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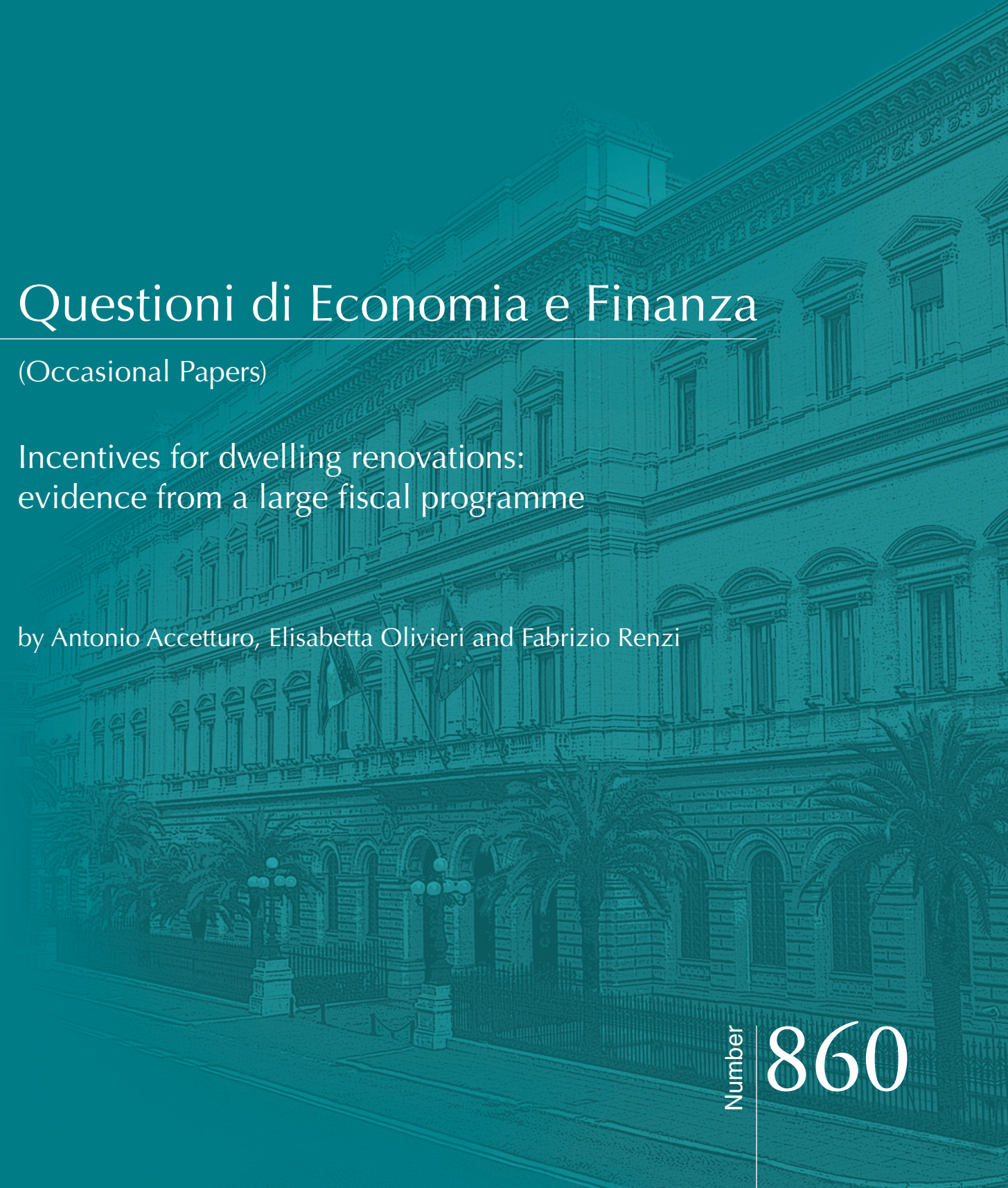

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The series is available online at www.bancaditalia.it .

ISSN 1972-6643 (online)

Designed by the Printing and Publishing Division of the Bank of Italy

INCENTIVES FOR DWELLING RENOVATIONS: EVIDENCE FROM A LARGE FISCAL PROGRAMME

by Antonio Accetturo*, Elisabetta Olivieri** and Fabrizio Renzi***

Abstract

We analyse the economic impact of two tax credits ('Bonus Facciate'/facades bonus and 'Superbonus 110%'), active from the second half of 2020, which resulted in an expenditure of more than €170 billion in 2021-23 (about 3 per cent of GDP per year). The programmes aimed at improving the aesthetics, energy efficiency, and earthquake resistance of residential dwellings. Using the synthetic control method, we find that more than €45 billion represents a 'deadweight loss', as one fourth of the spending related to subsidized investments would have been carried out even absent the incentives. Given this result, we find that the fiscal multiplier is slightly below one, a figure lower than the ones associated with public investments in standard macroeconomic models or estimated for green investments. Using Input-Output tables, we compute that the incentives accounted for roughly three quarters of growth in value added in the construction sector between 2020 and 2023, but they played a rather limited role in other sectors.

JEL Classification: R3, H2, H3.

Keywords: programme evaluation, synthetic control method, dwelling investments, input-output tables.

DOI: 10.32057/0.QEF.2024.0860

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1. Introduction *

There are three main reasons why fiscal authorities subsidize dwelling renovations. The first is the stimulus to the economy during economic downturns; in 2022 construction firms accounted for more than 5% of total value of the EU economy and had strong intersectoral linkages with both manufacturing and services (Bielsa and Duarte, 2011). A strong demand for restructuring activities are therefore deemed to have a beneficial effect for the entire economy. The second is the economic support to individuals who are unable to afford the renovation of their properties. By incentivizing renovations that decrease future energy use (and increase housing values), policy makers aim at fostering the economic and social inclusion as well as the well-being of a large share of the population facing challenges in accessing clean, affordable, and modern energy services due to economic vulnerability.[1] The third is encouraging the green transition. According to the European Environmental Agency, in 2020 buildings contributed to 35% of energy-related greenhouse gas emissions in Europe. Buildings' renovations, such as better insulation and heating/cooling systems, can help reducing emissions from fossil fuel use. Public support to finance these investments is seen necessary, given the presence of a positive externality and the fact that *browner* buildings are often owned by poorer households, with more stringent financial constraints.

Within this context we can frame the decision taken by the Italian Government in the second half of 2020 to strengthen the system of incentives to restructuring activities by introducing two new subsidies. The first was called "Bonus facciate" (Bonus façade) for the renewal of the external façade of urban buildings; the second was the "Superbonus 110%" aimed at improving the energy efficiency and the anti-seismic characteristics of the dwellings.[2] Both incentives were extremely generous for two main reasons: first, higher deductions rates enabled residential improvement interventions to be undertaken at no cost to the citizen (in the case of "Superbonus 110%") or with a little disbursement (in the case of "Bonus facciate"); second, applicants could choose to transfer the tax credit to third parties or exercise the intervention invoice discount (up to a maximum of 100% of the invoice amount), enabling the applicant to commission the work without any (or limited) monetary outlay.[3] The introduction of these new tax credits, hereafter "the program", was financially lavish. It can be estimated that dwelling investments carried out using these incentives in 2021-23 accounted for more than 170 billion (about 3.0% of GDP on average per year)[4]. To our knowledge these incentives represent the largest fiscal stimulus targeted to the construction sector introduced across the EU in the last two decades.

* We wish to thank Paolo Angelini, Michele Caivano, Federico Cingano, Sauro Mocetti, Maria Lisa Rodano, Marzia Romanelli, Martino Tasso, Pietro Rizza, Luigi Federico Signorini and Pietro Tommasino for their insightful comments.
The views expressed in the article are those of the authors and do not involve the responsibility of the Bank of Italy.

1 In Italy, according to Faiella and Lavecchia (2021), there are over 2 million households experiencing energy-poverty, which accounts for almost 9% of the total households.

2 The "Bonus facciate" was introduced in the first half of 2020 but virtually no works could be carried forward in that period due to the lack of technical regulations and the restrictions to economic activities due to the pandemic. The "Bonus facciate" provided a deduction from personal income tax equal to 90% of the expenses incurred in 2020-21; it was still in place in 2022, with a rate reduced to 60%. In case of "Superbonus 110%", the original rate (110%) applies to the works carried out in 2021-22 and for most of those realized in 2023; it reduces in 2024-25 respectively at 70% and 65%.

3 Previously, bonuses for dwelling renovations provided a deduction from Personal Income Tax that can be used in several annual instalments (depending on the incentive). In the first half of 2020 the invoice discount option was extended also to other bonuses for dwelling renovations (with rates ranging from 50% to 85%). This option was progressively narrowed to a reduced number of cases for works authorized since 17th February 2023.

4 The official outturn for "Superbonus 110%" and "Bonus facciate" is not publicly available. Our estimates are based on the information reported by Istat, Revenue Agency and the Ministry of Finance through the Government programme documents, press releases and parliamentary hearings.

In this paper we provide an assessment of the economic impacts of the program by focusing on two main aspects. The first is whether and to what extent it was successful in stimulating additional demand for dwelling investments in the period 2021-23; the second is how much these subsidies affected economic growth in the post-pandemic period. We do not study, however, other important economic effects such as the environmental benefits of the incentives, nor the effects on prices in the construction sector or house prices. [5]

As for the first question, the fact that the subsidies were neither targeted to a specific area nor to stringent eligibility criteria poses several challenges in the identification of a proper control group. To address this issue, we resort to the synthetic control method (Abadie and Gardeazabal, 2003; Abadie et al., 2010, 2014), in which the comparison unit can be constructed "synthetically", as a weighted-average of comparable EU countries that did not experience a similar treatment in the period of analysis. The weights are chosen such that relevant economic characteristics in the synthetic control region match the treated unit as closely as possible in the pre-intervention period.

Using Eurostat quarterly data on national accounts, our results show that at the end of 2023, dwelling investments per capita in real terms were larger by 67% in Italy in comparison with the synthetic control; standard placebo tests show that this could hardly have occurred by chance. A number of robustness checks – involving drastic changes in the donor pool – confirms these results. Based on our estimates, about 73% of the total value of dwelling investments that received "Superbonus 110%" or "Bonus Facciate" were stimulated by the tax credits. The remaning one fourth of the spending related to subsidized investments – overall about 45 billion – represents a "deadweight loss", namely investments which would have been carried out even without these two incentives.

The second part of the paper aims at assessing the impact of the subsidies on the entire economy by using standard elasticities (Bulligan et al, 2017) to take into account the overall impact on the demand. We calculate that the ratio between the GDP generated by "Superbonus 110%" and "Bonus facciate" and their total costs (i.e. the fiscal multiplier) was slightly lower than one, a figure smaller than those usually associated with public investments in standard macroeconomic models or predicted for green investments. The estimate of the fiscal multiplier implies that the fiscal revenues generated by the bonuses (on average about 1 percent of GDP per year, under the standard assumption of a unitary revenue-to-output elasticity) were far below their costs, suggesting that they were unable to "repay for themselves."

The economic consequences of renovation subsidies are a relatively understudied topic. This is the first paper that, using a counterfactual method, provides a direct measure of the additionality – and the consequent deadweight loss – of dwelling renovation bonuses. A few papers have instead provided estimates on the fiscal multipliers associated with restructuring incentives. Kronenberg et al. (2012) use Input-Output model to estimate the macroeconomic effects of a German program aimed at subsidizing the rehabilitation of existing dwellings; they find that rehabilitation measures do not crowd out other investment projects and the net effect on the public deficit is positive. Hasna (2022) provides a causal estimate of the impact of green energy spending in the US – which included building retrofitting – on state-level GDP growth and finds a larger-than-one short run fiscal multiplier; this finding is also confirmed by Popp et al (2020) and Batini et al. (2021). Compared with these papers, we find a smaller multiplier that is consistent with the existence of a deadweight loss – i.e. that part of the subsidy actually financed renovation expenses that would have been carried out even without the public intervention. However, our finding might also be explained by displacement effects in downstream industries (Barattieri et al., 2023), that might depress the overall impact of the policy.

[5] Alpino et al. (2022) evaluate the impact of the subsidies on total emissions and find that their expected environmental benefits are likely to be quite low in comparison with their costs. Crispino and Loberto (2023) analyses the impact of the part of "Superbonus" aimed at the seismic renovation on the housing market; by exploiting a spatial discontinuity in eligibility criteria established by the northern region of Piedmont, they find that the subsidy was partially capitalised in house prices.

The rest of the paper is organized as follows. Sections 2 provide an overview of the recent trends for the construction sector in Italy and a description of the incentives for dwelling renovations. Section 3 presents our estimates of the effects on dwelling investments using the synthetic control method and Section 4 analyses the overall impact on value added using Input-Output tables. Section 5 concludes.

2. Institutional framework

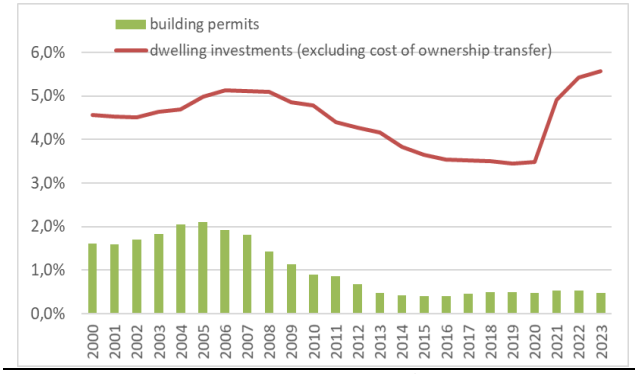
2.1. Dwelling investments in 2010s'

In this section, we give an account of the main trends in the residential construction sectors in the decade before the pandemic.

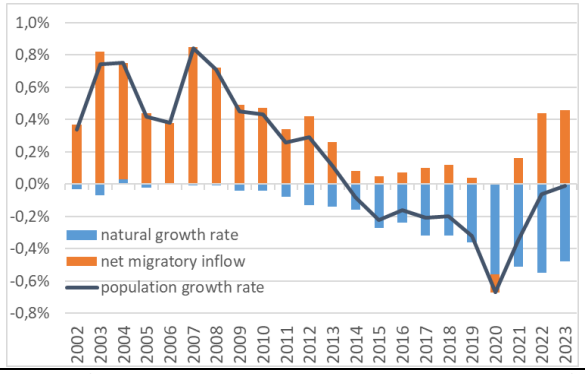
During the 2010s, the Italian construction sector was characterized by a prolonged crisis, determined by both structural and cyclical factors. Starting from 2009 dwelling investments – which includes the costs of ownership transfer, the construction of new houses and the renovations of existing buildings and represents about one-fourth of gross fixed capital formation[6]– experienced a sharp decrease due to the credit crunch determined by the global financial crisis and, in the following years, the sovereign debt crisis (figure 1, panel a). After 2015, despite a more favourable cyclical environment and improved financial conditions, dwelling investments remained at historical low levels for several years, revealing the structural weaknesses in the real estate sector, mostly due to decreasing population and sluggish economic growth (Borowiecki, 2009; Panetta 2009; figure 2, panel b). In particular, on account of demographic trends, building permits stayed at a very low level, about one-third of the peak values recorded at the beginning of the century. Since 2016 housing prices consequently experienced a steady slow decline (Crispino and Loberto, 2023).

Figure 1: Construction sector dynamics

(a) Dwelling investments *(as a % of GDP)*



(b) Population *(Growth rates)*



Source: Istat. Building permits are converted from square meters into a percentage of GDP considering the average price per square meter of new buildings.

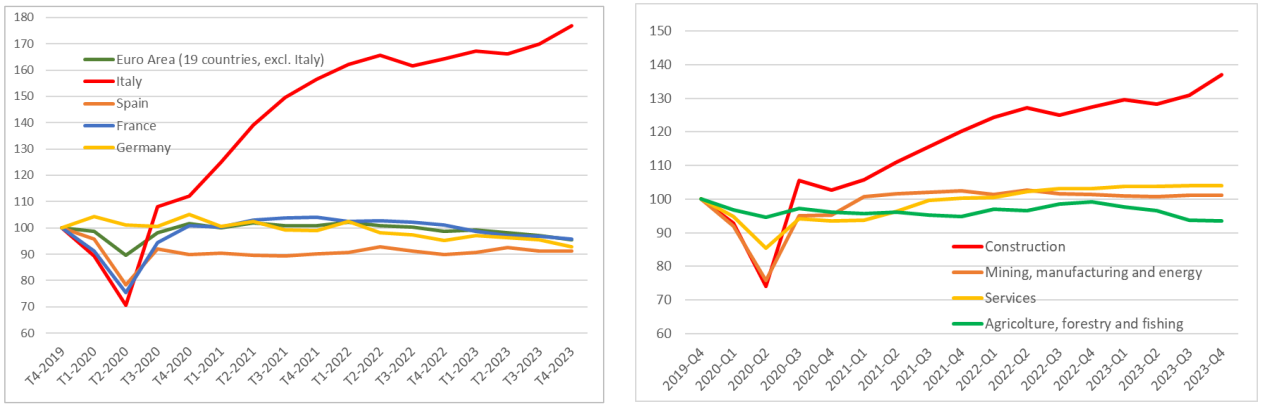
The Covid-19 crisis represents a major break for these trends. Dwelling investments firstly registered, in the second quarter of 2020, the largest drop among European countries, together with France (figure 2, panel b). Afterwards, following the introduction of "Bonus Facciate" and "Superbonus 110%", it promptly showed a vivid recovery, reaching values significantly above pre-pandemic levels. Real spending on dwelling investments in 2022 was 55% higher than in 2019, while other European countries exhibited a much flatter dynamic. As a consequence of the growth of their

[6] Conversely, investments in buildings for productive purposes (such as warehouse and industrial buildings, commercial buildings, hotels, restaurants) and with public utility (educational buildings, health buildings, public monuments) are considered non-residential investments.

business' volumes, firms in the construction sector showed strong increases in the number of employees and value added, which exceeded the values recorded in 2019 by 16% and 25%, respectively. Over the same period, other sectors showed a more moderate recovery (figure 2, panel b).

Figure 2: The Covid-19 crisis
(volumes; 2019-q4=100)

(a) dwelling investments in the Euro area (b) sectoral value added in Italy



Source: Own elaboration on Eurostat data.

2.2. The incentives for dwelling renovations in Italy

Public support for building renovations was introduced by the Italian Government in 1998. The incentives, that averaged around 50% could be accessed with a deduction from personal income tax to be used in 10 annual instalments. As a consequence, they could be used more often by high income taxpayers; moreover, as the incentives were de facto a permanent measure which could be used for any kind of renovations they likely had a modest aggregate impacts on dwelling investments and the construction sector.[7]

The 2020 modifications to the legislation increased the economic relevance of these incentives, thanks to an increase in the magnitude of the benefit and the introduction of new methods of utilization.

The Italian budget law for 2020 introduced the "Bonus facciate", which offered a deduction from Personal Income Tax equal to 90% of the expenses incurred in 2020 and 2021 for the recovery or renewal of the external facade of a large number of urban buildings. The incentive was still in place in 2022, with a rate reduced to 60%.

In 2020, at the onset of the pandemic crisis, the Relaunch Decree (Decreto Rilancio, DL n° 34/2020) introduced the so called "Superbonus 110%", a tax incentive scheme for homeowners, non-profit, social and voluntary organisations, and public social housing bodies (IACPs) to commission energy-efficient and structural improvements to their properties.[8] The incentive, initially planned for interventions carried out between July 2020 and December 2021, was further extended up to December 2022 with the same deduction rate (110%) and for most of those realized in 2023; the rate reduces in 2024-25 respectively at 70% and 65%.

[7] In 2016-19 about one third of dwelling investments received public support. This share has more than doubled following the introduction of "Bonus facciate" and "Superbonus 110%".

[8] According to the original official estimates the Superbonus was expected to abate emissions by 0.677 million tons of CO2 starting from 2027. Considering the present discounted value of emission reductions until 2100, the climate-related return of this policy would be between 0.2 and 0.35. See Alpino et al. (2022).

From mid-2020 until the beginning of 2023, for these incentives (as well as for other building incentives), taxpayers were given the option to replace the direct use of the deduction (respectively in 10 and 4 years for the "Bonus facciate" and the "Superbonus 110%") with an invoice discount or with a transferable tax credit to third parties.

Due to the delays in the issuance of implementing decrees and technical regulations, households were only able to start using these incentives at the end of 2020. The take-up was massive over the period 2021-23, with more than 40% of dwelling investments benefiting from these incentives, amounting to about 3% of GDP on average. In 2021 the "Bonus Facciate" played a prominent role,[9] while its contribution was minor in 2022 following the reduction of the incentive rate (from 90% to 60%). The use of "Superbonus 110%" increased over the period 2021-23 (Table 1[10]).

Table 1: Tax credits related to "Superbonus 110% and "Bonus Facciate"

(% of annual GDP)

	Total	**"Superbonus 110%"**	**"Bonus facciate"**
2020	0.1	0.0	0.1
2021	2.0	0.9	1.1
2022	2.9	2.9	0.0
2023	3.9	3.9	0.0
Total	**8.9**	**7.6**	**1.2**

Source: own elaboration on the information reported by Istat, Revenue Agency, and the Ministry of Finance through the Government programme documents, press releases and parliamentary hearings up to April 2024.

3. An evaluation of the program using the synthetic control method

As seen in the previous section, the strong increase in dwelling investments in Italy in the period 2021-23 coincided with the introduction of generous subsidies for dwelling renovations. In order to establish causality, we resort to the use of the synthetic control method. This methodology – that represents an evolution of a difference-in-differences approach – is based on the premise that, when the units of analysis are one or a few aggregate entities, a combination of possible comparison units is able to reproduce the characteristics of treated unit and its evolution over time in absence of treatment. The control is constructed "synthetically", as a weighted-average of units that did not undergo the treatment over the sample period. The weights are chosen such that relevant economic characteristics and pre-treatment dynamics on the outcome variable in the synthetic control region match the treated unit as closely as possible in the pre-intervention period. By comparing the subsequent evolution of an outcome variable in the synthetic control region with that of the treated region, we can obtain an estimate of the treatment effect.[11]

[9] This difference is likely due to the fact that "Superbonus 110%" had much more stringent requirements compared to "Bonus Facciate", resulting in a longer time needed to gather the necessary documentation.

[10] According to data of the Italian Revenue Agency released in March 2023, fraud in 2021-22 related to incentives for dwelling renovations amounted to approximately 9 billion, of which only 5% concerned "Superbonus 110%" (around 450 million). The majority of frauds involved the "Bonus Facciate" (about 5 billion). Data in Table 1 should be considered downstream of the preventive checks carried out by the Revenue Agency.

[11] Synthetic control has become very popular and have been applied to diverse research topics. Recently, it has been widely used for macroeconomic impact of structural reforms. Among others: Billmeier and Nannicini (2013) assess the impact of economic liberalization on real GDP per capita in a worldwide sample of countries. Abadie et al. (2015) apply the synthetic control method to estimate the economic impact of the 1990 German reunification on West Germany, using a weighted average of a few OECD countries. Adhikari et al. (2018) studied the impact on GDP per capita of extensive reforms of their labor and product markets in the 1990s and early 2000s. Newiak and Willems (2017) use the Synthetic Control Method to study the effect of IMF advice on economic growth, inflation, and investment.

In the context of this paper, we consider as "treatment" the introduction of the incentives; the outcome variable is per capita dwelling investments in real terms; the synthetic control is then constructed from a group of "untreated" European countries.

In order to correctly identify a causal parameter three main assumptions must hold. The first is that the treatment was not anticipated by households and firms. This is trivially respected due to the emergency nature of the subsidies we evaluate; the Covid-19 crisis – and the associated support measures to the productive system – could not be predicted ex ante and, for this reason, it is unlikely that households could decide, for example, to postpone or change the nature their dwelling renovations to obtain a more generous incentive. The second is the stable unit treatment value assumption (SUTVA); according to SUTVA, treatment effects do not influence the potential outcomes of control units. In our context, SUTVA is violated if subsidies for renovations in Italy directly influence dwelling investments in the donor pool (e.g. the countries that provide for the synthetic control); this may occur if, for example, renovations services can be imported or exported. It should be noted, however, that construction is a relatively non-tradable industry as, for example, in 2019 imports accounted for only 0.8% of total production. The third relates to the absence, in the same period, of similar programs in other EU; this is also confirmed in our setup: we inspected all budget laws by European countries in the Covid and post-Covid years and we did not find an equivalent massive support to restructuring activities[12].

3.1. The synthetic control method

In this subsection we briefly recall the synthetic control approach strictly following Abadie and Gardeazabal (2003) and Abadie et al. (2010).

Suppose we observe $J + 1$ units (countries, regions, or individuals), with the unit $i = 1$ exposed to the treatment. Framing the problem in the context of Rubin's (1976) potential outcome model, let Y^1_{it} be the potential outcome of unit i ($i = 1, \dots, J + 1$) at time t ($t = 1, \dots, T$) if the unit is exposed to the intervention and Y^0_{it} if the unit is not exposed. The causal effect of the intervention is $\alpha_{it} = Y^1_{it} - Y^0_{it}$. For each unit it is possible to write:

$$(3.1) \qquad Y^1_{it} = Y^0_{it} + D^0_{it}$$

with $D_{it} = 0$ in all units in all periods up to $t = 0$ as well as in the unaffected units from $t = 1$ onward and $D_{it} = 1$ for unit $i = 1$ from $t = 1$ onward.

The identification problem arises from the fact that the treatment effect, α_{it}, depends on the potential outcome in both states ($D^0_{it} = 0$ and $D^0_{it} = 1$), while only one state is observed. To overcome this issue, the effect of the treatment is estimated through comparing the actual outcome in the treated unit with a counterfactual value, defined as a weighted average of the units in the control group:

$$(3.2) \qquad \hat{\alpha}_t = Y_{1t} - w_j \sum_{j=2}^{J} Y_{jt},$$

[12] Among others, France and Spain the Governments introduced two programs to finance building renovations and improving their energy efficiency, whose magnitude is not comparable to the case of Italy. In particular, the French program *MaPrimeRénov*, introduced in the 1st January 2020, offered a grant to partially cover the cost of installing energy efficient improvements to their homes, with additional amounts for those in the low-income segment in order to combat energy poverty; the programme had a budget allocation of about 2 billion euro in 2021 and in 2022. Spain has budgeted 6.8 billion euros from the EU's Next Generation funds for renovation of residential and public buildings up to 2026.

where $t>0$ and w_j is the weight assigned to each unit in the control group, estimated following a two-step procedure. First, let X_1 be a $(kx1)$ vector of pre-treatment characteristics of unit 1, X_0 be a (kxJ) matrix that contains the same variables for the J possible control units and V a positive definite diagonal matrix. The vector of weights is then selected minimizing the difference between the treated unit and the synthetic control with respect to this set of characteristics. Conditional on V, the vector of weights W must solve the following equation:

$$\min(X_1 - X_0 W)' V (X_1 - X_0 W). \qquad (3.3)$$

subject to $wj \geq 0$ and $\Sigma\, wj = 1, \forall j = 2, \dots, J + 1$.

Finally, V is chosen in such a way that the resulting synthetic control unit approximates the trajectory of the outcome variable of interest of the treated unit in the pre-treatment period.

3.2. Data and baseline results

We consider a quarterly panel data set including all EU countries, for the period ranging from the first quarter of 2015 to the last quarter of 2023, using the quarterly national account data published by Istat in the April 2024 release. In our exercise, the outcome variable is per-capita investments in dwellings[13]. The vector of covariates includes many plausible, observable determinants of this variable.

In order to control for demand factors we include GDP per capita and log salary per employees, average age of the population – to control for the fact that ageing societies tend to invest less in new residential units (Panetta, 2019) –, renovation rates of residential buildings – to control for the quality of dwellings –, and the share of foreign born over total population, to consider the fact that foreign born individuals have higher fertility rates and have a direct impact on housing markets (Accetturo et al., 2014; Andersson et al., 2021). We also include the share in value added in accommodation and food services (a proxy of the relevance of the tourist sector), to take into account the growing impact of the "sharing economy" on the real estate markets (Garcia-Lopez et al., 2020; Petrella and Torrini, 2019), and the share of population residing in the primary urban area, to consider the impact of large urban areas on residential development in advanced economies (Accetturo et al., 2019).

Supply factors are controlled by the inclusion of the relevance of the construction sector within the economy in terms of share of value added. Furthermore, general macroeconomic conditions are approximated by investments (excluding the residential component) per capita, with the aim to control for the cyclical conditions for capital accumulation in the economy, such as lending conditions, expectations on the economic outlook, and, in general, the willingness to invest of the economy; finally, as common for this econometric exercises (e.g. Abadie, 2013), we add the lagged dependent variable in order to improve the matching between treated and controls before the treatment.

In our baseline we assume that the treatment took place during the third quarter of 2020, immediately after the introduction of the "Superbonus 110%", even though disbursements started in 2021. The pre-treatment period starts in 2015, in a period of moderate economic growth just after the financial and the sovereign debt crisis, which, as we have seen, deeply affected the construction sector in Italy; pre-treatment period also includes the Covid-19 pandemic in the first half of 2020, that might

[13] In the last three years, the official estimates of dwelling investments have frequently been revised upwards in subsequent data releases. For example, in the October 2023 release the estimate of this series in 2021-22 has been increased by more than 10% overall with respect to the previous data release; likewise, in the March 2024 release, the first three quarter of 2023 were subject to a similar revision.

have influenced the recovery observed at the end of 2020. Alternative periods are considered within our robustness checks.

The synthetic control approach assigns positive weights to France (0.48), Portugal (0.25), Croatia (0.16), and Greece (0.12). In Table 2 we compare the pre-treatment characteristics of Italy with those of the synthetic control in 2015, as well as with a population-weighted average of other European countries in the donor pool and main European countries. Overall, Table 2 demonstrates that, for most variables, the synthetic Italy provides a much better counterfactual for Italy than France, Germany and Spain, as well as the average of the Euro area and the European Union.

The most notable differences between Italy and its synthetic control are observed in terms of share of population in the principal urban area of the country in 2015.

Table 2: predictor means in the pre-treatment period

(euros and percentages; data referring to 2015)

Variables	Italy	Synth. Italy	Euro area	EU	France	Germany	Spain
GDP per capita	27,467	23,871	31,055	27,486	33,036	37,012	23,230
inv. in dwellings per capita	1,129	1,097	1,501	1,276	1,938	2,142	938
other investments per capita	3,520	3,528	4,668	4,278	5,167	5,257	3,245
log salary per employee	10.3	10.2	10.4	10.3	10.5	10.6	10.2
VA accomm. and food (2)	3.7	4.3	2.9	2.7	2.7	1.5	6,0
foreign born over population	9.6	11.3	11.7	10.0	11.9	12.5	12.7
% pop. principal urban area	6.7	17.6	11.0 (1)	11.7 (1)	15.3	4.3	10.4
VA in constructions (2)	4.3	4.6	4.9	5.1	5.5	4.6	5.8
renovation rate	4.5	6.5	4.3	5.1	5.0	4.2	0.8
median population age	45	43	43	43	41	46	42

Source: own elaboration on Eurostat data. – (1) Population-weighted average of countries within the area. – (2) Share of total value added.

Figure 3 compares the dynamic of per-capita investments in dwellings for Italy from 2015 to 2023 with that of its synthetic counterpart. The synthetic control closely follows the pattern of Italy during the pre-treatment period. However, starting from the second half of 2020, the two lines begin to diverge, with Italy experiencing a faster growth compared to its counterfactual; this difference reached its maximum value in the last quarter of 2023, as the take-up of the incentives for dwelling renovations hit their peak before the start of the phasing out. During the treatment period the counterfactual shows a steep increase towards pre-crisis level, then remains broadly stable for several quarters and starts to slightly decline at the beginning of 2023, a pattern consistent with the cyclical and financing condition.

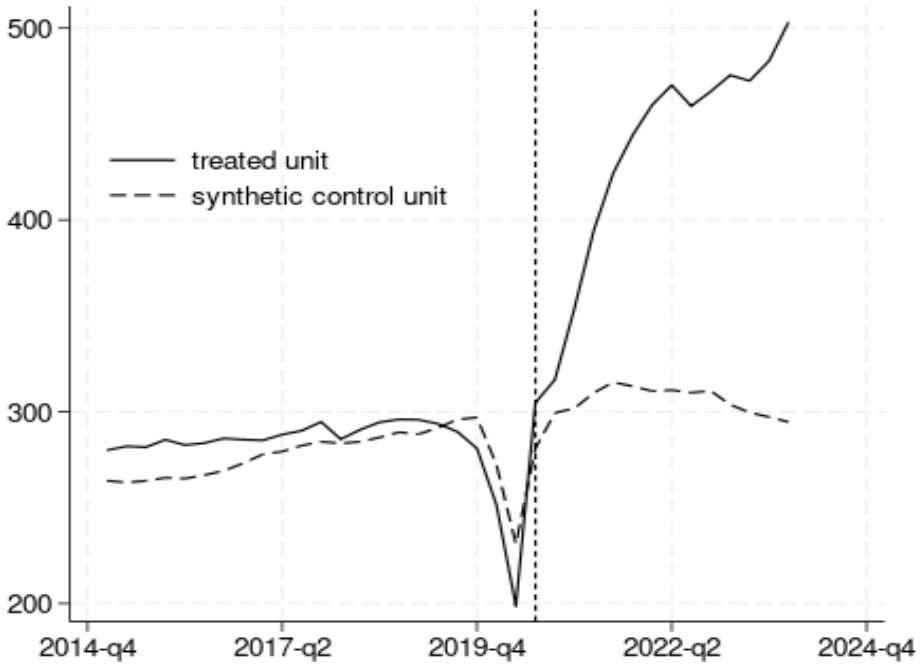
At the end of the estimation period, Italy's investments per capita amounted to almost 500 euros, that is 67% higher than in the synthetic control (less than 300 euros). This implies that most of the growth observed in Italy was due to the treatment. Indeed, the magnitude of the increase observed after the treatment suggests that the bonus had a substantial effect on Italian investments in dwellings.

It is worth to underline that we implicitly assume that the take-up of other tax-credit for dwelling renovations already in place in Italy in 2020 remained stable following the introduction of "Superbonus 110%" and "Bonus facciate". Even though detailed information regard these bonuses is not available, some preliminary evidences confirm this hypothesis.[14]

In order to validate the statistical significance of our results, we employ the falsification test proposed by Abadie et al. (2010). This test involves generating placebo effects by virtually assigning the treatment to unaffected countries, to rule out the possibility that the estimated impact of the Superbonus could be driven entirely by chance. We consider the effect of the subsidies to be significant if the difference between the treated unit and its synthetic control during the post-treatment period is unusually large compared to the distribution of placebo estimates.

Figure 3: baseline results: per-capita investments in dwellings

(euros; data in real terms)



Source: own elaboration on Eurostat data. The weights utilized in the synthetic control approach are as follows: 0.48 for France, 0.25 for Portugal, 0.16 for Croatia, and 0.12 for Greece.

Figure 4, panel (a) indicates that, starting in the second half of 2020, our baseline estimate of the treatment effect falls within the higher tail of the distribution of placebo estimates. In particular, in 2022 our baseline has the highest absolute value; in 2021 the observed relative increase in per capita investments in dwellings in Italy remains unlikely under the null hypothesis of no treatment effect.

This finding is further supported by Figure 4, panel (b), where for each post-treatment period we test the null-hypothesis that the actual differences in per capita investments in dwellings between Italy and the synthetic control is nil. The p-value test implies that we fail to reject the null in the first two periods, the third and the fourth quarters of 2020. After that, and as the estimated effect increases in magnitude, the p-values rapidly decline to zero. These results are consistent with observed delays in implementation: due to the time required to issue the related implementing decrees, the take up of

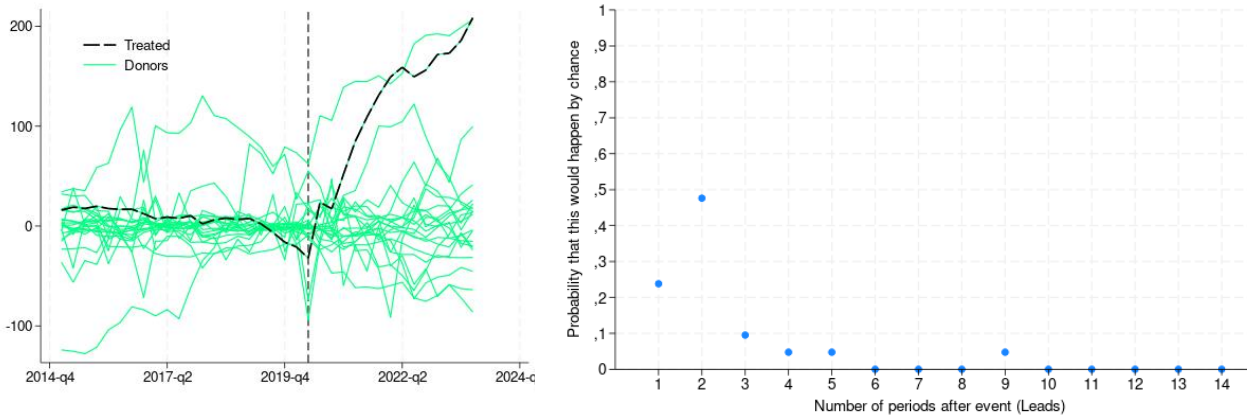
[14] According to the information released by the Government during a Parliamentary hearing held on 15th November 2023, the amount of tax credits for 2021 appears to be broadly in line with previous years.

these bonuses was negligible in 2020 and started to grow from the first quarter of 2021 (namely, the third observation in the treatment period).

Figure 4: Placebo exercises

(a) estimated gap between each country and its synthetic control *(euros)*

(b) p-values *(probabilities)*



Source: own elaboration on Eurostat data.

3.3. Robustness checks

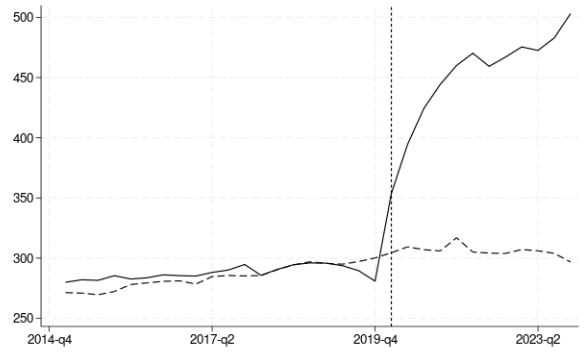
In this sub-section, we conduct some exercises to verify the robustness of our results to changes in the specification. Our treatment occurred during a unique economic period, as these incentives were introduced a few months after the initial spread of Covid-19 in early 2020. Since Italy was severely impacted by the pandemic, our results might potentially conceal a catching-up effect on the Italian economy following a significant downturn.

Figure 5, panel (a) displays our results when excluding data from 2020, demonstrating that our findings remain valid even without considering the recovery in the second half of 2020. Additionally, in panel (b) and (c), we replicate our baseline specification using shorter and longer time series, respectively. In particular, utilizing a shorter time series (starting from the third quarter of 2019) ensured an optimal match between Italy and its synthetic control during the period immediately preceding our treatment. Although these estimations assign positive weights to different countries compared to the baseline, the magnitude of the estimates remain similar to our baseline, ranging from 288 euros (71% difference) to 314 euros (57%).

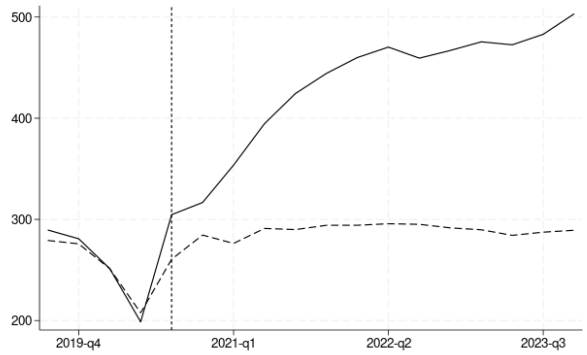
Finally, we conduct a placebo test where the treatment unit and the donor pool remains unchanged while the treatment year is changed to the third quarter of 2018. Panel (d) illustrates that no divergence is observed prior to the second half of 2020, thereby providing additional support for our assertion regarding the positive impact of these incentives on per capita investments in dwellings. Also in this case our estimated effect in the last two quarters of 2022 remains almost unchanged (56%).

Figure 5: Robustness checks
(euros)

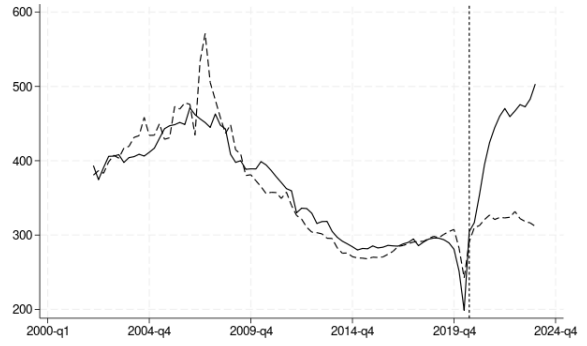
(a) without 2020



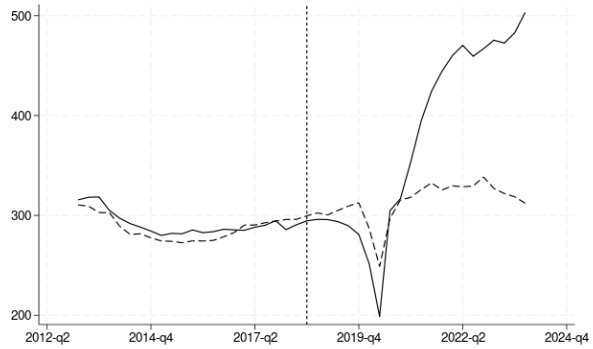
(b) 2019-2022



(c) 2002-2022



(d) placebo test: treatment in 2018Q3



Source: own elaboration on Eurostat data. The weights utilized in the synthetic control approach are as follows: (a) 0.40 for Germany, 0.22 for Slovenia, 0.18 for Greece, 0.17 for Portugal, and 0.03 for Finland; (b) 0.51 for Croatia, 0.35 for France, 0.12 for Ireland, and 0.03 for Bulgaria; (c) 0.46 for France, 0.35 for Greece, 0.08 for Slovenia, and 0.06 for Croatia; (d) 0.45 for France, 0.40 for Greece, 0.09 for Austria, and 0.06 for Portugal.

3.4. Measuring the additionality of the program

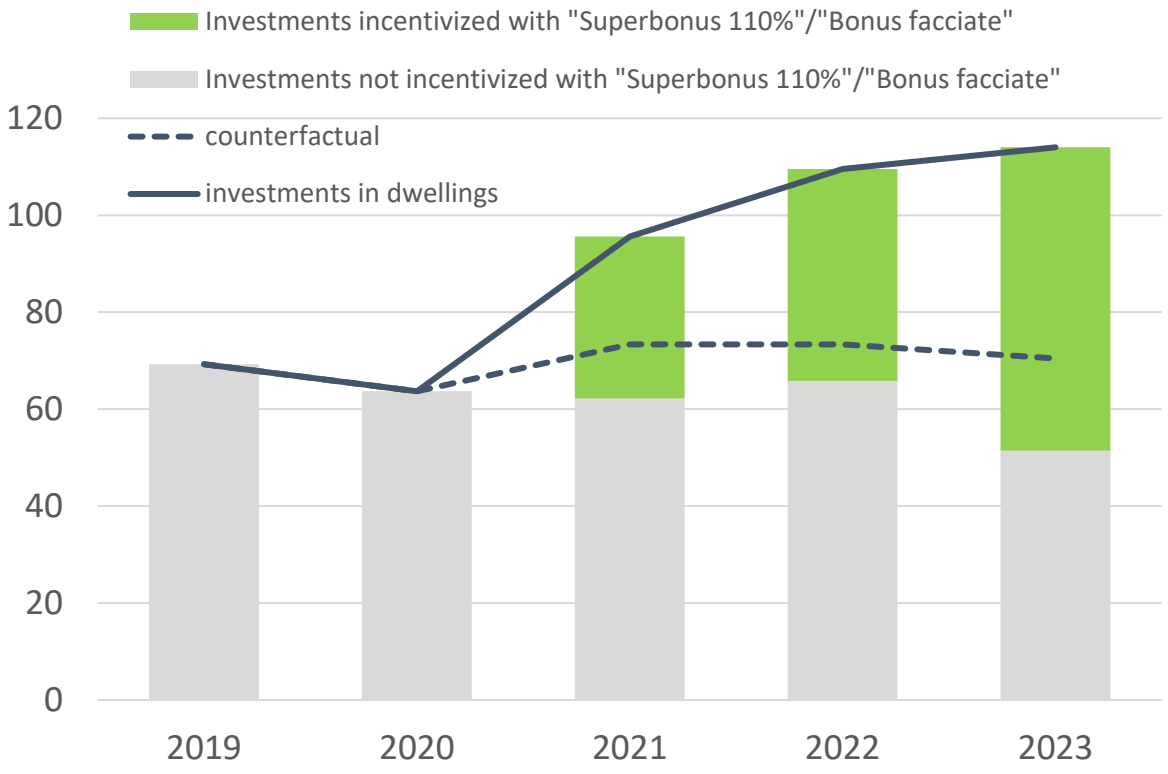
In the previous section, we have shown that public support to dwelling renovations determined a sharp increase in dwelling investments in the period 2020-23. We now compute a measure of the additionality of the program, calculated as the ratio between additional investments triggered by the subsidies and the value of dwelling investments that received public support. According to our baseline estimates, additional investments generated by the subsidies in the period 2021-23 amounted to 34 billion euros per year (in real terms). This figure is obtained by multiplying the Italian population (60 million) by the difference between actual Italian investments per capita in dwelling renovation and its synthetic control (see the solid line in figure 4, panel a); total subsidized investments amounted to about 47 billion euros per year (in real terms)[15]. Therefore, the additionality of the program was around 73%. This result implies that 27% of subsidized works would have been carried out without public support. Looking at the temporal distribution (figure 6), the impact of the incentives for dwelling renovations seems greater in 2022 than in the previous year. This temporal profile likely reflects the growing weight of the "Superbonus 110%" over time compared to that of the "Bonus facciate" (whose take-up was very high in 2021 but negligible in 2022, due to the reduction of the subsidy rate from 90 to 60%). Indeed, the additionality for "Superbonus 110%" is expected to be larger than the one for "Bonus facciate" for technical reasons; energy renovation – such as of thermal insulation of the vertical, horizontal and inclined opaque surfaces, the replacement of existing winter air conditioning systems with centralized systems – and anti-seismic interventions generally need larger financial disbursements and, as a consequence, are less likely to be carried out without public

[15] This take-up is consistent with the public administration national accounts released by Istat on 22th April 2024. As Istat pointed out in the press release, data for 2023 are still subject to further adjustments in the coming months.

support by financially constrained households. As the program covered entirely the cost for interventions, the share of additional investments can be interpreted as the ratio between the impact of the incentives on investments and their costs. Since we are observing only on one component of GDP, this estimate implicitly provides a rough lower bound estimate of the fiscal multiplier embedded in this program. A more detailed analysis on the overall impact on the Italian economy is discussed in the following section.

Figure 6: Additionality

(real values; billion euros)



Source: own elaboration on Eurostat data.

4. Assessing the overall economic impact

As we have seen in the previous section, “Superbonus 110%” and “Bonus Facciate” caused a significant increase in per capita spending on dwelling investments over the period 2021-23. According to our results, most of the growth observed for this variable was due to these subsidies, that succeeded in increasing dwelling investments by 67% at the end of 2023. These results are confirmed by some evidence obtainable from a sample survey of construction firms, described in the Appendix.

Given the size of the fiscal stimulus and the centrality of the construction sector in the economy, we now aim to analyse the effects on the other sectors by taking into account the intersectoral linkages and the possible positive feedback on final demand.

More in details, we use a Leontief model, in which we consider the impact of the two measures as an exogenous demand shock. More in details, we consider an economy composed of 63 sectors, in which the following identity applies:

$$X = AX + D \quad (4.1)$$

where X is a 63x1 vector of total production for each sector, A is the 63x63 matrix that contains all input-output intersectoral linkages among the 63 sectors, and D is a 63x1 vector of final demand. Vector D is either final consumption by households or government or investments.[16]

Equation (4.1) describes the main relationships in an economy: the output of each sector can be used either as an intermediate input for the same sector or other industries in the economy or as a final good. Rearranging and taking differences over time, we obtain:

$$\Delta X = (I - A)^{-1}\Delta D \quad (4.2)$$

where ΔX (ΔD) is vector of changes over time in sectoral output (final demand) and I is the identity matrix. $(I - A)^{-1}$ is computed by using the input-output matrix provided by Istat for 2019.[17]

In order to compute the impact of the bonuses on the economy we consider two scenarios for ΔD. The first – that we label *lower bound* – only considers supply-side effects of the higher investments generated by "Superbonus 110%" and "Bonus facciate"; in this case ΔD is equal to zero for all the demand components except for the spending in dwelling investments (the "additional investments" component described in the previous subsection).

The second scenario – that we label *upper bound* – also includes the positive effects on households' consumption derived by the non-additional part of the subsidies, which is akin to a public transfer to households increasing available income and, therefore, aggregate demand. According to the Bank of Italy econometric model (Bulligan et al., 2017), the elasticity of final consumption to a transfer to households' shock is about 0.3 on average in the first three years. This scenario also includes the Keynesian effects associated with the additional investments, i.e. the increase in consumption arising from higher demand and employment which adds to the mechanical impact on GDP through dwelling investments. In this case, we assume the same response as the one associated with a public investment shock, namely an elasticity of consumption of around 0.1 on average in the first three years. Extra-consumption is distributed across spending items using consumption share in 2019 to obtain the values in vector ΔD. While we consider this scenario more realistic than the lower bound, we should keep in mind that subsidies for dwelling renovations were mostly used by richer families[18], which are less financially constrained and, therefore, the impact on consumption might have been lower than the one predicted through standard elasticities.

To evaluate the impact of subsidies on sectoral real value added, we multiply ΔX by the ratio between value added and total production in 2019 and use annual value added deflators. Results are shown in table 3. The Italian value added grew by 13.5% in real terms between 2020 and 2023; we estimate that "Superbonus 110%" and "Bonus facciate" contributed for a value ranging between 2.6 and 3.4 percentage points. The ratio between the GDP generated by the policy and the fiscal stimulus (i.e. the fiscal multiplier) ranges between 0.7 (in the lower bound scenario) and 0.9 (in the upper bound).

[16] In an open economy version of the Leontief model, inputs include imported goods and final demand contains exports. For a matter of simplicity and given the fact that construction sector can hardly be traded across countries, we consider only a closed economy version of the model.

[17] We use the pre-pandemic (2019) version of input-output tables since data for 2021 and 2022 can still be affected by the sanitary restrictions and could be influenced by the policy we evaluate. We only consider intersectoral linkages for domestic goods. Results (available upon request) are robust to the inclusion of imported goods.

[18] Home owners typically have higher income; moreover, preliminary evidences point to a concentration of Superbonus in the richest regions in Italy (Agenzia delle Entrate and Ministero dell'Economia, 2023).

Overall the fiscal multiplier in 2021-23 was slightly lower than one, a figure in line with the estimates of the spending multiplier prevailing in the literature (Ramey, 2019) but smaller than the ones found in previous studies mainly focusing on green spending (Kronenberg, 2012; Hasna, 2022; Popp et al., 2020; Batini et al., 2021). This is consistent with the existence of a deadweight loss – i.e. that part of the subsidy actually financed renovation expenses that would have been carried out even without the public intervention. However, our finding might also be explained by displacement effects in downstream industries (Barattieri et al., 2023), that might depress the overall impact of the policy. More in general, the multiplier is lower than the one usually associated with public investments (Gechert, 2015), suggesting that alternative – more productive – uses of the resources would have had higher effects on GDP both in the short and in the long run (Ramey, 2021).

Using the standard assumption of a unitary revenue-to-output elasticity (i.e. revenue increases proportionally to GDP), and given that fiscal revenue in Italy stands at about 47% of GDP, the estimates of fiscal multiplier suggest that the revenues generated by the bonus-induced boost to economic activity were on average about 1 percent of GDP per year. Indeed, the net cost of the program (that is, netting out the extra-revenues caused by higher economic activity) would be around 100 billion. In other words, the policy is far from repaying for itself.

In terms of sectoral impacts, both subsidies accounted for roughly three-quarters of the growth in the construction industry but for just 10% in the value added increase in manufacturing and services. The impact was relatively larger in industries that are more related to construction due to input-output, like non-metallic minerals, metals, water and waste disposal, legal, accounting, and architecture services, administration, mining and quarrying, and chemical products.

Table 3: Sectoral impacts on value added growth between 2023 and 2020 using input-output tables

(percentage changes and percentage points)

SECTORS	Growth in real value added		
	Actual	Contribution of bonuses:	
		Lower bound	Upper bound
Manufacturing	19.7	1.7	2.3
Construction	38.8	30.4	30.6
Services	12.9	1.2	2.1
Total (1)	**13.5**	**2.6**	**3.4**

Source: own elaboration on Istat data. (1) Total includes other sectors of the economy (such as the energy, mining, and agriculture) that experienced a 16 per cent decline in value added.

5. Conclusions

In this paper we have analysed the economic impact of "Superbonus 110%" and "Bonus facciate" on the Italian economy from several perspectives.

Using the synthetic control method, we have showed that the subsidies provided a sizeable stimulus to dwelling investments, that we considered the target variable of the treatment. At the end of 2023, investments per inhabitants in real terms were larger by 67% in Italy in comparison with the synthetic control; the result are confirmed by standard placebo tests and by a number of robustness checks.

The additionality of the program, namely the share of dwelling investments that received public support which would have not been realized absent the program, was roughly 73%. In other words, one fourth of the spending related to subsidized investments, more than 45 billion, represents a "deadweight loss", namely investments which would have been carried out even without "Bonus facciate" and "Superbonus 110%". Given this result, we find that the fiscal multiplier – based on standard model elasticities to take into account the overall impact on demand – is slightly below one, a figure lower than the one associated with public investments in standard macroeconomic models or those predicted for green investments.

We find that "Bonus facciate" and "Superbonus 110%" were responsible for about 2.6 to 3.4 percentage points of the 13.5% total value added growth from 2020 to 2023. Using Input-Output tables, we compute that the incentives accounted for roughly three-quarters of growth in value added in the construction sector; at the same time, they played a limited role in other sectors.

It is important to stress that our analysis falls short of a full-fledge evaluation of the program. For example, the possible impact on the environment via the increased energy efficiency is not included in the picture;[19] nor we quantify the possible behavioural responses of firms and households in a context characterized by rising input prices and long delays in the execution of renovation works. We did not discuss the issues related to transferability of tax credits to third parties. Some of these were likely to be positive, as it allowed individuals with zero taxable income to use the tax credit; other issues were negative, since they generated uncertainty related to the final beneficiaries of the subsidies and their implications for the public budget. It is also fair to acknowledge that the conditions in which the bonuses (especially "Superbonus 110%") were conceived – in the midst of the pandemic crisis – did not lend themselves to a well-pondered decision process; on the contrary, timeliness was of the utmost importance.

It must be noted that indeed there is a degree of uncertainty surrounding the estimates of the fiscal multiplier. First of all, both spending in dwelling investments and the cost of the measures could still be revised in national accounts;[20] second, we used standard model elasticities, which might not hold in the context of the post-pandemic recovery; finally, our results could be affected by the frontloading of future dwelling investments which might lead to a corresponding decrease in coming years.

Comparing the value added generated by the program with its costs and using standard revenue-to-output elasticities we can safely conclude that the policy did not "repay for itself", i.e. the extra-public revenues generated by the bonus-induced boost to economic activity were significantly lower than their gross cost for the State coffers, leading to further accumulation of public debt which shall be repaid in the future[21]. Consequently, one can argue that, looking forward, the policy maker will and

[19] Alpino et al. (2022) provide an ex-ante evaluation of future discounted benefits in terms of expected emission, based on technical documentation provided with the National Recovery and Resilience Plan.

[20] In September 2023 ISTAT revised upwards real growth rate in 2021 by 1.3 p.p., half of which on account of higher spending in dwelling investments; at the same time, the estimates of the take-up of "Bonus facciate" and "Superbonus 110%" in 2022 were increased by almost 10 per cent (about 4 billion).

[21] Incidentally, a comprehensive assessment of the burdens on the public budget should also include the marginal cost of the higher debt which will weigh on public finances for coming years.

should be able to design initiatives that are socially fairer and more financially sustainable than those analysed in the present paper. A possible solution to keep supporting green renovations in the most efficient way could be let the rate of the incentive to be maximum just for poorer households and for pure “green” works; however, even in this case the rate should be somewhat below 100% to make the applicants willing to contain the overall cost of renovations. The rate should then be decreasing the higher the income of the applicants and the lower the share of green works.

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Appendix

The effectiveness of "Superbonus 110%" is confirmed by data from the yearly Bank of Italy's survey of construction firms, which is conducted on a sample of approximately 600 firms with at least 20 employees, representative of the entire population of Italian firms within this size range.

The analysis is limited to the 2020-2022 waves, which included specific questions about the "Superbonus 110%". Specifically, firms were asked what share of their production (realized in the private construction sector) benefited from the "Superbonus 110%". The same question referred to both the second half of the previous year and the firms' expectations for the current year[22]. In the 2020 survey, firms were also asked about the payment terms they had adopted or intended to adopt more frequently for works related to the "Superbonus 110%".

Through firm-level information, it is possible to observe the characteristics and performance of firms that have benefited from the "Superbonus 110%". Overall, the survey data reveals a significant 16% growth in production within the construction sector in 2022; the increase is in line with the one recorded the previous year and follows the decline observed in 2020 (around -6%). The increase in 2021-22 was primarily attributed to private construction, where approximately three-quarters of firms are engaged. Looking ahead to 2023, firms expect production to remain at the levels of 2022.

According to the survey results, in 2022 approximately two-thirds of the firms operating in the private construction sector have benefited from the "Superbonus 110%". However, this percentage is expected to decrease to 50% in 2023. Among these firms, about half reported that over one-third of their production has benefited from the "Superbonus 110%".

Regarding the methods of using the "Superbonus 110%", over half of the firms report that they most frequently choose to apply a discount on the invoice[23]. In contrast, the option to pay the invoice in usual terms and get a deduction from future Personal Income Tax (which is the standard option for previously existing bonuses) had a lower prevalence, accounting for around 20% of firms each.

The firms that have benefited from the "Superbonus 110%" are, on average, larger than other firms operating in the private construction sector (approximately five more employees on average). Additionally, these firms tend to have higher levels of production (more than about 30%).

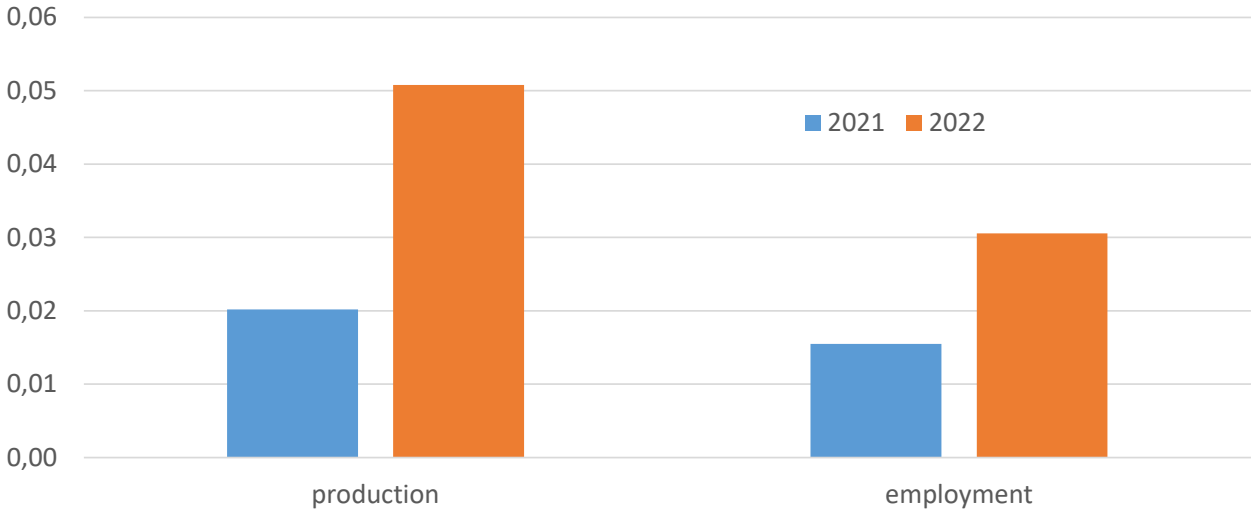
At the same structural characteristics, firms that benefited from the "Superbonus 110%" are those that have had a better performance in terms of production and employment in 2021-2022 (Figure A1). Specifically, the firms interested in the incentive showed a more significant production growth of nearly 2% in 2021 and 5% in 2022 and a higher increase in employment of almost 1.5% in 2021 and 3% in 2022. However, the improved production dynamic did not immediately translate into firms' profitability, which has been essentially the same for firms that have and have not benefited from the "Superbonus 110%".

[22] The survey is conducted annually in the spring. The question about the share of production that has benefited/will benefit from the "Superbonus 110%" included a closed-ended response with the following options to choose from: (i) none; (ii) between 0 and 1/3; (iii) between 1/3 and 2/3; (iv) over 2/3; (v) the firm does not operate in residential construction.

[23] In this way applicants could commission the work virtually without any monetary outlay. On the other hand, firms accepting this means of payment could transfer the tax credit to a third party or to bear lower liquidity inflows (as tax credits could be used in four annual instalments).

Figure A1: higher performance of firms that have benefited from the Superbonus

(percentage differences compared to other companies in the sector)



Source: Survey of Italian construction companies conducted by Bank of Italy in 2020 and 2021. Results are obtained by a regression that controls for the year and for the structural characteristics of the companies.