

# THE ECONOMIC EFFECTS OF BIG EVENTS: EVIDENCE FROM THE GREAT JUBILEE 2000 IN ROME

Raffaello Bronzini<sup>\*</sup>, Sauro Mocetti<sup>\*\*</sup>, and Matteo Mongardini<sup>\*</sup>

*Preliminary version - 15 September 2017*

## Abstract

This paper assesses the economic impact of the Great Jubilee 2000 on the economy of the city of Rome over a period of ten years. This is an extraordinary and unreproducible religious event that occurs every 25 years, therefore it is quite far from those usually investigated in the empirical studies.

By applying the synthetic control approach (Abadie et al. 2010), we find that after ten years per capita value added of Rome was not significantly different from that of the cities of the control group. However, the employment rate and the house prices in the periphery of Rome were significantly larger (on the contrary we find no effects on the house prices in the city center). Moreover, we find a positive impact on the tourism expenditure that, however, after a few years vanished. Some additional exercises suggested that the increase in employment rate (with no changes in per capita value added) was due to a shift of the economy towards less productive sectors, like some branches of services and construction.

Keywords: mega events; synthetic control; urban economic growth

JEL codes: R00, R11, R12, R58

---

<sup>\*</sup>Bank of Italy, Rome Branch. Email: [raffaello.bronzini@bancaditalia.it](mailto:raffaello.bronzini@bancaditalia.it).

<sup>\*\*</sup>Bank of Italy, Dept. of Economics, Statistics and Research. Email: [sauro.mocetti@bancaditalia.it](mailto:sauro.mocetti@bancaditalia.it)

<sup>\*</sup>Bank of Italy, Rome Branch. Email: [matteo.mongardini@bancaditalia.it](mailto:matteo.mongardini@bancaditalia.it)

## 1. Introduction<sup>1</sup>

Countries and cities fiercely compete at the international level to host big events, like Olympic Games or Football World Championships, because such events are supposed to bring economic prosperity to the host area, and are considered important promotion opportunities. However, their economic impact should not be taken for granted. In the short term they usually spur an increase in tourism and other expenditures that push local demand, but in the long term the economic benefits are uncertain and rarely overcome the organizing costs (Owen 2005; Coates 2007). In a recent survey on the impact of Olympic Games, for example, Baade and Matheson (2016) conclude that current expenditures and the costs to provide the necessary infrastructure are usually bigger than the economic benefits, coming from an increase in tourism and an improvement of amenities, together with those linked to the promotion effect.

This paper assesses the economic impact of a big event different from those examined by the empirical literature so far - the Great Jubilee 2000 - on the economy of the province of Rome over ten years. This is a large extraordinary religious event that occurs every 25 years in Rome, the capital of the Catholic Church. Even though the nature of the event is different from those usually investigated, it shares with them some important characteristics able to enhance the local economy: it moved a large amount of public and private investment, improved local infrastructure and amenities, and attracted an impressive amount of tourists.

A crucial issue in the empirical studies of big events is the choice of a suitable strategy to identify their economic impact. We apply the synthetic control method which is based on the construction of an opportune counterfactual for the economy of Rome: a weighted average of the outcome variable of other provinces that mimics what would have been happened to Rome if it had not hosted the Jubilee (Abadie et al. 2010).

The literature on the impact of mega-sport events is extended. Several papers employ panel data model and pre- post-estimates. For example, Rose and Spiegel (2011) use country data from 1950 to 2006 to investigate the effect of hosting Olympic Games on exports. The

---

<sup>1</sup> We would like to thank the participants in...

rationale is that hosting games increases country visibility that stimulates trade. By a panel model they find a positive gap on export not only for hosting countries, but also for unsuccessful candidates (candidate countries that eventually did not host the games). The interpretation is that it is the bid for the games, not hosting them, which has an impact on trade, because through the candidature countries signal their trade liberalization intentions and stronger outward orientation. Brükner and Pappa (2015) find a positive effect of bidding for Olympic games also on country consumption, investment, and output. Fourie and Santana-Gallego (2011) estimates a standard gravity model of bilateral cross-country tourist flows and show that hosting mega-sport event promotes tourist arrivals before and during the event, but not afterwards. At the regional level, Jasmand and Maennig (2008), using a panel data for German regions over 1961-1988 period and difference-in-differences estimates, find that 1972 Munich Olympic Games had a positive effect on income (GDP) of hosting regions but not on their employment. Baade and Matheson (2004) focus on FIFA World Cup using 1970-2000 data for US cities that hosted the event in 1994, by comparing actual and predicted personal income. They conclude that host cities experienced a loss from 5 to 9 billion of dollars, because the expenditures overcame monetary gains.

More recently some studies use counterfactual strategies that challenged previous findings. Maennig and Richter (2012) and Langer et al. (2017) argue that countries that hosted or bid for Olympic games are structurally different from the others and therefore selection might have biased previous results. By using only a subset of countries chosen by propensity score matching method, as controls, they find no effects of hosting games on exports, consumption, investment or output. For further in-depth critical discussions of the economic literature on the impact of major sport events see Baade and Matheson (2016) and Maennig (2017).

While the analyses of sport events are numerous, quantitative assessments of the economic effects of non-sport event are very rare.<sup>2</sup> This paper contributes to the existing literature in many respects. First, as previously recalled, the Great Jubilee shares many features with big events examined by the literature but shows also some peculiarities that

---

<sup>2</sup> Lamberti et al. (2011) examine the effect of Shanghai World Expo on community participation in tourism development by qualitative information collected by questionnaires.

makes the study of the event particularly interesting. The Jubilee moved a sensible amount of public and private investment and attracted an impressive number of tourists. It lasted more and involved a much wider range of infrastructure and amenities than sport events examined so far. To some extent we can envisage that its impact on the local economy could be deeper than those triggered by other types of events. Second, as far as we know the economic impact of big event in Italy have never been assessed with in-depth counterfactual strategies. This paper employs the synthetic control method which is particularly suitable to evaluate the effects of economic shocks that hit one specific geographical area. The similarity of the dynamic of the main outcome variables among Rome and its counterfactual before the event supports the validity of our identification strategy. Overall, we hope that the findings of this exercise can be useful to for both public administrators and policy makers to gauge information on the economic benefits of hosting mega event.

Our exercise shows that after ten years per capita value added of Rome was not significantly different from that of the cities of the control group. However, the employment rate and the house prices in the periphery of Rome were significantly larger (on the contrary we find no effects on the house prices in the city center). Moreover, we find only a short term impact on tourism expenditure. Some additional exercises suggested that the increase in employment rate (with no changes in per capita value added) was due to a shift of the economy towards less productive sectors, like some braches of services and construction.

## **2. The Great Jubilee 2000**

The Jubilee is the main religious event for the Catholic Romanian Church which is related to the universal pardon. In the year of the Jubilee catholic believers can receive the indulgence (remission of sins) attending religious ceremonies in certain sites located in Rome. The ordinary Jubilees (called also Holy Year) occur each 25 year and last a little more than one year. Catholic Jubilee was established for the first time in 14<sup>th</sup> century. From 1300 to 2015 there have been celebrated 34 Jubilees, most of them ordinary; the Pope, chief of the Catholic Church, can also proclaim extraordinary Jubilees for outstanding events. The ordinary Great Jubilee 2000 lasted from Christmas 1999 (December) to the Epiphany 2001 (January), and was celebrated by Pope John Paul II.

Supporters of mega events argue that they are able to spur the economic expansion of the hosting city or country through a number of channels. First, public and private investments made in preparation for the event enhance the endowment of local private capital, infrastructure, and facilities. Citizens and firms therein located take advantage from the investments, and local production capacity increases, together with the competitiveness and attractiveness of the hosting geographical area. Second, mega events attract an extraordinary number of tourists boosting local demand for goods and services. Finally, the event represents a unique promotion opportunity for the city, which can be able to attract tourists and external flow of investment over the long-term, and by this channel eventually triggering a virtuous circle of economic expansion.

As regards the investment, a large plan of public expenditures in preparation of the 2000 Great Jubilee was officially approved in 1996 by the competent authorities (*Commissione per Roma Capitale*). Afterward, the plan was several times changed and downsized, mainly to respect the amount of allocated public funds or temporal deadlines. However, in its final version it included more than 800 projects, almost all realized from 1996 to 2000, and it mobilized a substantial amount of resources. Total investments amounted to about 1.88 billion of euros, of which 1.77 financed by state funds (Law n. 651/1996; the other part was financed mainly by public fund and marginally by privates). More than the 90% of the total investments were made in province of Rome (see: Benevolo et al. 2003). As a result, the public program was similar to an expansive fiscal policy which was not financed by local taxes.

A large share of the plan was absorbed by public investment for infrastructure (about 43% of the total expenditure). Mainly projects aimed at improving the mobility, enhancing metropolitan road, railroad and car parking. Among others, we can recall the development of the motorway city-ring (Gran Raccordo Anulare), Fiumicino-Airport, and railroad Viterbo-St.Peter, the renewing of “Termini” railroad station, the realization of a central road tunnel in Lungotevere Sassia, the parking of Gianicolo, the musical Auditorium; other investment projects strengthened local and urban railroads and hospital emergency. Among the remaining part, 16.5% of the total public investment was allocated to improve the cultural assets; 14.1% to maintain and requalify of the urban public areas; another 14.3% for people

security. The rest was destined to the reception, information, and communication: among them there are the public incentives for investment of private structures (e.g. hotels).

As recalled, the total direct expenditures planned for the Jubilee (1.88 billion of euros) does not represent a marginal amount. It is about 10.6% of the total investment realized in the region of Latium in 1995 (1.7% of the regional GDP and 2.5% of the value added of the province of Rome). According to the official regional account, investment over GDP ratio in Latium increased from 80% of the national average in 1996, to almost 90% in 2000 (Figure 1a); while it decreased in the following years.<sup>3</sup> Many of the aforementioned public works were important public intervention planned for Rome far before the Jubilee, however the event represented a unique opportunity to speed up their realization and sometimes to expand their scope (Rutelli 2001). Overall, the index that measures the endowment of economic infrastructures in the province of Rome increased from 144.7 percentage points of the national mean in 1991, to 163.0 in 2004 (from 178.2 to 196.6 including also social infrastructures; see the index provided by Istituto Guglielmo Tagliacarne, 2011).

Besides public expenditures strictly related to the Jubilee, there were also other private or public expenditures which were indirectly related to the event, that are hard to calculate such as private spending to renew the structures for reception. According to some estimates the overall private and public investment related to the event was more than three times bigger than those recalled, reaching about 6.5 billion of euro (Rutelli, 2001; Ciccarone et al. 2015).

Notice that realized infrastructure and investment planned for the Jubilee are facilities that have wider utilizations than those strictly related to sport event, which on the contrary often creates overcapacity and afterward problems of underutilization. Moreover, sport events like Olympic Games and Football Championships are strongly concentrated in time, lasting usually a few weeks.

Another important driver of the economic expansion triggered by mega events is the tourism. Actually, Rome experienced a huge spike in tourism arrivals and expenditures in

---

<sup>3</sup> Only regional data on investment are available, whereas data on investment at the provincial level are not available.

2000. In the year of the Jubilee the total arrivals increased by 17.8% in one year (to 8.3 million of tourists) and the number of nights spent, a measure of tourism performance related to the duration of the stay, increased by 42.2% (to 24 millions). The expenditure of the foreign tourists increased by 20%, to almost 6 billion of euros (official data domestic expenditure are not available; Figure 1b). After the peak in 2000, stays and expenditure of international tourists in Rome experienced a rapid decline over the two following years, in the aftermath of the 2001 Twins Tower terrorist attack.

These considerations suggest how the Jubilee is an event that has a high potential for increasing and changing the pattern of development of the hosting city. It involves a larger scope of interventions on infrastructure and amenities; it lasts more than sport events and consequently might have a more durable impact on tourism; it is predictable and therefore the plan of interventions can be more accurately targeted.

### **3. Empirical strategy and data**

#### *3.1 Empirical strategy*

While the financial cost from hosting big events can be reasonably measured, the overall economic impact on the host city is much more difficult to estimate. Ideally one needs to compare the patterns over time in the GDP per capita of the host cities with that of a control group of unaffected cities. However, two main issues make this exercise particularly challenging. First, there are typically few treated units.<sup>4</sup> This is due to the fact that big events are fairly rare and that comparable data on the host cities are difficult to assemble. For example, the Olympic games are held every four years and (sufficiently long) time-series data for the host cities cannot be easily found. Second, big events are often targeted to cities that have peculiar characteristics with respect to other cities (e.g. in terms of size, infrastructures, growth potential, etc.), making the choice of the control group particularly important for a proper policy evaluation exercise.

---

<sup>4</sup> For example, the difference-in-difference strategy does not perform well when the treated units are few or even only one. This is especially true when considering that the standard errors obtained from such regressions are not correct as they rely on asymptotic assumptions which do not hold with small number of units (Conley and Taber, 2011).

To address these issues we adopt the synthetic control method for comparative case studies (Abadie and Gardeazabal, 2003 and Abadie et al., 2010). Specifically, we use a combination of other Italian provinces to construct a “synthetic” control that resembles to Rome before the Great Jubilee. The donor provinces used to construct the synthetic control are selected by an algorithm that assigns weights based on donors similarity to Rome with respect to relevant covariates and past realizations of the outcome variable. The subsequent evolution of the synthetic control with respect to Rome is used to identify the impact of the Great Jubilee.

Formally, we have a balanced panel with 110 provinces observed from 1990 to 2010. The sample includes Rome that hosted the Great Jubilee in 2000 and other 109 provinces that serve as potential controls. This set of controls units is conventionally called the “donor pool”. Years before 2000 are pre-intervention periods ( $T0$ ) while those after 2000 are post-intervention periods ( $T1$ ). The treatment effect for Rome at time  $t \in T1$  is defined as:

$$\tau = Y_{Rome,t}(1) - Y_{Rome,t}(0)$$

where  $Y_{Rome,t}(1)$  and  $Y_{Rome,t}(0)$  are the Rome’s outcomes with and without the Great Jubilee.

$Y_{Rome,t}(0)$  is not observed and has to be estimated. This is the well-known fundamental problem of causal inference. To address this point, a synthetic control is built as a weighted average of the units in the donor pool. A synthetic control can be represented in our case by a  $(109 \times 1)$  vector of weights  $W = (w_1, w_2, \dots, w_{109})$  with  $w_1 + w_2 + \dots + w_{109} = 1$ . The vector  $W$  is chosen to minimize the difference between the pre-intervention characteristics of the treated unit and the control units (with more weights, in turn, assigned to those variables that have a large predictive power on the outcome of interest). Therefore, the treatment effect for Rome at time  $t \in T1$  is defined as:

$$\tau = Y_{Rome,t}(1) - \sum_{j=1}^{109} w_j Y_{j,t}$$

The synthetic control method has many advantages with respect to traditional regression analysis in terms of transparency and strength of the identification assumptions. On one side, the control group is not chosen arbitrarily but with a transparent data-driven approach. On the other side, only units that are alike in both observed and unobserved



determinants of the outcome variable (as well as in the effect of those determinants on the outcome variable) are chosen, thus improving with respect to other statistical techniques traditionally used to refine the control group.<sup>5</sup>

The synthetic control method has been recently applied in many different fields such as, among others, the economics of terrorism (Abadie and Gardeazabal, 2003), political science (Abadie et al., 2015) and the growth-enhancing effects of liberalizations (Billmeier and Nannicini, 2013). Interestingly, it seems potentially very well suited for the urban economics and economic geography applications (e.g. Barone and Mocetti, 2014; Gobillon and Magnac, 2016).

### 3.2 *Data and variables*

Our main outcome variable is the value added per capita. Figures on value added at the province level are drawn from the regional accounts of the national institute of statistics (ISTAT); they represent the official figures on the value added at the local and are consistent with the national accounts. Figures are deflated using the GDP deflator.<sup>6</sup>

Following a rather consolidated approach (Abadie and Gardeazabal, 2003; Barro and Sala-i-Martin, 2004), we include among our main predictors the capital stock per capita, the employment rate, the share of graduates (as proxy for human capital) and the population density (to account for agglomeration economies). In a richer specification we also include the export orientation (i.e. export over value added), the sectoral shares, the fraction of small firms and a proxy of social capital. These variables are both predictors of the value added per capita and might also capture different exposure of each province to external shock depending on the structural characteristics of the local economy. The capital stock is drawn

---

<sup>5</sup> For example, propensity score matching is a suitable approach to restrict the donor pool to a subsample of control units more similar to the treated units. However, this technique exploits only observable characteristics and has a *static* approach rather than a *dynamic* one as the synthetic control method.

<sup>6</sup> Data on the value added published by ISTAT cover the periods from 1995 to 2010. Figures from the period 1990 to 1995 are estimated backward using the GDP growth rate estimates by Istituto Tagliacarne.

from the research institute CRENOS<sup>7</sup>, while other variables mentioned above are mostly drawn from ISTAT.<sup>8</sup>

As further outcome variables we also look at house prices that are calculated using data from *Il Consulente Immobiliare*, a semiannual survey conducted for a review published by *Il Sole 24 Ore* media group (Muzzicato et al., 2008). data are broken down into two property categories (new and existing) and three locations for each city (center, semi-center and outskirts). The main advantages of this survey are its long time range (from mid 60s) and broad territorial reach, as it comprises data on all provincial capitals.

Descriptive statistics on the main variables used in the empirical analysis (and their sources) are reported in Table 1.

## 4. Results

In our paper we use several outcome variables in order to gauge the effect of the Great Jubilee. First, we employ the *value added per capita*, as a proxy of the overall level of economic development. Second, we examine the *employment rate* in order to evaluate the effect on the local labor market. Third, we investigate the *house prices* (also distinguishing between different areas of the city) to capture potential other effects of the investments made in the infrastructure and other facilities. Finally we also provide some descriptive evidence on the impact on *tourism*.

### 4.1 The impact on the value added per capita

We start with the value added per capita and with a simple graphical evidence. In Figure 2 we plot the (average) value added per capita for the province of Rome and for all the other Italian provinces in the 10 years before and after 2000. The value added per capita was higher in the 2000s with respect to the 1990s in both areas, though the growth rate was larger for the province of Rome (15% and 10%, respectively). This simple graphical representation mirrors what we would obtain using a difference-in-differences strategy to

---

<sup>7</sup> These figures are available at the regional level. Province level figures are estimated to be consistent with value added and population at the province level.

<sup>8</sup> Data on human capital are taken from population censuses conducted by Istat. As censuses are run every 10 years, inter-census data are obtained through interpolation.

estimate the impact of the Great Jubilee. However we should refrain from the temptation of interpreting this evidence as causal: first, we have just one treated unit; second, some of the other Italian provinces might not represent a proper control as they might display quite different structural characteristics and divergent paths from that of Rome also in the period before 2000 (thus invalidating the standard assumptions underlying the difference-in-differences approach).

As discussed in the previous section, we address these identification threats using the synthetic control method. The method delivers positive weights for Aosta, Milan, Trento and L'Aquila if we use a parsimonious set of predictors of the value added per capita and for the same provinces except of Imperia in place of L'Aquila if we use a richer set of predictors (our preferred specification). Weights and the root mean squared prediction error (RMSPE) are reported in Table 2. On the economic ground the choice made by the algorithm is reasonable as most of the cities are capitals of central-northern regions and, therefore, like Rome, they have more administrative duties; Milan is the province with the largest weight and indeed it is a metropolitan area comparable to Rome for size and agglomeration economies.

In Table 3 we report the value added per capita and the growth predictors in the five years before the Jubilee of the treated province (Rome), the average of the entire set of province in the donor pool and of the synthetic provinces built using the base and the full set of predictors of the value added growth. As clearly shown, the synthetic provinces closely mimic Rome in terms of value added per capita while the difference with the average province is much higher. Thus, synthetic control seems a good counterfactual of the province of Rome, as far as possible suitable to assess the economic impact of the Jubilee.

In Figure 3 we compare the dynamic of the value added per capita in Rome and in the synthetic control, using two different set of predictors of the outcome variable, over 30 years. The evolution of the outcome variable in the treated and in the (synthetic) control province mostly overlaps until 1999, underscoring the credibility of the synthetic control as a counterfactual estimator. In the aftermath of the Great Jubilee, the trend in the treated region slightly starts to positively diverge from the control unit; the positive impact, however, vanishes in the second half of the decade.

In Figure 4 we conduct several robustness checks. In panel (a) and (b) we exclude the province of Milan (that has the highest weight in the construction of the synthetic control) and that of L'Aquila (as the province experienced an impressive earthquake in 2009 and therefore one could argue that it is unsuitable as control unit). Indeed, the synthetic control method usually delivers positive weights for just a few units and one may wonder whether the estimates are sensitive to the particular performance of a single province. The patterns are similar to those observed with our baseline specification: in the aftermath of 2000 we observe a slightly positive effect that however disappears in the second half of the 2000s. In panel (c) we replicate the analysis taking 1995 as the year of the treatment: this allows us taking into account that investments in the preparation of the event (and therefore potentially economic spillovers on the local value added) started before 2000. We do not find any detectable effect of the event. Finally, in panel (d) we use value added per kilometer instead of value added per capita; indeed, the latter reflects both the trends in value added and in population while one may want to examine the impact on value added solely, thus scaling that variable on some exogenous and fixed factor such as geographical surface of the province. Again we do not find different dynamic patterns between the control and the synthetic unit.<sup>9</sup>

As large scale (asymptotic) inference cannot be conducted on synthetic control estimators, Abadie et al. (2010) suggest the use of permutation methods that essentially consist in running placebo studies reassessing the treatment to other comparison units. In this way, we can obtain synthetic control estimates for provinces that did not experience the Jubilee. Applying this idea to each province in the donor pool allows us to compare the estimated effect of the Jubilee on Rome to the distribution of placebo effects obtained for other provinces. We will deem the effect of the Jubilee on Rome significant if the estimated effect for Rome is unusually large relative to the distribution of placebo effects. For reasons of graphical representation we restrict the analysis to placebo evidence for the largest 35 provinces (those with a population above 500,000 in the year before the Jubilee). Figure 5

---

<sup>9</sup> One further potential concern in the context of this study is the potential existence of spillover effects. In particular, it is possible that the Jubilee had effects on value added per capita in provinces other than Rome and, in particular, in provinces that are spatially close. However the other provinces of Latium (i.e. the region of Rome) do not enter with positive weights in the construction of the synthetic control and therefore we do not have this potential source of bias in our exercise.

(left panel) shows the results of this test. The black line represents the estimated gap between the treated unit and the synthetic control for Rome; the grey lines denote the same gap for the placebo runs. Figure 5 (right panel) reports the ratios between the post-2000 RMSPE and the pre-2000 RMSPE for Rome and for the other provinces of the placebo studies. The underlying idea is that a large gap in the value added per capita between each province and its synthetic counterpart is not indicative of a large effect of the event if the synthetic control does not closely reproduce the outcome of interest prior to the event (i.e. a large post-2000 RMSPE is not indicative of a large effect of the Jubilee if the pre-2000 RMSPE is also large). According to these results in a confidence interval setting we would conclude that the estimate effect for Rome is not significant at the conventional confidence levels.

#### 4.2 *The impact on the employment rate*

We move now to the second outcome variable, the employment rate that, for reasons of data availability, is observed from 1993 on. In the Figure 6 we show the employment rate for Rome and for its synthetic counterpart; as before we use two specifications, one more parsimonious and one enriched with sectoral shares, export orientation and social capital. According to our preferred specification, the donors include Imperia, Genoa, Milan and Reggio Calabria; these provinces enter with roughly a similar weight in the construction of the synthetic province. Contrary to the value added, for employment rate we do find a substantial effect: in the end of the 2000s, after ten years from the Jubilee, the employment rate in Rome was about 4 percentage points higher than that of its synthetic control.

As before we run placebo studies to get some insights on the statistical significance of the estimated impact. Figure 7 (left panel) shows that the black line (representing the estimated effect of the Jubilee for the province of Rome) is large with respect to the distribution of the gaps in the placebo studies. Figure 7 (right panel) reports the distribution of the ratios of post-Jubilee over pre-Jubilee RMPSPE for the 35 largest provinces: Rome clearly stands out in the figure recording the 3<sup>rd</sup> highest RMSPE ratio. The post-Jubilee gap is about 5 times larger than the pre-Jubilee gap. If one were to pick a province at random from the sample, the chances of obtaining a ratio as high as this one would be  $3/35 = 0.086$ . Thus we can conclude that the impact of the Great Jubilee on the employment rate of the province of Rome was positive and statistically significant at the conventional levels.

So far we find that the Jubilee had a positive impact on employment but no effects on the value added: how do we reconcile this apparently contrasting evidence? One hypothesis is that there has been a sectoral shift from high- to low-productivity sectors, a sort of “Dutch disease” effect. In such a case, the expansion of employment would be compatible with no changes in per capita value added. In order to verify this hypothesis we need to examine the dynamic of the sectoral employment. Unfortunately reliable time series for sectoral employment at the provincial level are available from 2000 on and therefore we cannot apply the synthetic control method for each sector.<sup>10</sup> To overcome this limitation we consider the synthetic control built using employment rate as outcome variable and we compare the employment growth of Rome with that of this synthetic counterparts in the period 2000-2010.<sup>11</sup> Figure 8 reports the results of this exercise: between 2000 and 2010 the overall employment grew faster in Rome than the counterfactual (19% and 14%, respectively), consistent with previous results. Interestingly enough, nearly two thirds of the employment growth is attributable to the construction sector and to services characterized by lower skill content (e.g. trade, hotel and restaurants, real estate, etc.); the growth in these sectors was significantly larger with that recorded in the synthetic control. Therefore, we can conclude that in the decade after the Jubilee we observe a sectoral shift from higher- to lower-productivity sectors.

#### 4.3 *The impact on the house prices and city attractiveness*

The Jubilee was accompanied by a wide set of interventions devoted to the improvement of mobility and requalification of the cultural and building heritage. We can envisage that the improvement of infrastructure and amenities might have had some effects on the attractiveness of the city and on house prices (Roback 1982). Moreover, investment in transport infrastructure, by improving mobility and commuting within the city, might have changed the appeal to reside in the periphery relatively to more central and expensive areas. As a results demand and house prices could have been changed differently between central and peripheral areas. In order to explore these issues we replicate previous analysis using

---

<sup>10</sup> Data are the territorial and sectoral breakdown of the national accounts and are provided by ISTAT.

<sup>11</sup> In unreported evidence we also use the synthetic control built using value added per capita as outcome variable. The results are substantially similar and are available from the authors upon request.

house price as outcome variable and we also distinguish between house prices in the central and in the peripheral areas. Finally we also provide some descriptive evidence on overall city attractiveness as proxied by expenditure of foreign tourists.

In Figure 9 we report the dynamics of house prices in Rome and its synthetic counterpart before and after the Jubilee, using as before two specifications with a different set of predictors. Genoa and Milan, with the latter accounting for nearly 90% of the synthetic province, are the two donors province capitals. We do not detect any visible impact of the Jubilee on house prices. In Figure 10 we replicate the analysis going beyond city-average house prices and allowing differential effect between the city center and the peripheral neighborhoods. While we continue to find negligible effect on house price for the more central areas, we record a substantial increase of the house prices in periphery of Rome with respect to its synthetic counterpart.<sup>12</sup> More specifically, house prices per square meter were about 2,000 Euros in 2000 and increased to nearly 4,000 Euros ten years later; the increase was substantially lower in the peripheries of the other province capitals (from 2,000 to 3,000 Euros). This effect might be plausibly attributed to the improvement of the transport infrastructures realized for the Jubilee.

The results for the central areas are also not significant from a statistical point of view, as shown in panels (a) and (b) of Figure 11. On the contrary, the estimated impact for the peripheral areas is statistically significant: according to panel (c) in Figure 11, the black line (that represents the estimated gap for Rome) is larger with respect to the distribution of the gaps in the other placebo studies. At the end of the sample period, the estimated gap for Rome ranked 1<sup>st</sup> out of 35 tests. This indicates that the probability of estimating a larger effect under a random permutation of the treatment is  $1/35 = 0.029$ . In a confidence interval setting, we would conclude that the estimate effect is positive and significant at a 5% confidence level, though the evidence from the distribution of the ratios of post-Jubilee over pre-Jubilee RMPSPE is somewhat weaker (Figure 11, panel (d)).

Supporters of mega event argue that they represent a unique opportunity to promote the city and favorite the tourism venue. Even though Rome represents a standard target for

---

<sup>12</sup> The province capital used to build the synthetic control are Genoa, Venice and Milan (with the latter weighting about 93%) in the case of house prices in the city centers and Genoa, Milan, Bolzano and Bologna (accounting for 31%, 42%, 10% and 17%, respectively) in the case of peripheral areas.

international and domestic tourism, the improvement of the amenities resulting from the Jubilee's interventions might have had a positive long-term impact on tourists' flows and city attractiveness. Therefore, we chose to analyze the effect of Jubilee on tourism expenditure sourced by the Bank of Italy. Unfortunately data at our disposal have two main limitations: first, we observe only international and not domestic tourism expenditure; second, data start from 1997 and this prevents us from applying the synthetic control. Therefore we proceed as follows. First, we select 9 provinces that had similar foreign tourism expenditure over population in the three years before the Jubilee: the cities include Aosta, Florence, Forli-Cesena, Gorizia, Imperia, Siena, Trento, Udine and Verona.<sup>13</sup> In Figure 12 we report the dynamics of the tourism expenditure per capita for Rome and for the "similar" provinces. We notice a sharp jump in tourism expenditure for Rome in correspondence of year of the Jubilee, as expected. In the following three years there was a drop in foreign tourists' expenditure, particularly pronounced for the province of Rome: we interpret this evidence as a consequence of the 2001's terrorist attacks in US which affected international touristic flows. In the second part of decade tourism expenditure of Rome returned to values similar to its counterfactual. This descriptive evidence is consistent with a null long-term impact of the event on tourism.

## 5. Conclusions

This paper contributes to the existing literature on the economic impact of the big event by studying the effect of the Great Jubilee of 2000, the Catholic more important event that occurs every 25 years and lasts one, on the economy of Rome. To address this issue we exploit the synthetic control method and we examine a large set of economic outcomes, such as value added, employment, house prices and tourism.

According to our findings, the impact of the Jubilee on the value added was negligible. We do find instead a positive impact on employment rate and employment growth, though mostly concentrated in sectors with lower skill content. Moreover, we show that house prices in the peripheral neighborhood increased significantly with respect to what observed elsewhere, likely to mobility and infrastructure investments that increased the attractiveness

---

<sup>13</sup> With similar we mean that the expenditure per capita was in the interval  $\pm 50\%$  that of Rome.



of certain peripheral areas. Finally, we fail to find any significant impact on tourism expenditure.

## References

- Abadie A., Diamond A. and Hainmueller J. (2010), “Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program”, *Journal of the American Statistical Association*, vol. 105, pp. 493-505.
- Abadie, A., A. Diamond and J. Hainmueller (2015), Comparative politics and the synthetic control method, *American Journal of Political Science*, vol. 59, pp. 495–510.
- Abadie A. and Gardeazabal J. (2003), “The Economic Costs of Conflict: A Case Study of the Basque Country”, *American Economic Review*, vol. 93, pp. 113-132.
- Baade R. A. and Matheson V. A. (2004), “The Quest for the Cup: Assessing the Economic Impact of the world Cup”, *Regional Studies*, 38(4), 343-354.
- Baade R. A. and Matheson V. A. (2016), “Going for the Gold: The Economics of the Olympics”, *Journal of Economic Perspectives*, vol. 30, pp. 201-18.
- Barone, G. and S. Mocetti (2014), Natural disasters, growth and institutions: a tale of two earthquakes, *Journal of Urban Economics*, vol. 84, pp. 52-66.
- Barro, R. and X. Sala-i-Martin (2004), *Economic Growth*, MIT Press.
- Benevolo F., Jannini P., Rasetta F., Rajola C. (2003), Dopo il 2000. L’impatto delle politiche per il Giubileo a Roma e nel Lazio. Rapporto finale. Fondazione Einaudi. Roma.
- Billings S. B. and Holladay J. S. (2012), “Should Cities Go For The Gold? The Long-Term Impacts Of Hosting The Olympics”, *Economic Inquiry*, vol. 50, pp. 754-772.
- Billmeier, A. and T. Nannicini (2013), Assessing economic liberalization episodes: a synthetic control approach, *Review of Economics and Statistics*, vol. 95, pp. 983-1001.
- Brükner M. and Pappa E. (2015), News Shocks in the Data: Olympic Games and Their Macroeconomic Effects, *Journal of Money, Credit and Banking*, 47(7), 1339–1367.
- Ciccarone G., Di Bartolomeo G., Fedeli S., Tancioni M. (2015), L’indotto del Giubileo straordinario della misericordia. Analisi di impatto economico. Università La Sapienza-Camera di Commercio di Roma.

- Coates D. (2007), "Stadium and Arenas: Economic Development or Economic Redistribution?" *Contemporary Economic Policy*, vol. 2, pp. 567-77.
- Conley, T.G and C.R. Taber (2011), Inference with "difference in differences" with a small number of policy changes, *Review of Economics and Statistics*, vol. 93, pp. 113-125.
- Flyvbjerg, B., Stewart, A. e Budzier, A. (2016) "The Oxford Olympics Study 2016: Cost and Cost Overrun at the Games", Saïd Business School RP 2016-20.
- Fourie, J. and Santana-Gallego, M. (2011), "The Impact of Mega-Sport Events on Tourist Arrivals", *Tourism Management*, vol. 2, pp. 1364-1370.
- Gobillon, L. and T. Magnac (2016), "Regional policy evaluation: interactive fixed effects and synthetic controls", *Review of Economics and Statistics*, vol. 98, pp. 535-551.
- Istituto Guglielmo Tagliacarne (2011), Indicatori di dotazione infrastrutturale per provincia, Rome.
- Jasmand S., and Maennig W. (2008), "Regional Income and Employment Effects of the 1972 Munich summer Olympic Games", *Regional Studies*, 42(7), 991-1002.
- Lamberti L., Noci G., Guo J., Zhu S. (2011), "Mega-events as drivers of community participation in developing countries: The case of Shanghai World Expo", *Tourim Managment*, 32, 1474-1483.
- Langer V., Maennig W., and Richter F. (2017), "The Olympic Games as a News Shock: Macroeconomic Implications", *Journal of Sports Economics*, forthcoming.
- Owen J. (2005), "Estimating the Cost and Benefit of Hosting Olympic Games", *Industrial Geographer*, vol. 1, pp. 1-18.
- Maennig W. (2017), "Major Sports Events: Economic Impact", University of Hamburg, Working Paper n. 58.
- Maennig W. and Richter F. (2012), "Exports and Olympic Games," *Journal of Sports Economics*, vol. 13(6), pages 635-641.
- Muzzicato, S., R. Sabbatini and F. Zollino (2008), Prices of residential property in Italy: constructing a new indicator, Bank of Italy, Occasional Papers, n. 17.

- Roback J. (1982), “Wages, Rents and Quality of Life”, *Journal of Political Economy*, vol. 90(6), 1257-1278.
- Rose A. K. and Spiegel M. M. (2011), “The Olympic Effect”, *Economic Journal*, vol. 121, pp. 652-677.
- Rutelli F. (2001), “Roma e il Grande Giubileo del 2000”, in Treccani. Il libro dell'anno 2000, Istituto dell'Enciclopedia Italiana Treccani. Rome.

## Tables

**Table 1. Descriptive statistics**

<i>Variable definition [source]</i>	<i>Mean</i>	<i>Std. dev.</i>
Value added per capita [Tagliacarne + ISTAT: regional accounts]	20.327	5.772
House prices per square meter [Il Consulente Immobiliare]	1.755	807
Capital stock per capita [estimated from CRENOS]	127.491	51.376
Employment rate [ISTAT: Labor Force Survey]	0,553	0,093
Population density [ISTAT]	234,2	315,9
Share of graduated [ISTAT: census]	0,064	0,023
Share of agriculture [ISTAT: census]	0,009	0,007
Share of industrial sector [ISTAT: census]	0,286	0,105
Share of construction sector [ISTAT: census]	0,087	0,022
Share of trade sector [ISTAT: census]	0,229	0,036
Share of private service sector [ISTAT: census]	0,147	0,039
Share of public sector [ISTAT: census]	0,243	0,068
Share of small firms (<50 employees) [ISTAT: census]	0,705	0,062
Export over value added [ISTAT]	0,164	0,125
Social capital: first principal component of referendum turnout [Ministry of Interior], share of no profit [ISTAT: census], corruption [Golden and Picci] and blood donation [AVIS]	0,001	1,505

Data refers to 95 Italian provinces observed from 1980 to 2010; linear interpolation is used to impute missing values between census years; monetary values are expressed in euros (constant price 2010).

**Table 2. Donors**

<i>Province</i>	<i>Weight (base)</i>	<i>Weight (full)</i>
Aosta	0.100	0.152
Imperia	0.000	0.086
Genoa	0.000	0.002
Milan	0.511	0.567
Bergamo	0.184	0.000
Trento	0.096	0.194
L'Aquila	0.109	0.000
Other provinces	0.000	0.000
Root mean squared prediction error	0.443	0.461

The weights of the synthetic controls are chosen to minimize the distance with the province of Rome in terms of value added per capita and predictors of its subsequent growth; the weights refers to the provinces that are used to build the synthetic control using a parsimonious or a richer set of predictors, respectively. Base specification includes capital stock per capita, employment rate, share of graduates and population density; full specification adds export orientation, sectoral shares and social capital.

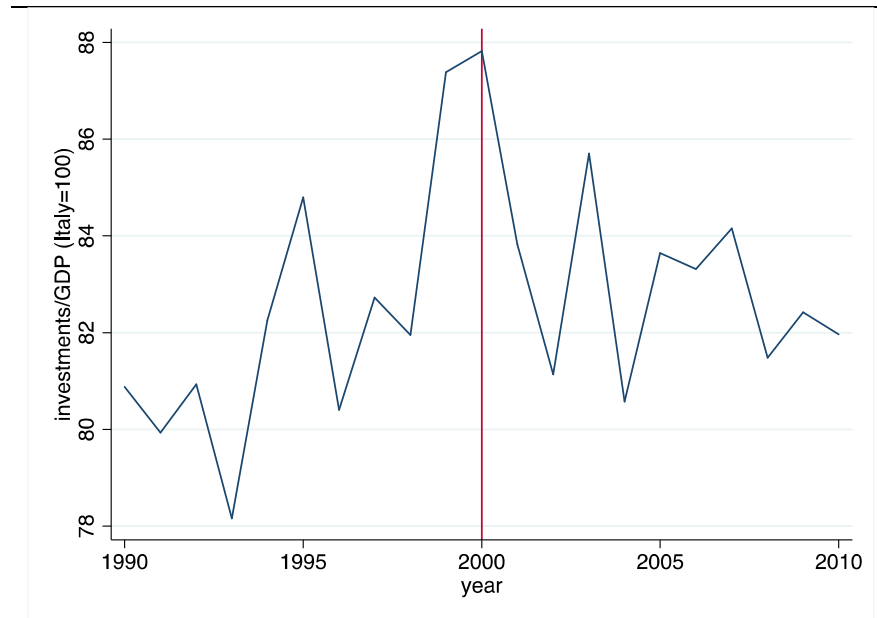
**Table 3. Balancing properties**

<i>Variable:</i>	<i>Rome</i>	<i>Italy</i>	<i>Synthetic province (base)</i>	<i>Synthetic province (full)</i>
Value added per capita	30,661	21,107	30,817	30,827
Capital stock per capita	220,680	141,248	233,639	231,939
Employment rate	0.511	0.522	0.579	0.588
Population density	695,8	232,6	822,1	834,3
Share of graduated	0.096	0.052	0.063	0.066
Share of industrial sector	0.109	0.266	0.293	0.246
Share of construction sector	0.059	0.088	0.084	0.082
Share of private service sector	0.530	0.390	0.427	0.464
Share of public sector	0.300	0.247	0.193	0.204
Export over value added	0.040	0.148	0.198	0.173
Social capital	-0.032	0.001	0.691	0.715

Data refers to the mean over the five years before the Great Jubilee (1995-1999); the figures for the base and the full synthetic province refers to the weighted average of the same variables for the subsample of provinces that are used to build the synthetic control using a parsimonious or a richer set of predictors, respectively. Base specification includes capital stock per capita, employment rate, share of graduates and population density; full specification adds export orientation, sectoral shares and social capital.

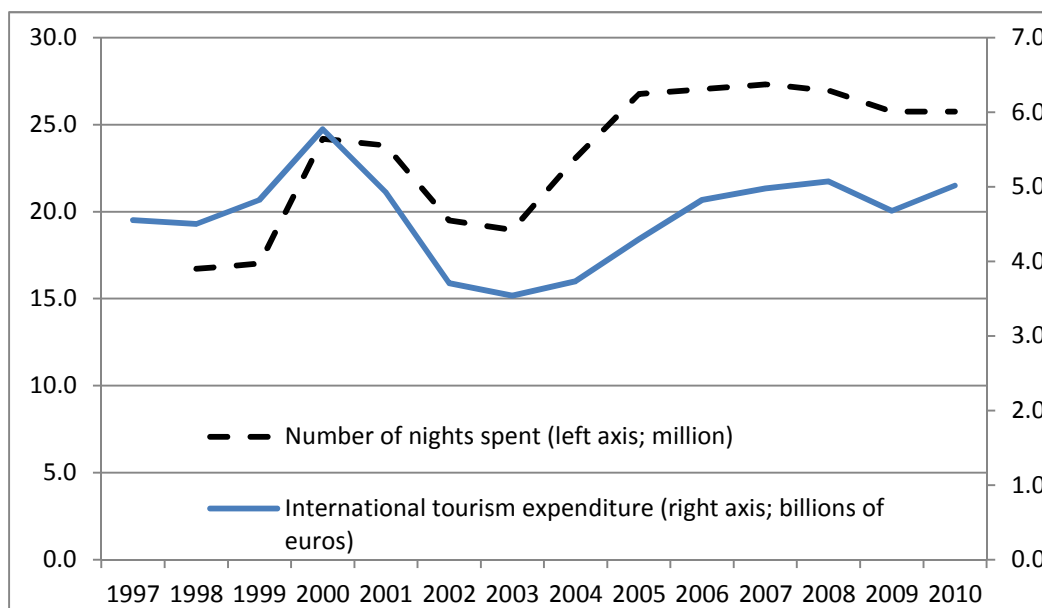
## Figures

**Figure 1a. Investment rate**



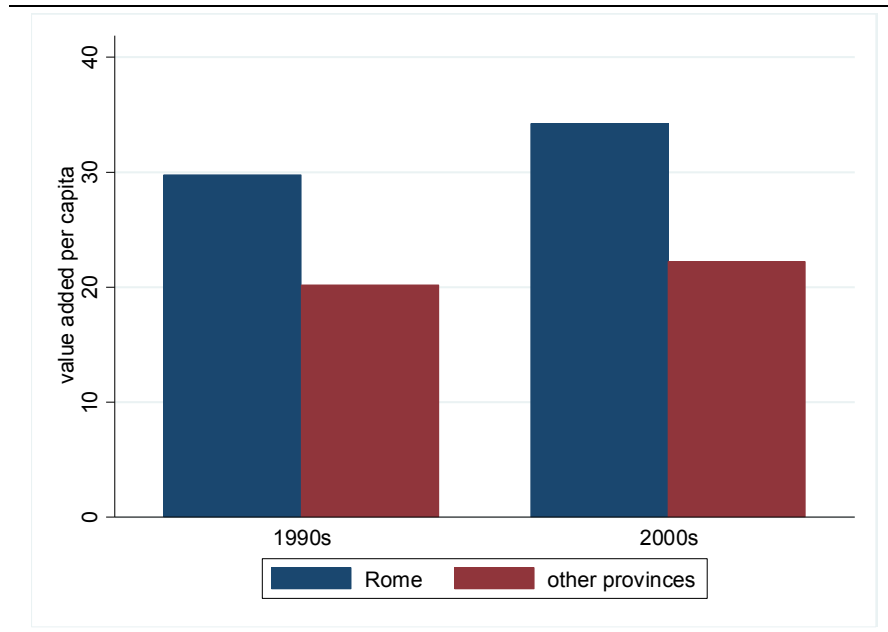
Investment over GDP for Latium (relative to Italy).

**Figure 1b. International tourism in Rome**



Sources: Istat (n. of nights spent) and Bank of Italy (expenditure)

**Figure 2. Descriptive evidence**

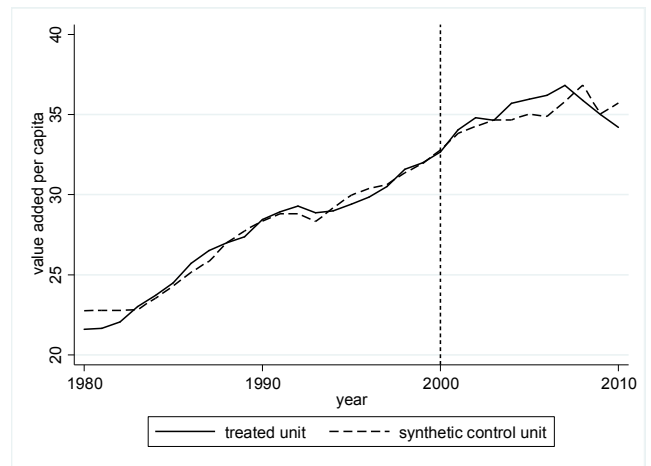
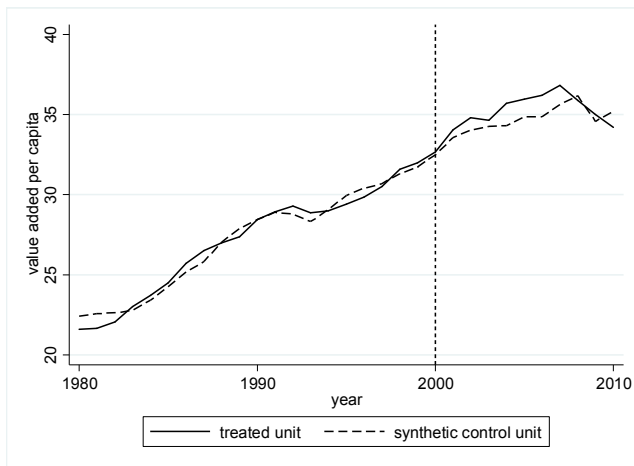


Value added per capita of the treated province (Rome) and (the average) of other Italian provinces, before and after 2000.

**Figure 3. The impact on the value added: baseline**

(a) Base

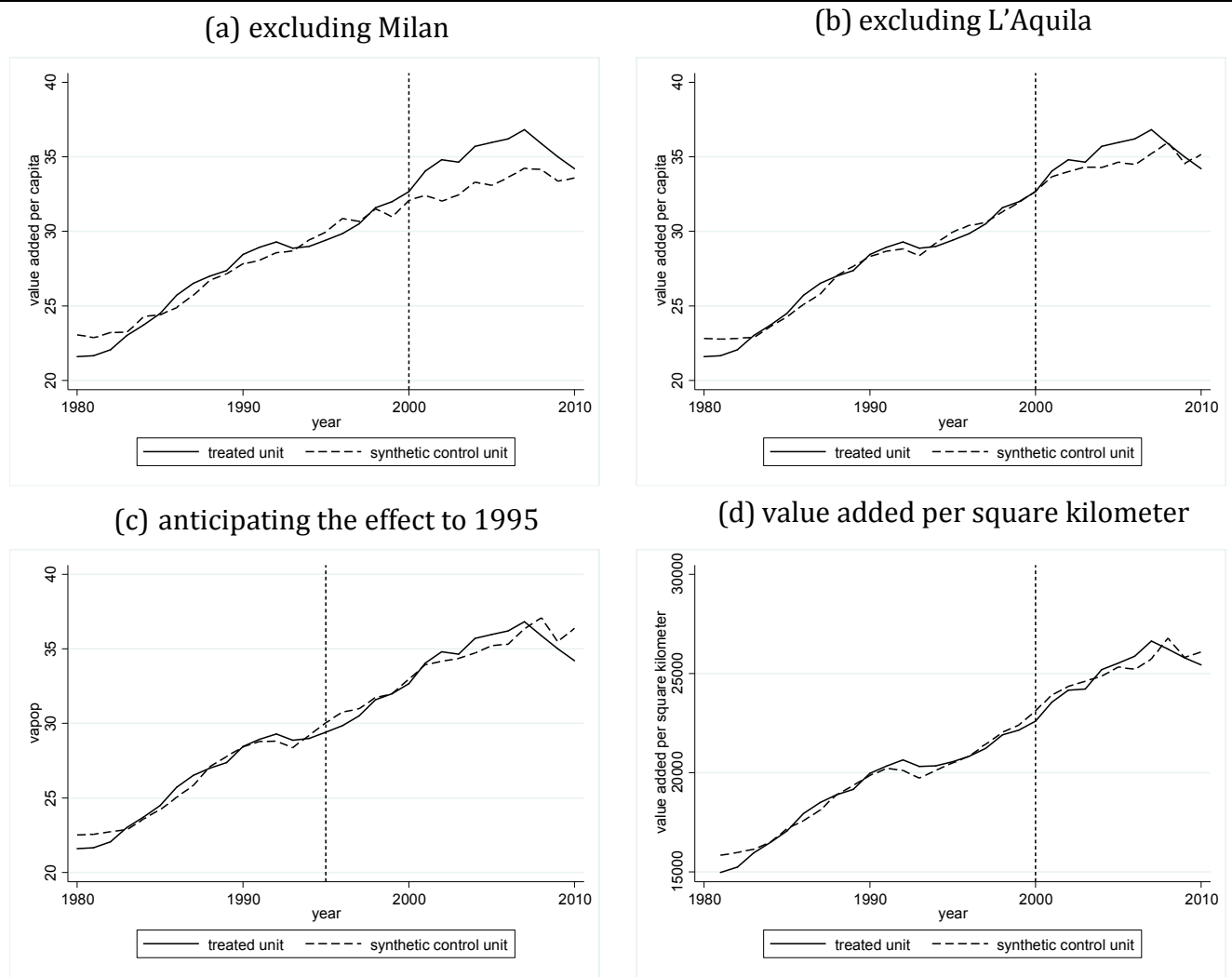
(b) full



Value added per capita of the treated province (Rome) and of the synthetic control built using a base specification (a) and a full specification (b). Base specification includes capital stock per capita, employment rate, share of graduates and population density; full specification adds export orientation, sectoral shares, and social capital. The weights used to build the two synthetic controls are presented in Table 2.



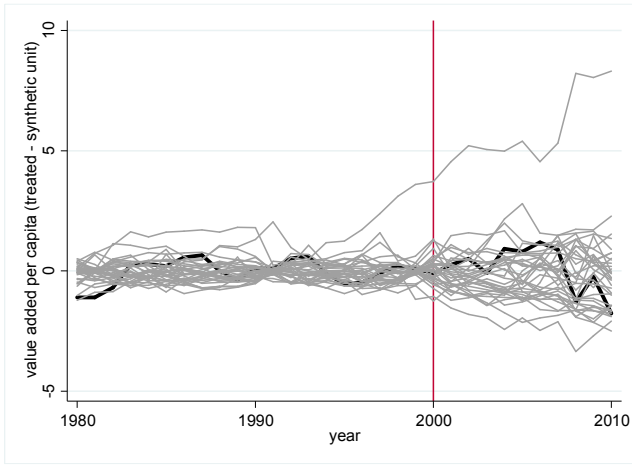
**Figure 4. The impact on the value added: robustness**



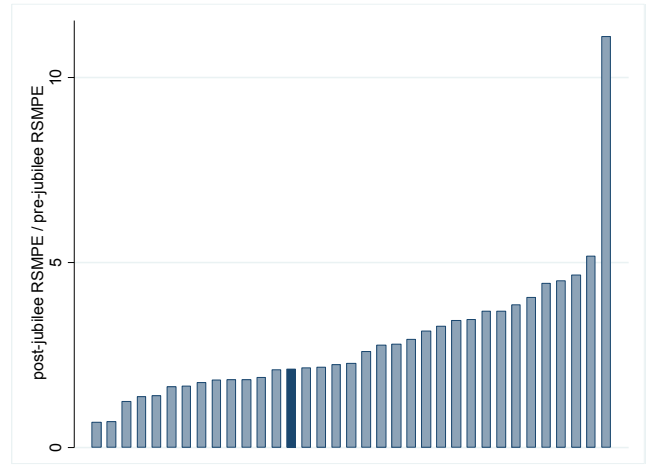
Value added per capita of the treated province (Rome) and of the synthetic control built using a specification excluding the province of Milan (a), excluding the province of L'Aquila (b), anticipating the effect of the Great Jubilee to the year 1995 (c) and using valued added per square kilometer (instead of per capita) as outcome variable (d). Each specification includes among predictors capital stock per capita, employment rate, share of graduates, population density, export orientation, sectoral shares and social capital.

**Figure 5. The impact on the value added: inference**

(a) placebo gaps



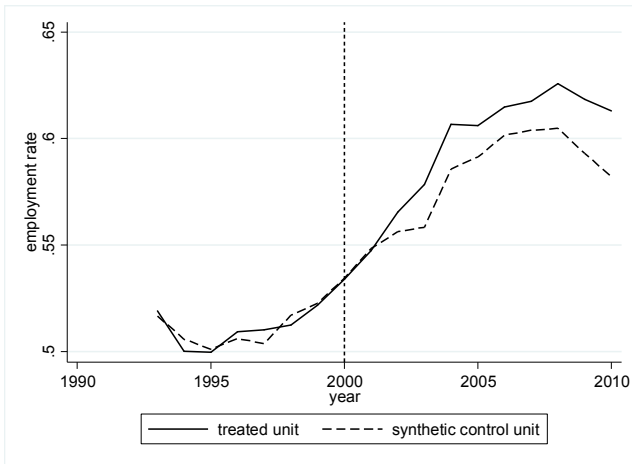
(b) post/pre-Jubilee RSMPE



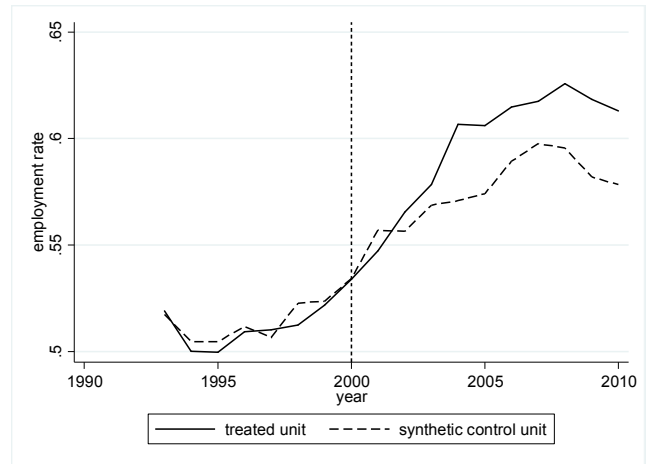
Placebo gaps are the difference between the outcome in the treated unit and in the corresponding synthetic unit; post/pre-Jubilee RSMPEs are the ratio between the root squared mean prediction errors after and before the Great Jubilee. We consider Rome (the black line in the left panel and the darker bar in the right panel) and 35 control provinces (those with a population above 500,000 before 2000).

**Figure 6. The impact on employment: baseline**

(a) base

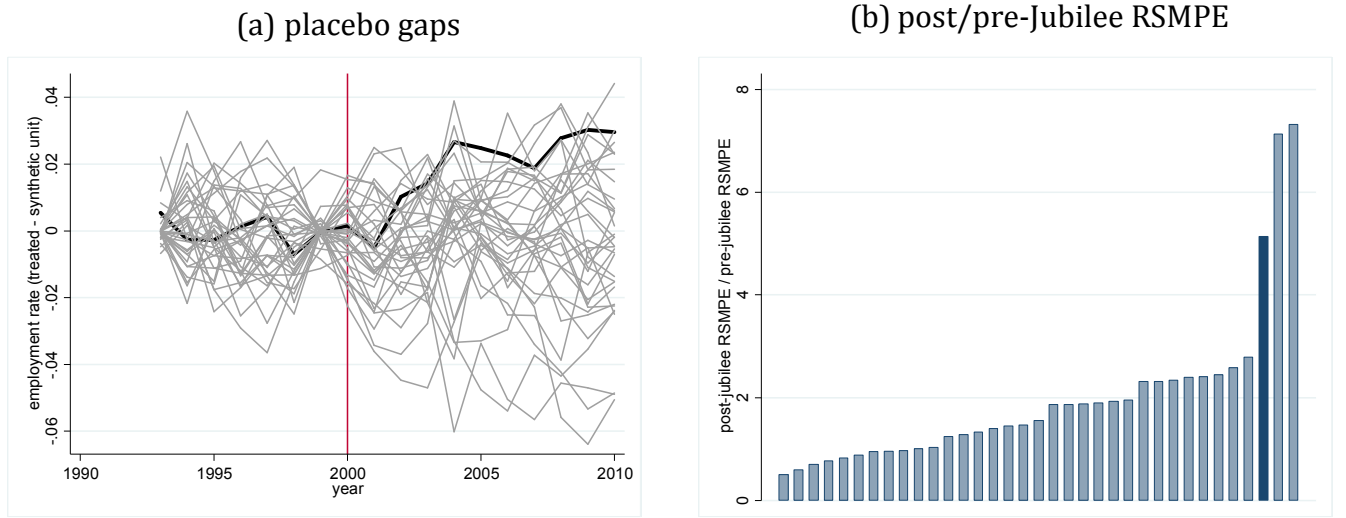


(b) full



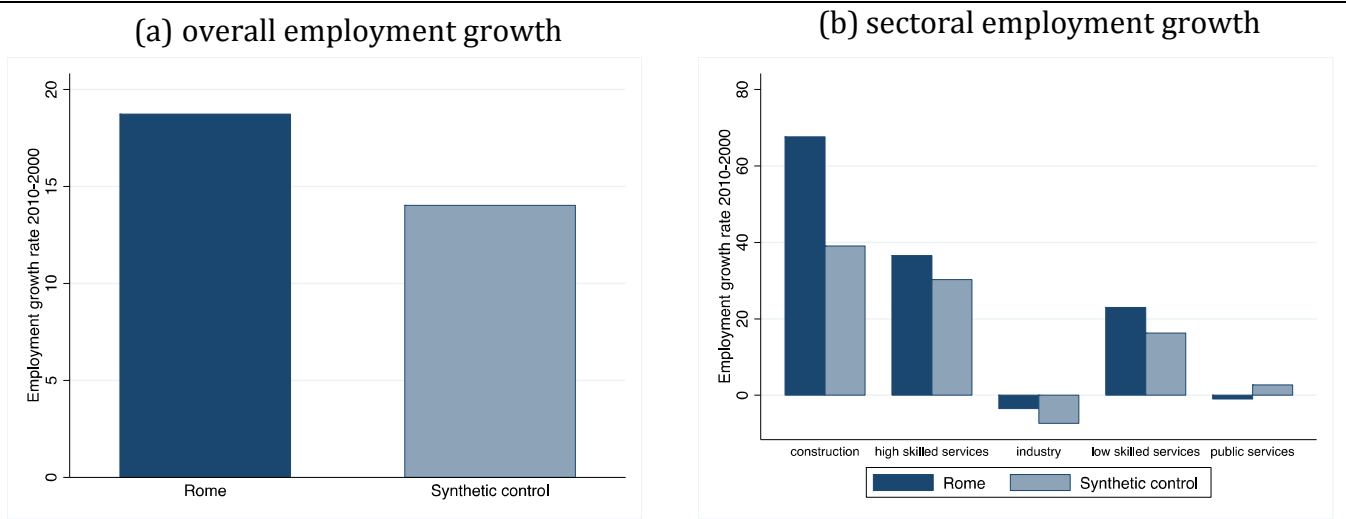
Employment rate of the treated province (Rome) and of the synthetic control built using a base specification (a) and a full specification (b). Base specification includes value added per capita, capital stock per capita, share of graduates and population density; full specification adds export orientation, sectoral shares and social capital.

**Figure 7. The impact on employment: inference**



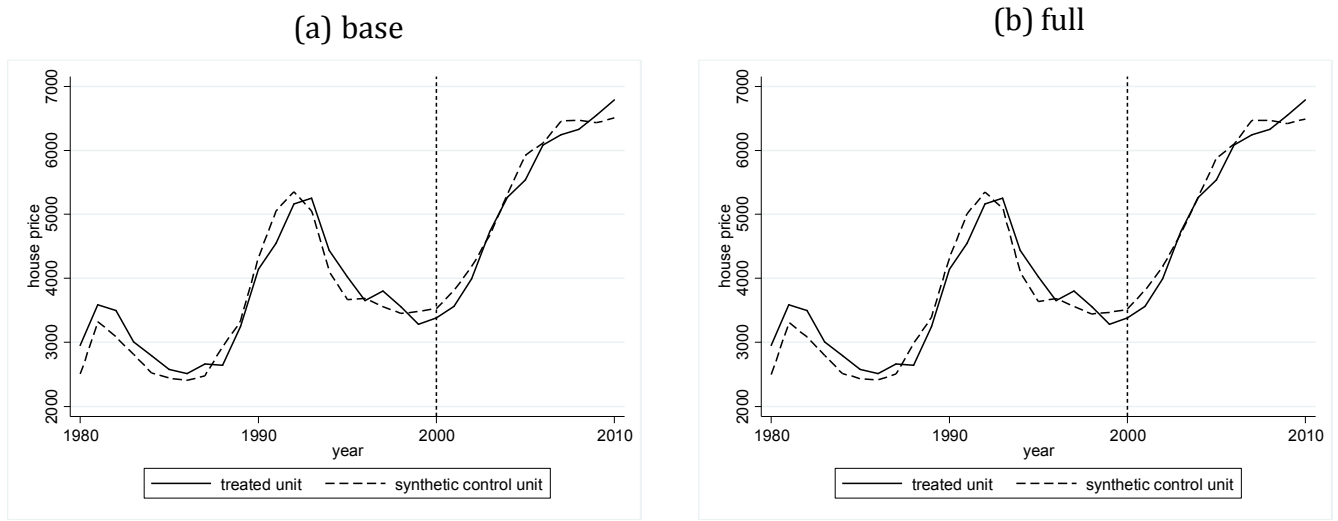
Placebo gaps are the difference between the outcome in the treated unit and in the corresponding synthetic unit; post/pre-Jubilee RSMPEs are the ratio between the root squared mean prediction errors after and before the Great Jubilee. We consider Rome (the black line in the left panel and the darker bar in the right panel) and 35 control provinces (those with a population above 500,000 before 2000).

**Figure 8. The impact on employment: sectoral evidence**



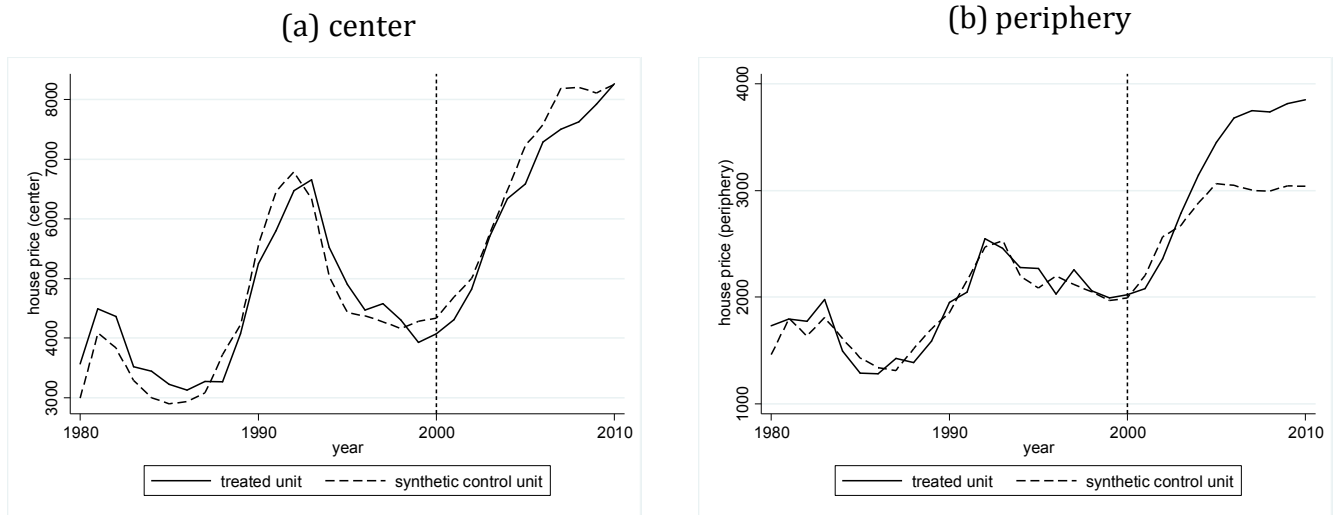
Employment growth, with sectoral breakdown, for the province of Rome and its synthetic counterparts.

**Figure 9. The impact on house price: baseline**



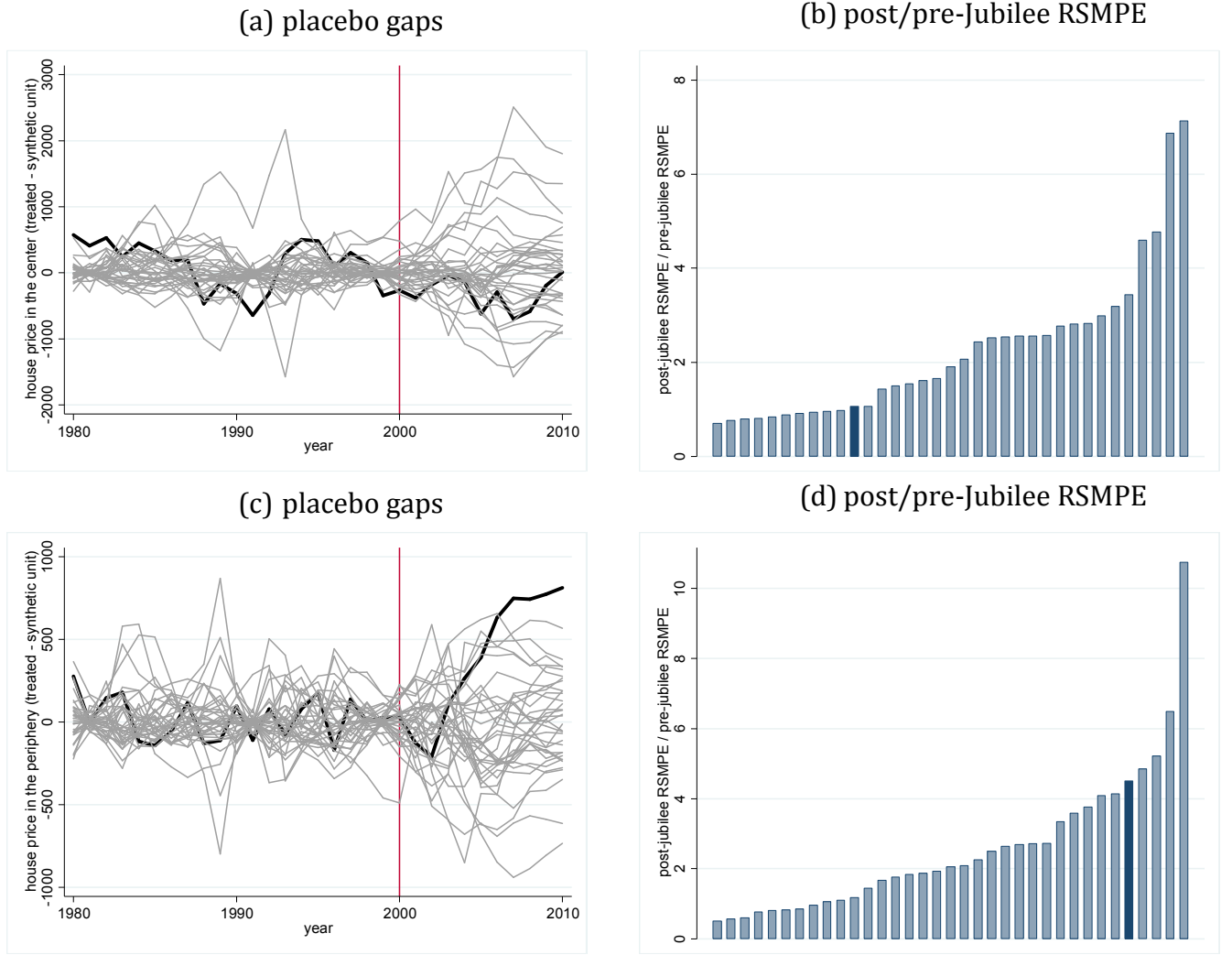
House price per square meter of the treated province (Rome) and of the synthetic control built using a base specification (a) and a full specification (b). Base specification includes value added per capita, employment rate, share of graduates and population density; full specification adds export orientation, sectoral shares and social capital.

**Figure 10. The impact on house price: center vs. periphery**



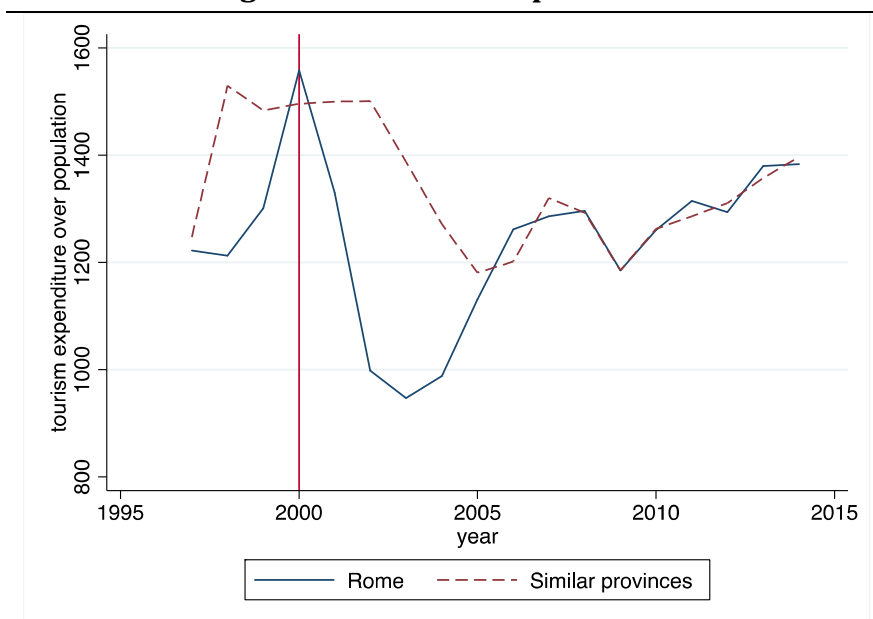
House price per square meter in the center and in the periphery of the treated province (Rome) and of the synthetic control. Each specification includes value added per capita, employment rate, share of graduates, population density, export orientation, sectoral shares and social capital.

**Figure 11. The impact on house price: inference**



Placebo gaps are the difference between the outcome in the treated unit and in the corresponding synthetic unit; post/pre-Jubilee RSMPEs are the ratio between the root squared mean prediction errors after and before the Great Jubilee. We consider Rome (the black line in the left panel and the darker bar in the right panel) and 35 control provinces (those with a population above 500,000 before 2000).

**Figure 12. Tourists expenditure**



Expenditure of foreign tourists (over population) for the province of Rome and for a group of similar provinces (see the text for further details).