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No blessing, no curse? On the benefits of being a resource-rich southern region of Italy*

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No blessing, no curse? On the benefits of being a resource-rich southern region of Italy*

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Abstract

The aim of this research is to examine the economic effects of natural resources in Basilicata, a southern region of Italy. The paper focuses on the economic effects of large-scale oil extraction that started in 1999. I proceed by systematically constructing a comparison unit for Basilicata using synthetic control techniques. The comparison unit's economic parameters capture how Basilicata's economic activities would have evolved in the absence of the oil extraction industry. The comparison between real GDP per capita in Basilicata and in its comparison unit suggest that a large amount of oil extraction, at times peaking at 50 barrels per capita per year, has no detectable effect on Basilicata's economic performance.

JEL Codes N54, O13, Q32, R15, R58.

Keywords Natural resources, Oil royalties, Regional development, Synthetic Control Method, Basilicata.

1 Introduction

"Call your men back, let them return from wherever they migrated to, and tell them that finally there will be jobs for them, here."¹ These optimistic words were pronounced by a

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¹This is a direct translation, by the author, of Enrico Mattei's last speech in the small town of Gagliano Castelferrato on 27.10.1962, as reported in the local newspaper SUD. The same day, E. Mattei

euphoric Enrico Mattei, an Italian public administrator and industrialist who developed the Italian fossil fuels company Ente Nazionale Idrocarburi (ENI) into a multinational company, when the first oil drilling activities were starting during the 1960s in the southern Italian region of Basilicata². At that time, the regional economy of Basilicata relied on traditional activities such as agriculture and low-skilled, labour-intensive manufacturing industries³. In some sense, Mattei's enthusiasm was justified. The size of the endowment and its economic value are enormous. Today, the main oil fields of Val D'Agri and Tempa Rossa are estimated to be the largest onshore fields in continental Europe (ENI, 2012), with extraction of approximately 80,000 barrels of oil per day (around 50 barrels per year per regional inhabitant). It is natural that policy-makers and the local population regarded the exploitation of the newly found oil reserves as an opportunity for economic development that should not be missed.

The main objective of this research is to investigate whether the exploitation of those oil fields, which has expanded at an unprecedented rate since the end of the 1990s, has on aggregate boosted economic development in Basilicata as compared to other southern regions of Italy. Estimating the impact requires us to answer the counterfactual question: how would the economic indicators of Basilicata have evolved in the absence of oil discovery and extraction? This is interesting partly because none of the existing papers answer this question, and partly because the economic impacts of such resources are often hard to predict beforehand.

Common sense would suggest thinking about the direct and indirect mechanisms that might be useful in making qualitative predictions. The oil adventure could generate economic development through its direct impact on the volume of the regional economy. The magnitude of this impact can be estimated, for example, through the effects on regional per capita income and employment rates, as well as physical investment of firms. Moreover, the imposition of royalties either on resource extraction quantities or on the value of resource production could generate revenues for local authorities; these revenues could indirectly impact the regional economy by financing a broad spectrum of economic policies. Nevertheless, the economics literature summarized by van der Ploeg (2011) has documented a number of cases in which exploitation of natural resources is associated with adverse economic effects for general economic welfare. The adverse effects can work through regional Dutch Disease, institutional corruption, or conflicts, among other channels. As a consequence, it is hard to predict the economic effect of large-scale oil extraction in Basilicata based on theory or experience from other countries. Thus,

died in a suspicious airplane crash. His last speech can also be found in the movie *The Mattei Affair* (1972).

²A socio-economic and political inquiry into the Basilicata region during the post-war period is provided in Banfield (1958).

³Basilicata, together with other southern regions of Italy, is labeled by the EU as an "Objective 1" region and receives substantial support for economic development and investment in infrastructure. In addition, the EU has a policy of promoting the use of indigenous natural resources. In 2000, the European Investment Bank approved a loan of 200 million Euros to ENI for the development of two large on-shore fields in the region of Basilicata.

the goal of this paper is to examine whether the exploitation of the resource has had a detectable effect on broad and aggregate economic indicators, focusing on Basilicata⁴.

The most relevant literature is the small but growing research base that deals with management of non-renewable natural resources at the sub-national level. Caselli and Michaels (2013), Papyrakis and Gerlagh (2007), Papyrakis and Raveh (2014), James and Aadland (2011), Kan et al. (2014), Borge et al. (2013), Percoco (2012), and Rocchi et al. (2014) focus on economic effects of natural resources on different sub-national entities (federal states, regions, provinces, municipalities).

Caselli and Michaels (2013) closely study a case from Latin America. Their focus is the effect of natural resource revenues on public services at the smallest administrative entity in Brazil - the municipality. They examine whether the royalties from oil revenues have affected the spending decisions of local authorities, the provision of public services, and benefits in terms of income and welfare for the local community. Their results suggest that, despite reporting large changes in expenditures on urban infrastructure, education and health services, no corresponding change resulted in the economic and social outcomes that the spending was meant to improve.

Similarly, Papyrakis and Gerlagh (2007), Papyrakis and Raveh (2014) and James and Aadland (2011) examine specific cases from North America. Papyrakis and Gerlagh (2007) tested the resource curse hypothesis by focusing on the U.S. and showing that the curse is also present at the state level in a federal system. They claim that resource-rich states perform comparatively worse in terms of economic growth compared to resource-poor states. Papyrakis and Raveh (2014) focus on Canadian provinces in order to investigate the existence of a regional Dutch Disease. They find that some of the standard Dutch Disease mechanisms are indeed present at the cross-provincial level. James and Aadland (2011) examine outcomes in U.S. counties and test whether the resource curse is present at the county level. They claim that natural resource earnings have had a statistically significant negative effect on economic growth for counties.

Kan et al. (2014) push the literature one step further by studying a case from Asia. They focus on a cross-province sample within China, using two different measures of resource abundance. Unlike the cases from North and Latin America, Kan et al. (2014)'s results suggest that resource abundance might have a positive effect on economic growth, depending on institutional quality. Surprisingly, the positive effects appeared to be stronger for provinces with poorer institutional quality.

Borge et al. (2013) advance the literature by adding a case from Europe. They focus on Norwegian municipalities' endowment of hydroelectric power potential and find supporting evidence for the claim that higher natural resource revenues retard efficiency, although no more than revenues derived from other sources.

To the best of my knowledge, the research that is closest to this work is that of Percoco (2012), who also focuses on the economic effects of oil on Basilicata's economy. His empirical work provides within-region estimates of the per capita number of new

⁴For a methodological discussion clarifying the meaning and explaining the utility of the case study method, see Gerring (2004).

enterprises that were created in the municipalities in which oil fields were physically established (the treatment group) as compared to the rest of the region's municipalities (the untreated group). His results suggest that enterprise creation was slightly higher than the average in the areas of oil extraction activity. Although enterprise creation might have increased, it is not clear whether the new enterprises have shifted from other areas of Basilicata or are entirely new; the latter case would mean additional returns for the overall economy. Complementary to Percoco (2012), I ask whether the extra enterprise creation in the oil-extracting areas has had any payoff at the aggregate level for Basilicata⁵.

This paper advances the literature in two ways. First, it offers new sub-national evidence from Europe about the resource curse and expands the coverage of the literature from Latin and North America, Asia and Europe. Second, it represents the first empirical attempt to test for a regional resource curse using a quantitative comparative case study. In other words, I address the problem associated with the appropriate choice of comparison unit that plagues many of the existing studies⁶ by employing state-of-the-art techniques to obtain better estimates of the economic effects of natural resources. This approach helps address key econometric problems, such as institutional differences, that plague cross-country studies. In addition, this work aims to capture general equilibrium effects that are often missing in case studies of the resource curse where comparison units have been generated by quasi-natural experiments. Furthermore, the results of this paper help answer the question of whether income is the most binding constraint for the regional economic development of Basilicata. Specifically, the findings can illuminate whether the poor economic performance of regions in southern Italy is driven by lack of productive resources or by something else, and whether the EU's goals for economic development in targeted regions (Objective 1) can be achieved by channeling more resources into the regions.

The rest of the paper is organized as follows: section 2 introduces the economic shock whose effect the paper focuses on and describes the empirical strategy aimed at estimating the counterfactual; section 3 presents the empirical results; section 4 discusses alternative explanations of the results; and section 5 concludes the paper.

⁵Using an input-output approach (a Social Accounting Matrix or SAM), Rocchi et al. (2014) examine the socioeconomic impacts of royalty revenues on the development of different economic sectors in Basilicata. To this end, they build a multi-sectoral model of the regional economy and explore the impact of resource revenue shocks during a given period of time. They suggest that royalty revenues had a negligible overall economic impact whenever channeled through the regional government. In addition, they propose that a more effective public use of the revenues could be that of financing investment projects, which would more broadly enhance regional competitiveness. Unlike Rocchi et al. (2014), who make ex-ante assumptions about functional forms, the current paper approaches the problem econometrically, i.e., it examines whether the observed data demonstrate a strong and positive effect of natural resources on the economy of the Basilicata region. I believe that this approach is better suited to estimate the dynamic multiplicative effects that the oil adventure might have had on Basilicata's economic performance over time.

⁶See Mideksa (2013) for a detailed discussion of similar econometric problems with the existing resource curse literature.

2 The Strategy of Estimating the Counterfactual

Let us start by introducing the magnitude of the oil adventure for Basilicata. Notwithstanding the intense exploration activities in the 1970s, the amount of total oil extraction by the early 1980s and 1990s was still limited. Figure 1 plots the per capita extraction of barrels of oil in Basilicata since 1980 (source: UNMIG; further details in Data Appendix B). As can be seen from Figure 1, extraction volume begins rising substantially after 1999 until it reaches the noteworthy level of 50 barrels of oil per capita per year in the mid-2000s at the peak of extraction (this contributes to the choice of 1999 as the treatment year, as explained later on in this section):

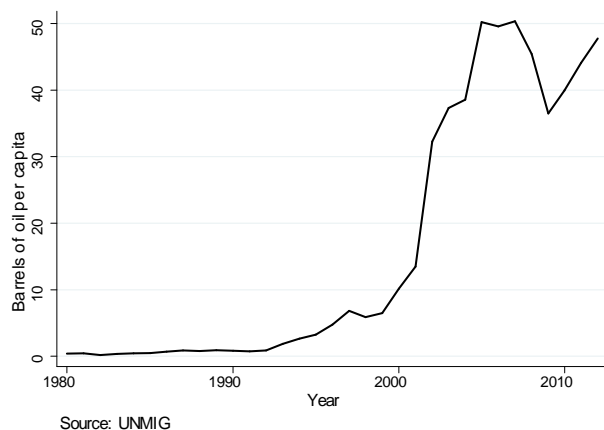


Fig. 1 Oil extraction in the Basilicata region

In order to formulate the scope of this work in a concise way, I propose the following testable hypothesis:

H: *All else being equal, intensive exploitation of oil fields and greater resource revenues have led to a higher degree of regional economic development in Basilicata, expressed by private investment, employment and real GDP per capita.*

The implicit assumption underlying this null hypothesis is that the amount of oil extraction is significant and thus it is natural to expect some positive effects on gross fixed investments, employment rates and real GDP per capita of the regional economy.

2.1 Royalties and regional revenues

A closer look at institutions in Basilicata and their relationship with the Italian state is needed here. A possible objection could be raised about the set-up of the current study: it is common knowledge that the fraction of resource revenues directly accruing to sub-national institutions crucially depends on the specific terms of the institutional agreements in place with the state. In other words, the agreement that the region of Basilicata stipulates directly with the Italian state and indirectly with extractive oil companies plays a decisive role for the research question of this paper. In a state with a

low overall degree of fiscal federalism, as in Italy, the bargaining power of the regions is limited and therefore the impact of royalty resource revenues on the regional government budget might also be limited. According to the current legislation for royalties charged on mineral extraction activity in Italy, the general institutional framework operates as follows:

Variable	Location	Net value based royalties
Oil production	<i>Onshore</i>	7%
	<i>Offshore</i>	4%
Gas production	<i>Onshore</i>	7%
	<i>Offshore</i>	7%
Revenue's benefiter		State (30%); Region (70%)

(1)

The basic rule described in (1) prescribes that a royalty tax of 7% is charged by Italian authorities on the value of *onshore* oil extraction activities (the case of Basilicata). The state holds 30% of the subsequent revenues and transfers 70% to the regions in which the extraction activity has taken place⁷.

What is decisive for the scope of the current study is a subsequent piece of legislation (Law 140/1999) which provides that, in the case of the southern regions of Italy, the 30% originally destined for the state has to be transferred to the regions. This implies that the whole of the 7% of oil production value in Basilicata has actually accrued to the regional government of Basilicata from 1999 onward. This further contributes to the choice of 1999 as the treatment year, as explained later on in this section. According to the author's estimations, the total value of the resource revenue for the regional government in the period 1999 – 2009 is approximately 590 million Euros. In my view, this confirms the validity of the research question, in the sense that the economic impact of the royalty allowance on the regional economy can be investigated regardless of further reference to redistribution schemes between regions and the Italian state.

2.2 On the choice of the best comparison unit

The task of estimating impact involves figuring out the right counterfactual that would describe the evolution of the treated unit in the absence of the treatment. Ideally, the outcome in the counterfactual scenario is estimated using a research design that randomly assigns treatment between the treatment and control groups. Unfortunately, the data generating process of natural resource endowment, discovery and extraction does not often happen in a way that satisfies the necessary conditions for sound statistical estimation. By definition, such interventions in an economy are never driven by an ex-ante research design that lends itself to proper causal impact evaluation. As a result, esti-

⁷Although this piece of legislation, in place since 2009 (Law 23/07/2009 n.99), has replaced the previous laws from 1996 and 2002 (Law 25/11/96 n.625 and 23/08/04 n.239), the royalty tax to be paid to the authorities for onshore oil extraction has been constant at the 7% level.

inating the economic impact requires a compelling counterfactual or the best comparison unit.

The issue of choosing the right comparison unit has been a central challenge to the literature of program evaluation in general and comparative case studies in particular. In the absence of best comparison units by research design, the path-breaking research by Card (1990) focuses on the labor market impacts in Miami of the Mariel boat lift of Cuban immigrants. Card (1990) proposed a comparison unit consisting of the average outcome of a group of units similar to the treatment unit but without the treatment, i.e., five southern cities with labor market outcomes similar to those of Miami before the arrival of Mariel boat lift immigrants. The key insight is that, even if the intervention of immigration was not randomly assigned to Miami relative to other cities, a comparison unit based on the average outcomes of similar cities can do a better job of functioning as the right comparison unit than a unit based on heterogeneous cities. Once similar comparison units are chosen, one can estimate the differential impact of the shock on Miami's labor market using the Differences-in-Differences estimator (DiD, hereafter).

Abadie et al. (2014) argue that the choice of the comparison units and average outcome in Card (1990) is to some extent subjective; they suggest that, by generalizing the DiD estimator using matching estimators, one can obtain the best comparison unit in a more rigorous way. This strategy has been labeled the Synthetic Control Method (SCM, hereafter). They argue that the comparison unit generated in this way often does a better job of replicating the outcomes of the treatment unit in the absence of the treatment and avoiding the extrapolation bias that plagues the standard regression-based estimators. Abadie et al. (2014) systematize this issue by developing an algorithm that constructs a best comparison unit based on a *donor pool* of potential comparison units, using a data-driven approach. The comparison unit in the SCM is therefore selected as a weighted average of the potential comparison units that have characteristics similar to the treated unit before the introduction of the treatment. Once the synthetic comparison unit has been constructed, the effect of the treatment can be estimated by comparing the time path of the treated unit to its counterfactual generated through the SCM.

2.3 Empirical strategy

The identification problem faced by the current study is that the effect of the treatment depends on the outcomes in both the actual Basilicata and a hypothetical, unobservable Basilicata in which oil extraction activity has never taken place. The empirical strategy adopted to overcome this limitation exploits the fact that, throughout the period of analysis, Basilicata produced a fraction close to unity of all the oil extracted in southern Italian regions⁸. Hence, comparing Basilicata with a control group of southern Italian regions is the methodology chosen to estimate the aggregate effect of oil extraction ac-

⁸More precisely, the share of oil produced by the oil fields in Basilicata constantly oscillated between 70% and 75% of the whole Italian yearly production of crude oil (Ministry of Economic Development, Directorate-General for Mineral and Energy Resources UNMIG).

tivity on the treated regional economy. The choice of a comparative case study at the level of regions is meant to avoid controlling for cross-country differences that usually contaminate empirical analyses at country levels.

I collected macroeconomic data on real GDP per capita and its conventional determinants such as indicators of capital stock, education level, employment, population size and value-added shares of different economic sectors⁹. The intervention is defined as the large-scale extraction of oil in the southern Italian region of Basilicata, from 1999 onward. The dataset 1980 – 2009 is therefore divided into a pre-treatment period, 1980 – 1998, and a post-treatment period, 1999 – 2009, in order to estimate the treatment effect on post-treatment regional macroeconomic outcomes.

The 6 southern Italian regions of Molise, Campania, Calabria, Apulia, Sicily and Sardinia¹⁰ make up the donor pool of potential comparison units. The 6+1 (with Basilicata) southern Italian regions are often referred to in Italian public debate as "Mezzogiorno"¹¹ and share the same structural economic problems, compared to the more developed regions of the center-northern part of the country¹².

The choice of the donor pool is also informed by a methodological note by the Bank of Italy (2012) about regional economic outlooks, in which 88 European regions were divided into 4 clusters to ensure within-group homogeneity in terms of citizens' purchasing power, employment rates, shares of value added in agriculture and industry, and number of employees working in sectors with medium-high and high technological progress with respect to the total number of regional employees. The cluster that includes regions with lower employment rates, lower purchasing power and relatively higher value-added shares in low-technology sectors comprises 5 Spanish, 3 French and 7 southern Italian regions, including the islands of Sicily and Sardinia. These 7 southern Italian regions constitute the group of interest.

To begin, consider the case in which the dependent variable is GDP per capita at constant prices. Conventional determinants of GDP per capita mentioned above are employed as predictors. The algorithm of the SCM assigned the following weights to the

⁹The choice of these macroeconomic variables is based on economic growth literature as summarized in Barro and Sala-i-Martin (2004).

¹⁰Fig. 8 in Appendix C shows the geographical location of the 7 southern Italian regions of interest.

¹¹Trigilia (2012) analyses in depth the reasons behind the chronic economic backwardness of the Italian Mezzogiorno, despite decades of considerable investments by the state.

¹²Abadie et al. (2014) advises selecting the group of potential comparison units by including those units that are driven by the same structural characteristics but are not contaminated by the structural shocks caused by the intervention.

comparison units of the donor pool¹³:

Region	Synthetic control weights
Campania	0
Molise	.253
Apulia	.457
Sardinia	.003
Sicily	0
Calabria	.287

(2)

As is shown in (2), the best comparison unit based on the SCM appears to be a convex combination of some of the regions of the donor pool, with the exclusion of Campania and Sicily. The SCM delivered positive weights for Molise (0.253), Apulia (0.457), and Calabria (0.287) but a negligible (0.003) for Sardinia. In the next section, results of the application of the SCM are presented.

3 The effect of the treatment

Once the synthetic comparison unit has been rigorously generated, the next task is to compare the time path of income per capita of the treated Basilicata with the income per capita of the synthetic control unit. The implicit assumption is that the economic shock described by Figure 1 in the previous section is significant and can in theory affect the per capita income of residents in Basilicata.

In order to investigate the impact of the treatment, Figure 2 presents the trajectory of real per capita GDP for Basilicata and its synthetic control unit before and after:

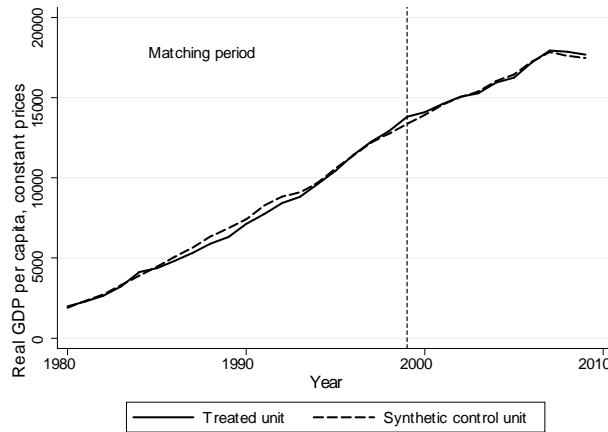


Fig. 2 The effect of oil on real per capita GDP

¹³Further details about implementation of the algorithm of the Synthetic Control Method are described in Appendix A. Dataset and do-files are available from the author on request. Statistical software package developed by Abadie et al. (2011, 2014) is available online at <http://stanford.edu/~jghain/software.htm#Synth>

The solid line indicates the real per capita GDP with treatment (the actual Basilicata) whereas the dotted line represents real per capita GDP in the synthetic control unit. The pre-treatment difference between the treated unit and the control unit is minimized by construction. In other words, the SCM does a satisfactory job in constructing a synthetic control unit that closely replicates the outcome of interest for the treated unit in the matching period.

More interestingly, there appears to be no perceptible difference between the real GDP per capita of Basilicata and its synthetic control unit in the post-treatment period. Thus, the effect of oil extraction as described by Figure 1 appears to be practically insignificant. In addition to evaluating the effects on per capita GDP as seen above, I also examined whether the resource had affected other important variables such as private investment or employment in the region. Figures 3 and 4 present the employment rate and the gross fixed investment in Basilicata as compared to those of the synthetic control unit¹⁴.

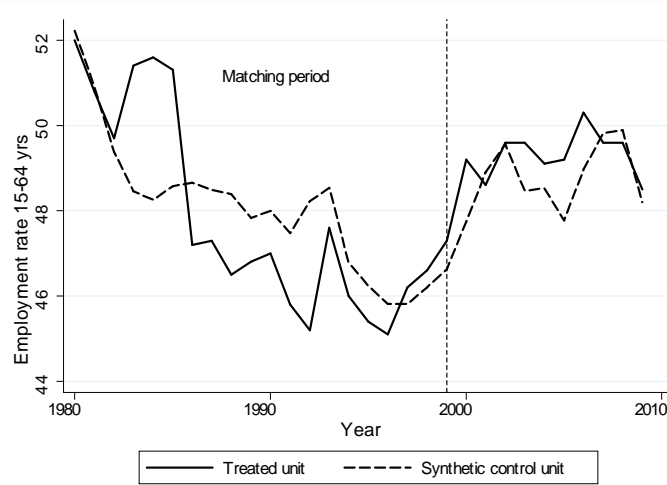


Fig.3 The effect of oil on employment rate

¹⁴For all three dependent variables - real GDP per capita, employment rate and gross fixed investment - the synthetic control weights and economic growth predictors for both the treated and the synthetic unit are given in Appendix C.

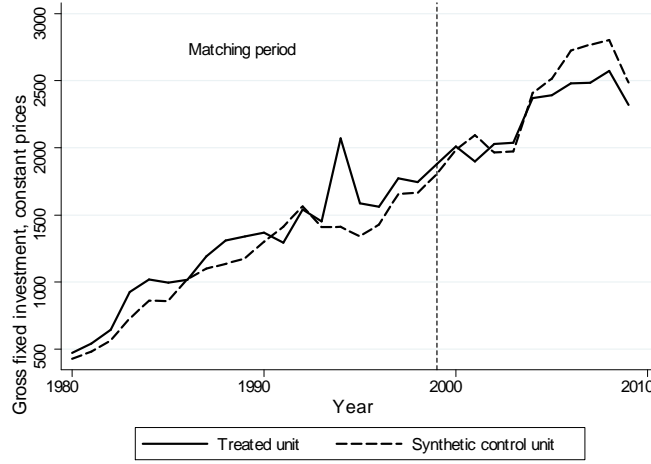


Fig. 4 The effect of oil on gross fixed investment

Again, similar to the result for per capita GDP, the effect of the treatment on employment or investment is practically insignificant. The null hypothesis of positive causal effect of oil extraction on the regional macroeconomy of Basilicata is therefore rejected on the basis of the empirical analysis¹⁵.

In order to make better sense of these results, let us provide a back-of-the-envelope calculation of the potential impact that royalty revenues could have had on the regional economy of Basilicata. In other words, I set aside for a moment the potential direct effect on macroeconomic variables and concentrate exclusively on royalty revenues. For this purpose, I rely on my own calculations based on macroeconomic data obtained from the Italian Statistics Institute (ISTAT) and on oil extraction and royalties data from the Italian Ministry of Economic Development, General Directorate for Energy and Mineral Resources (UNMIG) (further details on these time series are in Data Appendix B). The estimation of the value of resource production shows that the value of oil produced increased from 107 Euros per capita in 1999 to 2,898 Euros per capita in 2008 (in constant prices). To demonstrate the scale, the ratio of the value of oil production per capita to total regional per capita GDP increased from 1 % in 1999 to 16 % in 2008.

It is also important to verify that regional income from royalties was not undone by offsetting changes in other regional taxation income sources. In order to do so, Figure 5 plots the relative magnitude of regional royalty revenues with respect to aggregate regional tax revenues (net of royalties):

¹⁵Abadie et al. (2014) point out the importance of different placebo tests (both in-time and by reassigning the treatment to each of the control units in turn) in order to verify the robustness of the treatment effect estimated by the SCM estimator. The current study rejects the null hypothesis of a sizeable effect of oil on the regional economy of Basilicata. Hence, I disregard the placebo tests as explained in Abadie et al. (2014) as a validity test for the results.

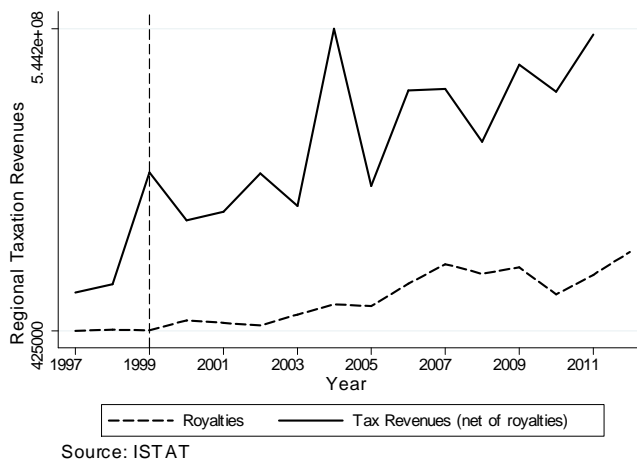


Fig. 5 Regional Taxation Revenues

The evidence from Figure 5 that aggregate regional tax revenues (net of royalties) for Basilicata increased throughout the post-treatment period seems to exclude the hypothesis that the regional government exploited greater revenues from royalties in order to decrease fiscal pressure. Note that total taxation revenues, although net of royalties, include tax revenues from labour income employed in the oil extraction activity as well as tax revenues from companies providing support and services to the extractive companies. As a further check, I conducted a descriptive analysis of regional taxation revenues for Basilicata (net of royalties) and the rest of the donor pool regions. This check indicates no significant change in the post-treatment period (either positive or negative) for the treated unit as compared to the donor pool units.

Although the main purpose of this paper is to provide empirical evidence of the treatment effect, I next provide a brief discussion of various issues that contextualize the story and illustrate some of the possible factors driving the results.

4 Discussion: the mystery of vanishing benefits

The empirical strategy implemented in the previous sections has shown that exploitation of oil fields has not (yet) brought widespread growth to Basilicata. Regardless of whether the empirical result of the current paper was to be expected based on simple observations of employment rates and economic activity indicators, it provides additional evidence of the poor performance of the regional authorities in turning Basilicata's oil adventure into a success story. The results presented up to now are silent, however, about the mechanisms that contributed to them. Mehlum, Moene and Torvik (2006) have claimed that the main explanation for poor growth performance of resource-rich countries is the quality of the institutions in place. In other words, institutions play a decisive role in how natural resources affect growth performance. The empirical part of their work concludes that a resource curse appears only for countries with inferior or grabber-

friendly institutions (say, Nigeria), whilst no indication of the curse is found for countries with producer-friendly institutions (say, Norway). In an intermediate range on the axis between bad institutions and good ones, the core result of neither blessing nor curse of the current paper is open to different interpretations. Let us therefore discuss some of the possible factors that contributed to the results of the empirical analysis.

4.1 Control rights structure

Brunnschweiler and Valente (2013) empirically investigate the effects on GDP levels of different regimes of ownership of oil extraction activity. Their analysis is carried out on a panel of 68 countries, which are divided up based on having a regime of the type Domestic Control, Foreign Control or International Partnership. They conclude that, on the aggregate level, Partnership tends to perform relatively better than the two other control rights structures.

In their panel dataset, Italy was classified as having a Foreign Control ownership regime from 1930 – 1956 and from 1995 onward, with an International Partnership in between. Under this classification, ownership over oil extraction activity was of the Foreign Control type throughout the post-treatment period of this paper (1999 – 2009)¹⁶. Thus, the control rights structure in place in Italy throughout the post-treatment period is not the International Partnership type that performs best in terms of economic development, according to Brunnschweiler and Valente (2013).

This raises the question of to what extent Brunnschweiler and Valente (2013)’s characterization of institutions for Italy as a whole can serve as a valid approximation for Basilicata. It is likely that oil extraction control structures in Basilicata are typical of Italy as a whole because Basilicata accounts for a very large fraction of yearly aggregate Italian oil production (74% in 2009, according to UNMIG). Therefore, the negligible aggregate effect of oil extraction on the regional economy appears to be in line with Brunnschweiler and Valente (2013)’s inference that a regime switch from Foreign Control to International Partnership could have benefited Italian GDP in the last two decades.

4.2 On the plague of organized crime

The socioeconomic context of the southern regions of Italy has been continuously influenced and infiltrated by organized crime, basically since the country’s unification in 1861. Economic development of these regions has consequently been inevitably interconnected with the development of criminal organizations. Pinotti (2012) provides a detailed historical overview of how Basilicata has suffered from organized crime, relative to other regions of Italy. In the 1960s and 1970s, Basilicata belonged to the group of regions enjoying steady economic growth and was catching up with the more industrialized parts of the country. However, the region suffered from a clear increase in organized crime

¹⁶Foreign Control is defined by the authors as a regime in which a foreign company owns more than 50% of the shares in the domestic oil sector.

starting in the mid-1970s. Pinotti (2012) explains this by the unfortunate geographic proximity to the historical centers of organized crime (Sicily, Campania and Calabria). He concludes that, due to crime, since the mid-1970s Basilicata has moved down to an inferior growth path that has determined its slower growth performance throughout the last decades. Pinotti (2012) examines in more detail the channels that could have contributed to decreased economic activity in Basilicata. He argues that sluggish economic performance seems to have been triggered mainly by a decrease in private investment, possibly due to lack of confidence after the escalating presence of organized crime in the region.

Let us now elaborate on how the empirical evidence from Pinotti (2012) relates to the current work¹⁷. As mentioned above, Pinotti (2012) assumes that, starting from the mid-1970s, a sudden eruption of criminal activity caused a deterioration of Basilicata's growth performance relative to a control group of regions that were not affected by organized crime. Even if Basilicata has moved to a slower growth path since the 1970s, this does not in principle interfere with the empirical analysis of this paper, which begins in 1980, after the effect of organized crime was in place.

Finally, Pinotti (2012) observes that, over the period 1970 – 1994, the advent of organized crime in Basilicata (and Apulia) coincided with clear evidence of substitution of private for public capital. The documented low productivity of public investment in Italy (Bonaglia et al. (2000)) then offers an interpretation for the low growth rates in the last decades of his sample period. Pointing out that public funds have traditionally represented a lucrative opportunity for criminal organizations in Italy, the author ends up with an additional channel for explaining the poor growth performance of Basilicata since the 1970s. If Pinotti (2012)'s story is valid, I cannot rule out the hypothesis that organized crime has to some unknown extent influenced the allocation process of the public royalty revenues in Basilicata since the late 1990s and thereby determined its poor growth performance.

4.3 Sectoral effects and the spectrum of Dutch Disease

The classic story of the Dutch Disease might contribute to explaining the puzzle of vanishing benefits from oil windfalls in Basilicata. Let us figure out how we can test

¹⁷Pinotti (2012) applies the SCM in order to provide estimates of the economic effect of organized crime. However, his different research question causes the selection of the donor pool to differ radically from this work. He chooses a donor pool consisting of all Italian regions with the exception of the three regions which suffer from a pervasive presence of criminal organizations (Sicily, Campania and Calabria). Hence, the donor pool in Pinotti (2012) is composed in part of northern regions that have a different economic structure from the treated units (Basilicata and Apulia) but that supposedly shared with Basilicata the absence of organized crime in the pre-intervention period. As explained in Section 2, the choice of the comparison units in my work was not only based on the fact that the donor pool regions did not take part in oil production, but was also informed by the Bank of Italy (2012)'s clustering of European economic regions according to similar economic structures. In other words, I believe that a rigorous donor pool choice procedure based on non-arbitrary considerations, such as the study by the Bank of Italy (2012), boosts the robustness of my results.

for the hypothesis of Dutch Disease in the current paper. Papyrakis and Raveh (2014), Borge et al. (2013) and the seminal work by Paldam (1997) constitute good examples for claiming that empirical studies of the Dutch Disease should not be confined to country analysis and thereby to currency-related issues. Paldam (1997) studied the boom in the fishing industry that supposedly determined reduced competitiveness in the Far Øer islands and Greenland, thereby focusing on the effects on the real exchange rate rather than the nominal one (both countries use the Danish krone as a currency for international trade).

Another strand of the literature suggests that a dynamic version of the Dutch Disease model can generate a negative correlation between resource abundance and the pace of economic growth. The argument is that, among the different sectors that operate in the economy, some are relatively more growth-enhancing than others. Imagine that the growth-enhancing sector of the economy was represented by manufacturing: a resource-boom crowding out production inputs from manufacturing would have negative consequences not only for the level of income, but also for the growth rate of the economy. This is the contribution by Van Wijnbergen (1984), Krugman (1987) and Matsuyama (1992) - amongst others - who argue that de-industrialization effects reduce income growth by weakening technological progress externalities.

Now, recall that the empirical results indicate that the impact of intensive oil extraction on Basilicata's regional economy was basically negligible. However, a null aggregate effect does not imply that value-added shares of GDP for different sectors remained constant. Similarly to the dynamic Dutch Disease literature, if oil extraction implied lower value-added shares for the industrial manufacturing sector, and assuming this to be the most innovative sector of the economy, the pace of technological progress might slow down and depress economic development in Basilicata in the longer run. Let us therefore investigate the impact of the exploitation of natural resources on value-added shares of GDP for different sectors of the regional economy. I estimated the Difference-in-Differences estimator through the following regression:

$$VA_{i,t} = \beta_0 + \beta_1 \cdot Treat_{i,t} + \beta_2 \cdot After_{i,t} + \beta_3 \cdot (Treat_{i,t} \cdot After_{i,t}) + \epsilon_{i,t} \quad (3)$$

where $VA_{i,t}$ stands for the value-added share of GDP of, in turn, agriculture and fishery, industry, construction, tourism transport and communication, financial intermediation and other services; $Treat_{i,t}$ is a dummy which equals one when the region under observation is the treated region (i.e., Basilicata); and $After_{i,t}$ is a dummy which equals one if the time of observation is within the post-intervention period. The OLS estimate of the coefficient β_3 on the interaction $(Treat_{i,t} \cdot After_{i,t})$ will represent the DiD estimator of the treatment effect.

Results in Appendix C Table 1 indicate that the treatment effect is positive and significant for the value-added share of GDP of the industrial sector, whilst it appears to be negative and significant for construction and other service sectors. No significant effects were found for the sectors of agriculture and fishery, tourism transport and com-

munication, or financial intermediation¹⁸. To the extent that these results provide us with an accurate picture of sectoral effects, we can infer that oil extraction increased the value-added share of industry in the regional GDP whilst crowding out the shares of construction and other service sectors. This result calls for a couple of considerations. On the one hand, evidence of the increasing relative importance of the manufacturing industrial sector prevents an issuance of a warning of dynamic Dutch Disease. On the other hand, the long-run growth effects of a relatively more robust industrial sector for the economy of Basilicata cannot be observed within the scope of the current study, which shows the need for future research on the topic.

4.4 The issue of labor migration

This subsection investigates an important aspect that might have hidden the effect of oil extraction on real GDP per capita and employment rates in Basilicata when these outcomes are compared to the other southern regions of Italy. This aspect is labor migration between the treated region of Basilicata and the donor pool regions. In order to migrate from one region of Italy to another, the basic requirement for each citizen is to register her migratory movement at the local population register (Anagrafe Nazionale della Popolazione Residente, ANPR) in the new region of residence. In other words, this can be thought of as a perfect labor mobility case.

Assume now that oil extraction creates higher labor demand and increases wages exclusively in the region of Basilicata in which this production activity has taken place. Based on pure economic reasoning, one would expect then to observe a flow of labor migration out of donor pool regions, directed toward the resource-rich region of Basilicata, until per capita incomes are eventually equalized. If this were the case, the relative per capita income between Basilicata and the regions of the donor pool (from which I have constructed the synthetic control unit) would not change. In other words, searching for the potential favorable impact of oil exclusively in the treated resource-rich region might be a misleading approach in case oil extraction activity has had a positive aggregate effect on a group of southern regions of Italy.

This crucial concern can be properly addressed by looking at regional resident population and internal migration data for Basilicata and the other southern regions of Italy, both in the pre- and post-treatment period, as done in Figure 6:

¹⁸Standard errors are adjusted for clusters. For a discussion of the inconsistency of standard errors in Differences-in-Differences estimation studies, see Bertrand, Duflo and Mullainathan (2004).

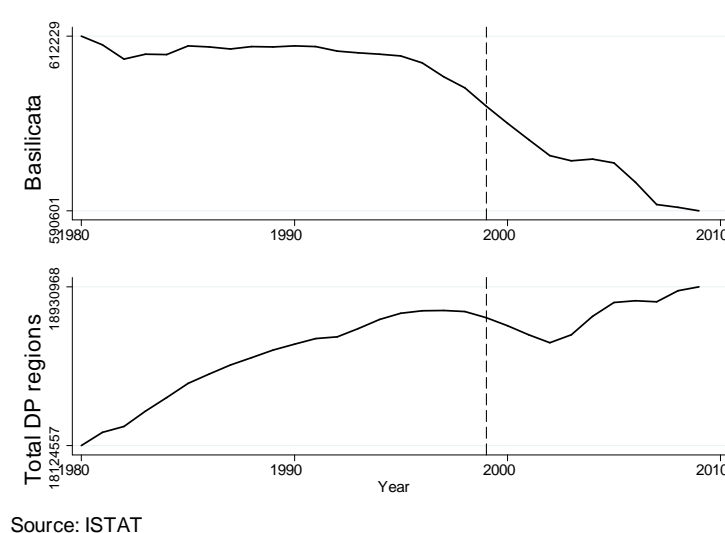


Fig. 6 Regional population dynamics

Generally speaking, the descriptive empirical evidence from Figure 6 seems to rule out a significant migration movement from neighboring regions toward Basilicata in correspondence with the oil extraction activity.

The upper graph of Figure 6 shows the monotonically decreasing dynamics of resident population for Basilicata, indicating a slight but constant negative regional migration rate throughout the period of analysis. The picture documented in Banfield (1958) of Basilicata as a region with a long emigration story (to the more industrialized northern Italian regions as well as to North and South America) is therefore confirmed here, regardless of the structural changes implied by the transformation to a resource-rich region.

The lower graph of Figure 6 shows instead the dynamics of resident population for the whole set of donor pool regions. The evidence of a generally stagnating population in donor pool regions from the mid-1990s onward, combined with the above-mentioned shrinking population for Basilicata, implies that no significant migration outflows can be inferred from donor pool regions, at least not toward the resource-rich but otherwise economically depressed region of Basilicata. In conclusion, we cannot infer from the issue of regional labor migration that the vanishing effect of oil on the GDP per capita and employment rates in Basilicata is due to a mistaken choice of the outcome of interest.

5 Concluding remarks

The aim of this study is to contribute to the empirical literature on the resource curse in two ways. The first contribution is to add the case of Basilicata (and hence Italy) to the existing evidence from Brazil, USA, Canada, China and Norway. To do so, I tested whether exploitation of oil fields in the region of Basilicata led to a higher degree of regional economic development, in terms of several macroeconomic indicators.

The second contribution is implementing a quantitative comparative case-study using the Synthetic Control Method in order to test for the hypothesis of resource curse. The SCM, arguably, enables a better estimation than other methods of the effect of natural resources. One of the salient features of the SCM is that the comparison unit is drawn from a donor pool of non-treated units with characteristics similar to the treated unit - namely, southern Italian regions which closely resemble the treated region of Basilicata, without being affected by the treatment. The empirical strategy exploits the fact that Basilicata produced a fraction close to unity of the entire volume of oil extracted in the southern regions of Italy. Results from the empirical analysis showed that the null hypothesis of positive economic effects was rejected and that the local development model in place has to a large extent failed to produce remarkable results.

In addition to the core result of the paper, I briefly discussed some of the possible mechanisms that might have played a role in determining the current situation in Basilicata. This was done by discussing the potential effects of four factors: the structure in place for the control of oil rights; the role of organized crime; the hypothesis of regional Dutch Disease; and the issue of regional migration. Although the research question of this paper aims exclusively to estimate the aggregate economic effects of oil on the regional economy, I am aware that additional environmental and sustainability considerations would be required in order to obtain a thorough socioeconomic evaluation of the impact of the oil adventure in Basilicata.

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A On the Synthetic Control Method and its implementation

This section draws heavily on Abadie et al. (2011, 2014). The synthetic control method (SCM) estimator compares the actual outcome in the treated unit of interest with a synthetic comparison unit based on a weighted average of units of the control group. This section explains how the SCM was implemented in the current study.

At first, a wide range of macroeconomic regional data were collected (further details about data are provided in the Data Appendix B) for a sample of $J + 1$ southern Italian regions indexed by j , where $j = 1$ is the region of Basilicata (the so-called treated unit) and units $j = 2$ to $j = J + 1$ are the rest of the potential comparison units (the so-called donor pool). The units are observed throughout the same time period $t = 1, \dots, T$ which goes from 1980 to 2009 and they therefore constitute a balanced panel. The entire time period is subsequently divided into a pre-treatment T^- [1980 – 1998] and a post-treatment period T^+ [1999 – 2009], with $T = T^- + T^+$, in order to estimate the effect of treatment on post-treatment regional macroeconomic outcomes. Define now X_1 as the $(k \times 1)$ matrix containing the pre-treatment T^- [1980 – 1998] values of the k macroeconomic variables of the treated unit that we aim to match as close as possible. Let then X_0 be the $(k \times J)$ matrix collecting the *predictors*: the values of the same k variables over the pre-treatment period T^- for all of the J potential comparison units. The synthetic control unit will be given by the $(J \times 1)$ vector of weights $W^* = (w_2, \dots, w_{J+1})$ with $0 \leq w_j \leq 1$ for $j = 2, \dots, J + 1$ and $w_2 + \dots + w_{J+1} = 1$ chosen as the value of W that minimizes

$$\sum_{m=1}^k v_m (X_{1m} - X_{0m}W)^2 \quad (4)$$

in which v_m are the weights assigned to the m -th predictor according to its relative importance within the whole range of predictors. Once the synthetic control $W^* = (w_2, \dots, w_{J+1})$ has been selected, we can proceed by estimating the treatment effect by comparing the actual post-treatment macroeconomic outcomes of treated Basilicata with the outcomes of the synthetic control unit which is by definition not exposed to the treatment. In order to do this, let Y_{jt} be the value of a specific macroeconomic outcome of region j at time t . Proceeding in a similar manner as above, define now Y_1 as the $(T^+ \times 1)$ matrix containing the post-treatment value of the macroeconomic outcome for the treated unit, whilst Y_0 will now represent the $(T^+ \times J)$ matrix where column j contains the post-treatment values of the outcome for the region $j + 1$. The synthetic control estimator of the effect of treatment will be finally given by the difference between the post-treatment outcome for the treated unit and the outcome for the synthetic control:

$$Y_{1t} - \sum_{j=2}^{J+1} w_j^* Y_{jt} \quad (5)$$

B Data Appendix

- **GDP per capita.** Gross domestic product per capita at current prices 1980–2009. Data were collected from the Italian Statistic Bureau (ISTAT) in millions of Euros (subsequently converted at constant prices using GDP deflator). Available both at <http://dati.istat.it/> under the directory: National Accounts / Regional Accounts / Per capita values territorial data (Euro) and <http://istat.it/it/archivio/11519>. Data downloaded on the 6/3/2013.
- **Population.** Resident population in Basilicata and the other regions of the donor pool, 1980 – 2009. Data from ISTAT and the Italian Historical Statistical Repository, online at <http://timeseries.istat.it/> under the directory: Population / Resident population and demographic balance / Resident population at the 1st of January and average by region and geographical area 1952 – 2009. Data downloaded on the 6/3/2013.
- **GDP deflator.** National GDP deflator 1980–2009. Data were obtained by Italian Statistics Bureau ISTAT, online at <http://timeseries.istat.it/> under the directory: Prices / Percentage changes in the National Index of Consumer Prices for the Whole Nation 1955-2011. Data downloaded on the 6/10/2013.
- **Gross Fixed Investment.** Gross fixed capital formation 1980 – 2009. Data on gross fixed capital formation in millions of Euros (extracted at current prices and subsequently converted into constant prices values using GDP deflator) were obtained by ISTAT in the archive on regional economic accounts, available online both at <http://istat.it/it/archivio/75111> and <http://istat.it/it/archivio/11519>. Data downloaded on the 6/10/2013.
- **Employment rates.** Employment rates are included in the dataset as % of both active labor force (15 – 64 yrs) and of total regional population, for the period 1980–2009. Data are from ISTAT and available at the Italian Historical Statistical Repository, online at <http://timeseries.istat.it/> under the directory: Labor market / Labor force / Employment rates, unemployment rates and activity rates by age group, gender and geographical area 1977 – 2011. Data were downloaded on the 7/7/2013.
- **Labor force.** Data provides the regional labor force (+15 yrs) in thousands, for the period 1980 – 2009. Data are from ISTAT and available at the Italian Historical Statistical Repository, online at <http://timeseries.istat.it/> under the directory: Labor market / Labor force / Resident population aged 15 and over by professional status, age group, gender and geographical area - Italy 1977 – 2011. Data were downloaded on the 7/7/2013.
- **Population shares by education level.** Data on fractions of population by education attainment includes the fraction of (+6 yrs) population which fulfilled up to

primary, secondary and tertiary level education. Data are from ISTAT and available at the Italian Historical Statistical Repository, online at <http://timeseries.istat.it/> under the directory: Education / Education in census of population / Resident population aged 6 and over by educational attainment, region and geographic division at census year 1951 – 2001 population censuses. Data were downloaded on the 10/7/2013.

- **Shares of regional value added by industry.** Data includes shares of regional value added for the period 1980 – 2009 in agriculture and fishery, industry, construction, tourism, transport and communication financial intermediation and other services. Data are from ISTAT and available online at <http://dati.istat.it/> under the directory: National Accounts / Regional Accounts / Territorial accounts detailed breakdown by industry (Nace rev.1.1), millions of Euros / Gross Value Added / Editions prior to February 2012. Data downloaded on the 6/3/2013.
- **Oil production.** Crude oil production in Basilicata 1980 – 2012. Data on regional (Basilicata) production of crude oil in tons are provided by UNMIG (Italian Ministry of Economic Development, General Direction for Energy and Mineral resources) and are available online at <http://unmig.sviluppoeconomico.gov.it/>. Data were downloaded on 1/7/2013. The production data in tons have been subsequently converted into barrels using the conversion unit (barrels of crude oil per metric ton) provided by the International Energy Statistics of the EIA (<http://eia.gov>). Europe Brent Spot Price FOB (\$ per barrel) 1987 – 2012 available as well at <http://eia.gov> was subsequently used to estimate the value of regional crude oil production. These data were downloaded on the 18/6/2013.
- **Royalties.** Royalties transfers received by the state and the regions for the period 1997 – 2012 were provided by the Basilicata region and by UNMIG (Italian Ministry of Economic Development, General Directorate for Energy and Mineral Resources) and are available online at <http://unmig.sviluppoeconomico.gov.it/>. These data were downloaded on the 18/6/2013.
- **Regional government budget.** Data on financial flows regarding regional government budget, precisely regional total expenses and regional total revenues (and fraction of these revenues given by tax income) for the period 1996 – 2011 were provided by DPS (Ministry for Economic Development, Department for Development and Economic Cohesion) and are available at <http://www.dps.tesoro.it/>. Data were downloaded on the 2/1/2014.

C Tables and Figures

(a) Recall the main case (Fig. 2) in which real GDP per capita is the dependent variable. The synthetic control weights were given already in Section 2 and are presented here again:

Region	Synthetic control weights
Campania	0
Molise	.253
Apulia	.457
Sardinia	.003
Sicily	0
Calabria	.287
Note: See section II for details.	

(6)

Economic Growth Predictor Means before treatment for Treated and Synthetic Unit:

Predictor	Treated	Synthetic
Gross Fixed Investment	1255.715	3699.329
Population	610082.1	2053517
Primary school	54.29474	57.49195
Secondary school	12.9421	12.72768
Tertiary school	2.278947	2.803647
Employment rate 15-64yrs	47.86842	46.85644
Employment rate total	40.35789	39.79181
Labour force +15yrs thousands	238.8045	917.4772
Agriculture and fishery	7.81927	7.866004
Industry	16.19503	16.20668
Construction	11.66696	8.519072
Tourism Transport and Communications	19.02455	22.49934
Financial intermediation	17.08901	18.7285
Other services	28.20518	26.18042
Note: predictors are averaged for the 1980 – 1998 period.		

(7)

(b) Recall the case (Fig. 3) in which dependent variable is Employment rate (15-64 yrs). The Synthetic control weights are:

Region	Synthetic control weights
Campania	0
Molise	.398
Apulia	.377
Sardinia	.099
Sicily	0
Calabria	.126
Note: See section III for details.	

(8)

Economic Growth Predictor Means before treatment for Treated and Synthetic Unit:

Predictor	Treated	Synthetic
GDP per capita constant prices	6830.101	7335.145
Population	610082.1	2053516
Gross Fixed Investment	1255.715	3128.74
Primary school	54.29474	57.92043
Secondary school	12.9421	12.59795
Tertiary school	2.278947	2.760158
Employment rate total	40.35789	40.63517
Labour force +15yrs thousands	238.8045	759.6145
Agriculture and fishery	7.81927	7.447543
Industry	16.19503	17.24811
Construction	11.66696	8.76373
Tourism Transport and Communications	19.02455	22.10604
Financial intermediation	17.08901	18.53501
Other services	28.20518	25.89956
Note: predictors are averaged for the 1980 – 1998 period.		

(9)

(c) Recall the case (Fig. 4) in which dependent variable is Gross Fixed Investment at constant prices (millions Euro). The Synthetic control weights are:

Region	Synthetic control weights
Campania	0
Molise	.83
Apulia	0
Sardinia	.01
Sicily	0
Calabria	.16
Note: See section III for details.	

(10)

Economic Growth Predictor Means before treatment for Treated and Synthetic Unit:

Predictor	Treated	Synthetic
GDP per capita constant prices	6830.101	7644.416
Population	610082.1	620527.4
Primary school	54.29474	55.85821
Secondary school	12.9421	13.18384
Tertiary school	2.278947	2.907211
Employment rate 15-64yrs	47.86842	50.76079
Employment rate total	40.35789	41.78568
Labour force +15yrs thousands	238.8045	234.7934
Agriculture and fishery	7.81927	6.900495
Industry	16.19503	16.77648
Construction	11.66696	9.540192
Tourism Transport and Communications	19.02455	21.48778
Financial intermediation	17.08901	18.12866
Other services	28.20518	27.1664
Note: predictors are averaged for the 1980 – 1998 period.		

(11)

Table 1	(1)	(2)	(3)	(4)	(5)	(6)
Shares of Value Added	Agriculture and fishery	Tourism Transport and comm.	Financial Intermed.	Industry	Construct.	Other services
Treat	1.039* (0.563)	-3.818*** (0.274)	-1.810* (0.922)	0.286 (0.540)	2.918*** (0.648)	1.385*** (0.516)
After	-2.541*** (0.232)	-0.536** (0.259)	6.170*** (0.395)	-2.446*** (0.483)	-2.394*** (0.224)	1.860*** (0.372)
DID	0.00839 (0.622)	0.866 (0.687)	-1.823* (1.022)	4.740*** (0.942)	-1.631** (0.758)	-2.472*** (0.641)
Constant	6.780*** (0.196)	22.84*** (0.137)	18.90*** (0.364)	15.91*** (0.307)	8.749*** (0.203)	26.82*** (0.206)
Obs.	210	210	210	210	210	210
R²	0.342	0.393	0.476	0.170	0.407	0.129

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Note: standard errors adjusted for clusters.

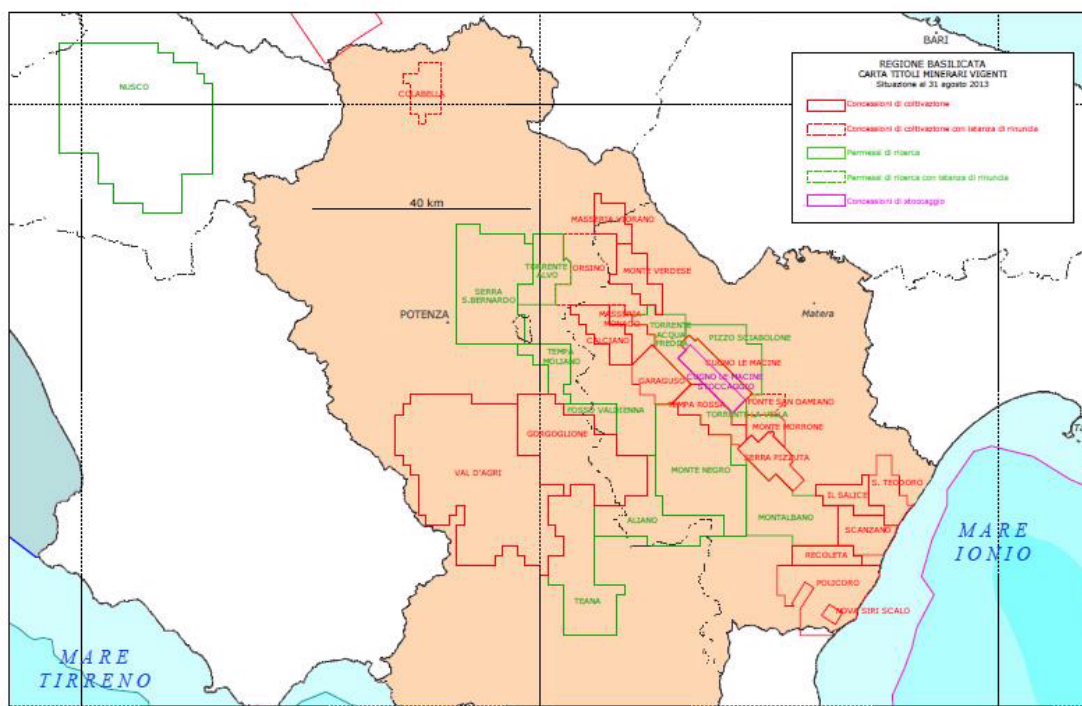


Fig.7 Oil fields in the Basilicata region

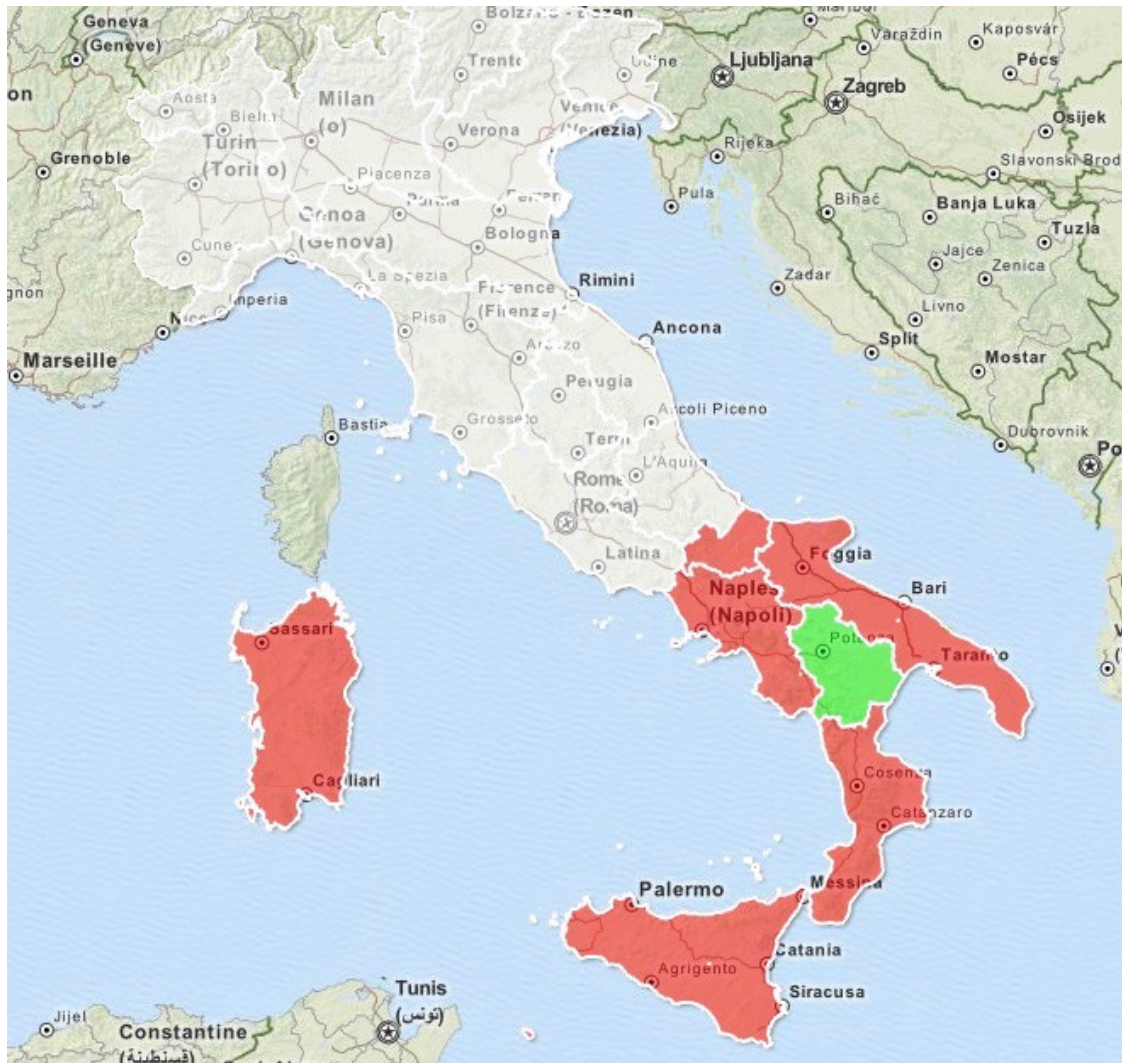


Fig.8 Basilicata and the rest of "Mezzogiorno". Note: Basilicata (green), Donor Pool regions (red), Rest of Italy (white).