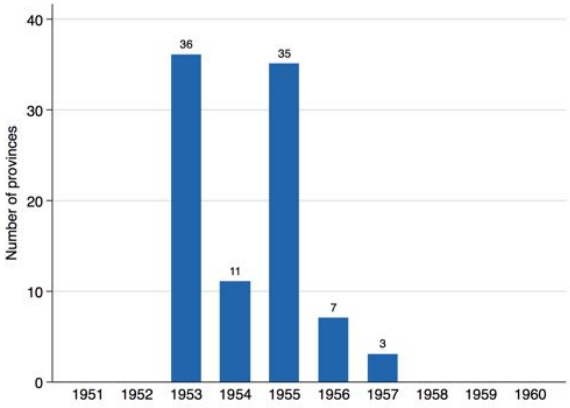
Figure A3: Year of Completion of Large Infrastructure Projects



A. Year of completion top 5 projects



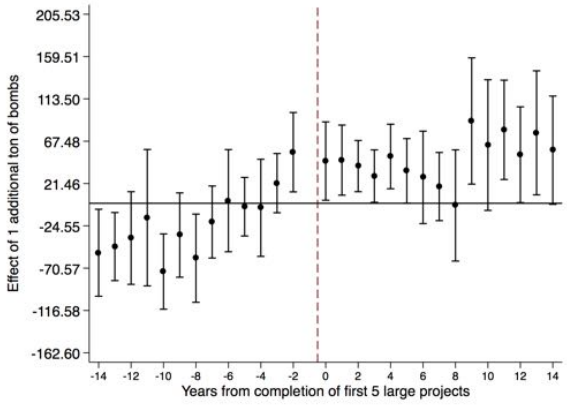
B. Year of completion top 5 roads



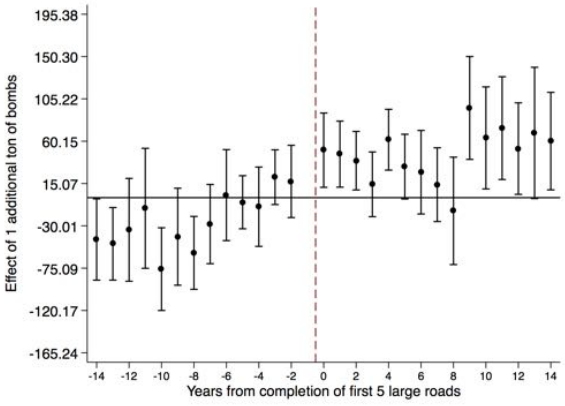
C. Year of completion top 5 railways

Notes: This graph shows the distribution of the completion year of the first 5 large infrastructure projects funded by E.R.P aid across the 92 Italian provinces. Panel A shows the completion year of the first 5 projects, each amounting to at least 5 percent of total funds assigned to a province. Panel B shows the completion year of the first 5 roads, each amounting to at least 5 percent of total funds assigned to a province. Panel A shows the completion year of the first 5 railways, each amounting to at least 5 percent of total funds assigned to a province.
Source: *"Missione Americana E.R.P. in Italia",* "Mutual Security Agency" bulletins, and historical archive of the *Istituto Mobiliare Italiano.*

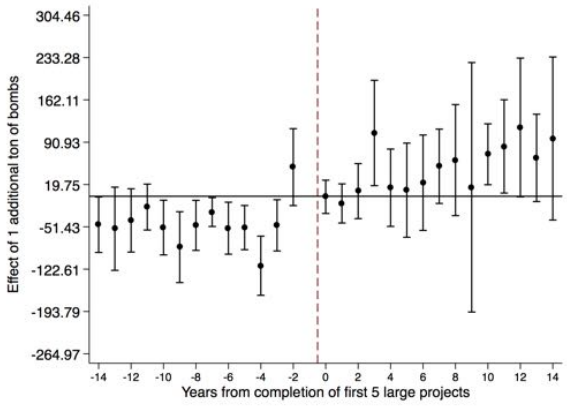
Figure A4: Completion of Large Infrastructure Projects



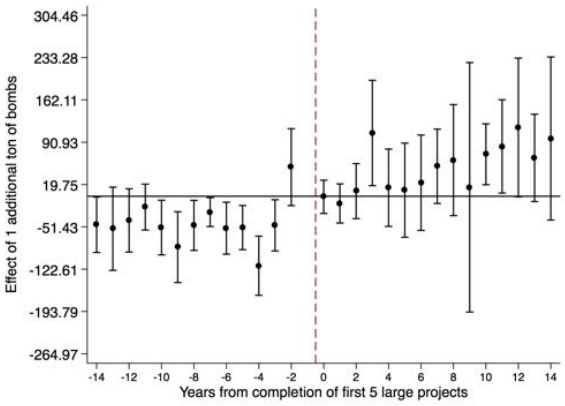
A. Wheat and corn - top 5



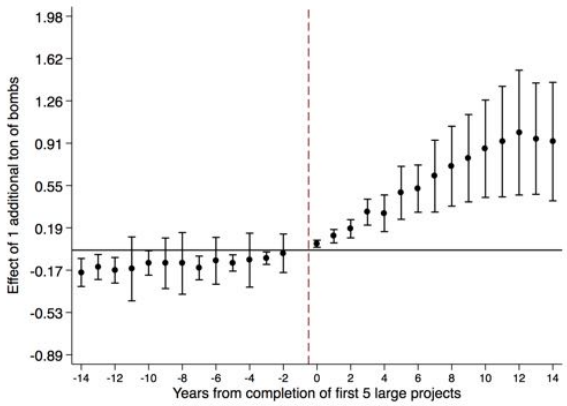
B. Wheat and corn - top 5 roads



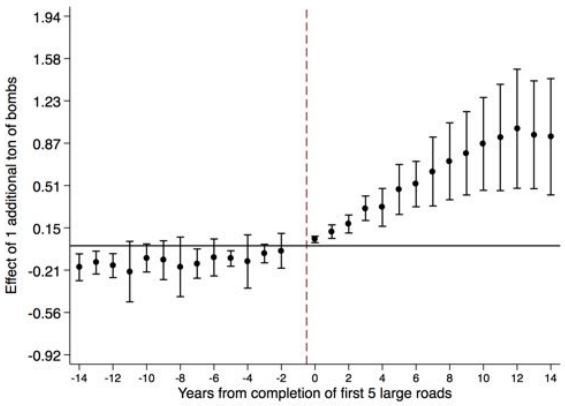
C. Grape - top 5



D. Grape - top 5 roads



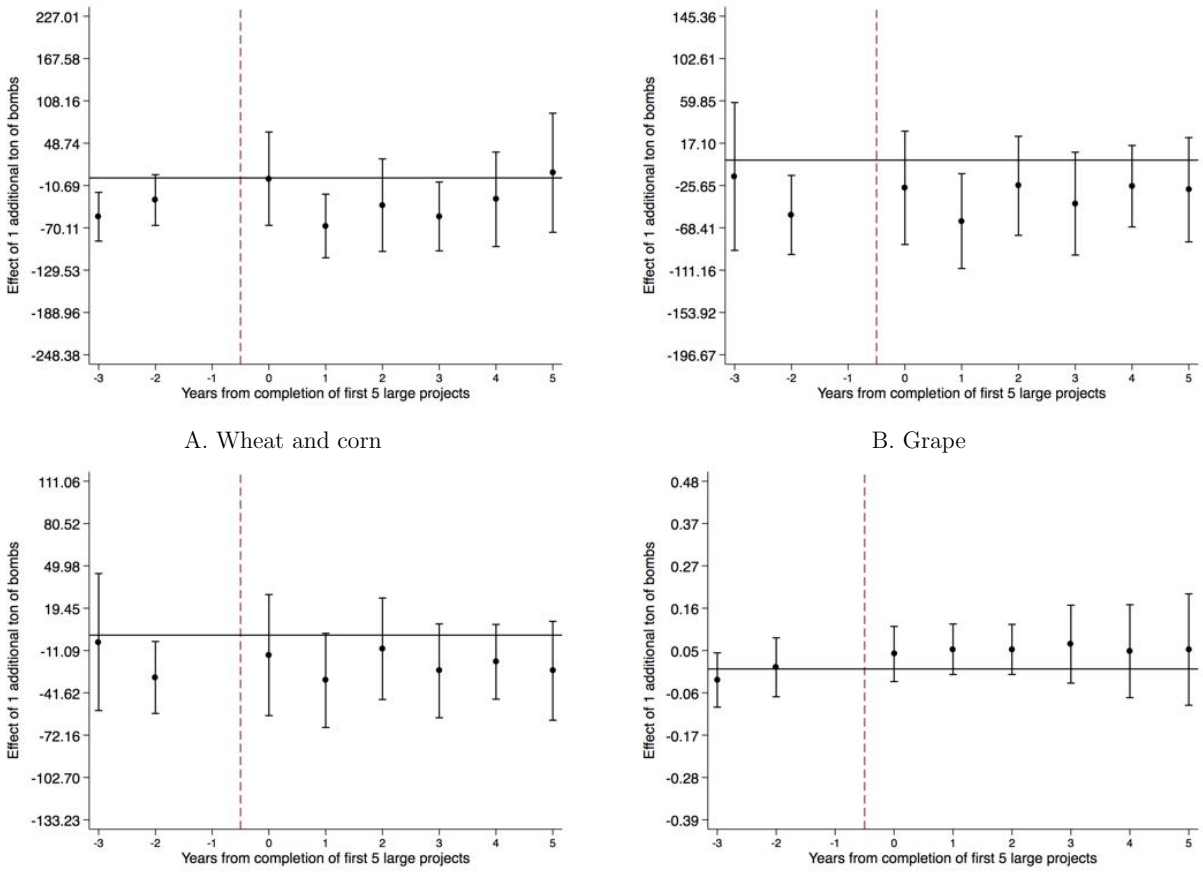
E. Tractors - top 5



F. Tractors - top 5 roads

Notes: The regressions are event studies in which period 0 is the completion year of the first 5 large infrastructures (all projects in panels A, C, and E; just roads in panels B, D, and F), each amounting to at least 5 percent of total funds assigned to a province, funded by E.R.P aid. Regressions also include province fixed effects, region-event period fixed effects, calendar year fixed effects, as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the production of wheat and corn in each province, and year (100kg, panel A and B), the production of grapes (100kg, panel C and D), and the number of tractors (panel E and F). Source: Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Figure A5: Completion of Large Infrastructure Projects, Placebo Treatments



A. Wheat and corn

B. Grape

C. Wine

D. Tractors

Notes: The regressions are placebo event studies. The estimating sample includes only periods before the actual completion of large infrastructures. In each province, period 0 is chosen randomly among the pre-treatment periods. Regressions also include province fixed effects, region-event period fixed effects, calendar year fixed effects, as well as linear, quadratic, and cubic trends in several baseline characteristics (population density, employment rate, share of industrial workers, share of agricultural workers). Standard errors are clustered at the province level. The horizontal bars measure 95% confidence intervals. The outcomes are the production of wheat and corn in each province, and year (100kg, panel A), the production of grapes (100kg, panel B), the production of wine (100L, panel C), and the number of tractors (panel D). Source: Annuario di Statistica Agraria, Censimento Generale della Popolazione, Istituto Nazionale di Statistica. USAF Theater History of Operations Reports (THOR) Database, available at www.afri.au.af.mil/thor.

Table A1: Other Outcomes

	Population	Total wage	Average wage	Illiterates	Non-agri area	Wheat and corn area	Gins	Other machines
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Panel A: Baseline								
Tons of bombs x Post 1948	83.883*	7,771.899***	-2.624	-5.092**	0.854**	-0.447	-0.000	0.473***
	(46.809)	(2,501.224)	(2.245)	(1.968)	(0.425)	(0.466)	(0.002)	(0.119)
Observations	609	2,835	2,730	382	1,712	2,350	1,794	2,324
R^2	0.925	0.330	0.088	0.937	0.964	0.980	0.931	0.900
Panel B: Province controls								
Tons of bombs x Post 1948	30.737	3,663.442***	-2.527	-1.916	0.306	-0.060	0.000	0.518***
	(24.792)	(1,234.536)	(2.611)	(2.198)	(0.372)	(0.379)	(0.002)	(0.140)
Observations	596	2,772	2,671	373	1,649	2,273	1,725	2,245
R^2	0.973	0.398	0.090	0.965	0.969	0.984	0.958	0.921
Panel C: Instrumental variable with province controls								
Reconstr. grants (M) x Post 1948	4,364.361	540,610.095***	-376.907	-296.307	41.573	83.416	-1.238*	70.639***
	(3,885.793)	(167,191.782)	(414.793)	(366.913)	(51.378)	(88.583)	(0.704)	(18.544)
Observations	596	2,772	2,671	373	1,649	2,273	1,725	2,245
R^2	0.971	0.398	0.090	0.964	0.969	0.985	0.952	0.917
F-statistic	29.661	33.587	32.452	18.484	37.706	38.143	42.485	37.848
Mean outcome	461,828	11,339,233	2294	73,733	27,142	69,992	78	319
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681
Source	Decennial census	Decennial census	Decennial census	Decennial census	Yearly statistics	Yearly statistics	Yearly statistics	Yearly statistics

Notes: Regressions in Panel A include province fixed effects, industry fixed effects (first 4 columns), and region-year fixed effects. In addition to these controls, regressions in Panel B include pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). Panel C shows instrumental variable regressions in which the reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. The dependent variables are the residential population (column 1), the wage bill in an industry, province, and year (column 2), the average wage (column 3), the number of illiterates (column 4), the hectares not used for agriculture (column 5), the hectares used for wheat and corn (column 6), the number of gins (column 7), the number of other agricultural machines (column 8). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A2: Robustness Checks

	Industrial firms (1)	Firms < 10 employees (2)	Industrial workers (3)	Electrical engines (hp) (4)	Agricultural workers (5)	Wheat & corn production (6)	Wine production (7)	Tractors (8)
Panel A: IC bombings since Armistice of Cassibile								
Tons of bombs x Post 1948	0.053***	0.033**	0.467***	0.569*	-5.586***	68.258***	53.803***	0.490***
	(0.017)	(0.013)	(0.114)	(0.315)	(1.512)	(18.996)	(18.251)	(0.146)
Observations	5,526	5,515	5,515	3,447	523	2,270	2,369	2,245
R^2	0.390	0.342	0.476	0.334	0.947	0.949	0.885	0.900
Tons of bombs - mean	1,486	1,486	1,486	1,486	1,486	1,486	1,486	1,486
Tons of bombs - std. dev.	2,063	2,063	2,063	2,063	2,063	2,063	2,063	2,063
Panel B: More targets during Italian Campaign								
Tons of bombs x Post 1948	0.038***	0.024***	0.289***	0.571*	-4.568***	59.467***	33.867***	0.442***
	(0.012)	(0.009)	(0.081)	(0.303)	(1.058)	(14.158)	(11.349)	(0.085)
Observations	5,526	5,515	5,515	3,447	523	2,270	2,369	2,245
R^2	0.391	0.342	0.476	0.334	0.950	0.951	0.885	0.905
Tons of bombs - mean	2,490	2,490	2,490	2,490	2,490	2,490	2,490	2,490
Tons of bombs - std. dev.	3,074	3,074	3,074	3,074	3,074	3,074	3,074	3,074
Panel C: All Italian Provinces								
Tons of bombs x Post 1948	0.052**	0.032**	0.470***	0.590	-5.741***	70.671***	65.551***	0.572***
	(0.020)	(0.015)	(0.135)	(0.363)	(1.798)	(22.189)	(24.282)	(0.175)
Observations	6,318	6,307	6,307	3,942	600	2,624	2,741	2,605
R^2	0.388	0.341	0.475	0.329	0.945	0.937	0.841	0.901
Tons of bombs - mean	907	907	907	907	907	907	907	907
Tons of bombs - std. dev.	1,604	1,604	1,604	1,604	1,604	1,604	1,604	1,604
Mean outcome	704	638	3,969	4,427	96,445	1,234,237	459,348	454
Source	Decennial census	Decennial census	Decennial census	Decennial census	Yearly statistics	Yearly statistics	Yearly statistics	Yearly statistics

Notes: In Panel A, the treatment variable measures the amount of explosives related to the Italian Campaign between the signing of the Armistice of Cassible on September 3, 1943 (instead of March 1944) and the end of the war. In Panel B, the treatment variable measures the amount of explosives used during the Italian Campaign against a longer lists of targets: direct cooperation with ground forces; troop concentrations; radar installations; gun emplacements; weapon launching sites; tactical targets; supply dumps; tracks and marshaling yards; moving trains; highways and vehicles; transportation facilities; tunnels and bridges; waterways; airdromes. Panel C includes all Italian provinces, instead of dropping provinces in Sardegna and Sicilia. All regressions include province fixed effects, region-year fixed effects, and pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). The first four columns also include industry fixed effects. The dependent variables are the number of firms in an industry, province, and year (column 1), the number of firms with less than 10 employees (column 2), the number of industrial workers (column 3), the amount of horsepowers from electrical engines (column 4), the number of agricultural workers (column 5), production of wheat and corn in 100kg (column 6), the production of wine in 100L (column 7), the number of tractors (column 8). Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A3: Effects on Agricultural Outcomes Without War Years

	Wheat & corn production (1)	Wine production (2)	Grape production (3)	Oil production (4)	Tractors (5)	Threshers (6)	Gins (7)	Other machines (8)
				Panel A: Baseline				
Tons of bombs x Post 1948	60.700***	54.629***	64.863**	0.249	0.555***	-0.018***	-0.002	0.460***
	(18.594)	(19.713)	(24.630)	(0.468)	(0.149)	(0.006)	(0.002)	(0.123)
Observations	1,884	1,989	1,989	2,019	1,939	1,794	1,716	1,939
R^2	0.945	0.883	0.888	0.893	0.889	0.849	0.931	0.903
				Panel B: Province controls				
Tons of bombs x Post 1948	69.762***	62.272***	75.206***	0.961	0.577***	-0.004	-0.002	0.478***
	(21.919)	(22.708)	(27.245)	(0.768)	(0.177)	(0.007)	(0.002)	(0.144)
Observations	1,820	1,919	1,919	1,946	1,870	1,725	1,650	1,870
R^2	0.952	0.891	0.893	0.899	0.909	0.868	0.959	0.923
				Panel C: Instrumental variable with province controls				
Reconstr. grants (M) x Post 1948	9,145.649***	8,152.190**	9,845.324**	125.603	76.199***	-0.582	-0.209	63.102***
	(3,305.314)	(3,714.500)	(4,427.148)	(104.214)	(28.695)	(0.958)	(0.207)	(18.343)
Observations	1,820	1,919	1,919	1,946	1,870	1,725	1,650	1,870
R^2	0.953	0.878	0.883	0.899	0.905	0.868	0.959	0.921
F-statistic	38.047	38.142	38.142	38.306	37.848	38.154	42.485	37.848
Mean outcome	1,234,237	459,348	694,159	27,196	454	383	78	319
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681	1,681	1,681

Notes: These regressions exclude the observations between 1940 and 1945. Regressions in Panel A include province fixed effects, and region-year fixed effects. In addition to these controls, regressions in Panel B include pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). Panel C shows instrumental variable regressions in which the reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of tractors (column 5), the number of threshers (column 6), the number of gins (column 7), and the number of other agricultural machines (column 8). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A4: Event Study on Infrastructure Development, Placebo Treatments

	Wheat & corn production (1)	Wine production (2)	Grape production (3)	Oil production (4)	Tractors (5)	Threshers (6)
Tons of bombs x Post event	1.379	-8.185	-14.710	0.299	0.026	-0.006
	(15.854)	(9.708)	(12.663)	(0.630)	(0.019)	(0.005)
Observations	458	459	459	459	371	295
R^2	0.971	0.947	0.948	0.868	0.972	0.990
Mean outcome	1,234,237	459,348	694,159	27,196	454	383
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681

Notes: This table shows results from placebo event studies. The estimating sample includes only periods before the actual completion of large infrastructures. The dummy variable Post event turns from 0 to 1 randomly in each province. Regressions also include province fixed effects, region–event period fixed effects, calendar year fixed effects, pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of tractors (column 5), and the number of threshers (column 6). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A5: Event Study on Infrastructure Development, IV

	Wheat & corn production	Wine production	Grape production	Oil production	Tractors	Threshers
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: Top 5 projects						
Reconstr. grants (M) x Post event	17,980.256***	19,077.821**	22,063.006**	80.343	187.789***	-1.983
	(6,421.891)	(7,979.944)	(9,246.409)	(244.960)	(62.124)	(1.799)
Observations	1,960	2,065	2,065	2,079	1,918	1,752
R^2	0.941	0.780	0.823	0.856	0.816	0.891
F-statistic	27.868	28.755	28.755	29.205	27.537	30.903
Panel B: Top 5 roads						
Reconstr. grants (M) x Post event	17,993.871***	20,553.752**	24,043.848**	107.856	185.930***	-2.063
	(6,581.180)	(8,695.440)	(10,130.383)	(248.709)	(59.272)	(1.825)
Observations	1,961	2,065	2,065	2,078	1,915	1,749
R^2	0.940	0.765	0.809	0.855	0.814	0.892
F-statistic	25.295	25.906	25.906	26.352	28.662	26.238
Panel C: Top 5 railways						
Reconstr. grants (M) x Post event	17,918.157***	19,031.265**	22,014.369**	84.292	187.191***	-1.939
	(6,382.990)	(7,967.437)	(9,228.445)	(236.197)	(62.024)	(1.826)
Observations	1,959	2,065	2,065	2,079	1,916	1,754
R^2	0.942	0.780	0.823	0.879	0.817	0.891
F-statistic	27.929	28.886	28.886	29.344	27.249	30.658
Mean outcome	1,234,237	459,348	694,159	27,196	454	383
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681

Notes: This table shows results from event studies that isolate the completion of large infrastructures funded by E.R.P. aid. Post event in panel A is 1 after the first 5 large projects, each costing at least 5 percent of the total reconstruction budget, were completed. Post event in panel B is 1 after the first 5 large roads, each costing at least 5 percent of the total reconstruction budget, were completed. Post event in panel C is 1 after the first 5 large railways, each costing at least 5 percent of the total reconstruction budget, were completed. The reconstruction grants received by a province (in millions) are instrumented with the amount of explosives dropped during the Italian Campaign. Regressions also include province fixed effects, region–event period fixed effects, calendar year fixed effects, pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of tractors (column 5), and the number of threshers (column 6). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.

Table A6: Event Study on Infrastructure Development, First Project

	Wheat & corn production	Wine production	Grape production	Oil production	Tractors	Threshers
	(1)	(2)	(3)	(4)	(5)	(6)
Panel A: First project						
Tons of bombs x Post event	75.993***	70.609***	82.221***	1.255	0.571***	-0.005
	(21.236)	(25.141)	(29.191)	(0.916)	(0.171)	(0.007)
Observations	1,985	2,089	2,089	2,091	1,930	1,780
R^2	0.952	0.871	0.888	0.854	0.900	0.905
Panel B: First road						
Tons of bombs x Post event	72.005***	73.452***	86.838***	1.100	0.603***	-0.006
	(22.522)	(23.322)	(27.122)	(0.945)	(0.161)	(0.008)
Observations	1,987	2,090	2,090	2,092	1,933	1,782
R^2	0.951	0.871	0.888	0.854	0.901	0.905
Panel C: First railway						
Tons of bombs x Post event	76.186***	69.910***	81.429***	1.427	0.570***	-0.004
	(21.206)	(24.958)	(29.009)	(0.927)	(0.170)	(0.007)
Observations	1,983	2,087	2,087	2,090	1,916	1,776
R^2	0.952	0.871	0.888	0.858	0.914	0.905
Mean outcome	1,234,237	459,348	694,159	27,196	454	383
Tons of IC bombs - mean	1,045	1,045	1,045	1,045	1,045	1,045
Tons of IC bombs - std. dev.	1,681	1,681	1,681	1,681	1,681	1,681

Notes: This table shows results from event studies that isolate the completion of large infrastructures funded by E.R.P. aid. Post event in panel A is 1 after the first large project, costing at least 5 percent of the total reconstruction budget, was completed. Post event in panel B is 1 after the first large road, costing at least 5 percent of the total reconstruction budget, was completed. Post event in panel C is 1 after the first large railway, costing at least 5 percent of the total reconstruction budget, was completed. Regressions also include province fixed effects, region–event period fixed effects, calendar year fixed effects, pre-war characteristics (population density, employment rate, industrial horsepower, share of industrial workers, share of agricultural workers) interacted with a trend (up to the third order). The dependent variables are the production of wheat and corn in 100kg (column 1), the production of wine in 100L (column 2), the production of grape in 100kg (column 3), the production of oil in 100kg (column 4), the number of tractors (column 5), and the number of threshers (column 6). The estimating sample does not include provinces in Sardegna and Sicilia, because these regions were not affected by bombings related to the Italian Campaign. Standard errors clustered by province in parentheses, *** p<0.01, ** p<0.05, * p<0.1.