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The allocation of royalties from oil extraction: an ex-post evaluation.

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Abstract: The aim of this paper is to provide an ex-post evaluation of the allocation of royalties from oil extraction in the Basilicata region. The allocation of oil royalties accruing to the regional Government (€990 M€ up to 2013) among different expenditure programs is analyzed. The impact analysis is based on a multi-sector model based on a Social Accounting Matrix (SAM), appropriately implemented for Basilicata region. Results clearly show that the past the allocation of generated a much lower impact than expected in terms of economic growth and employment. Given the structure of the regional economy, much of the impact of investments and running expenses financed by royalties has maybe been lost outside the regional boundaries. A greater effect on income and employment will not be possible unless resources are re-directed towards greater competitiveness of the regional economic system. Better balancing the use of royalties between social expenditure and production investments would probably be the first step towards a strategy of sustainable development of the regional economy.
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1. Introduction

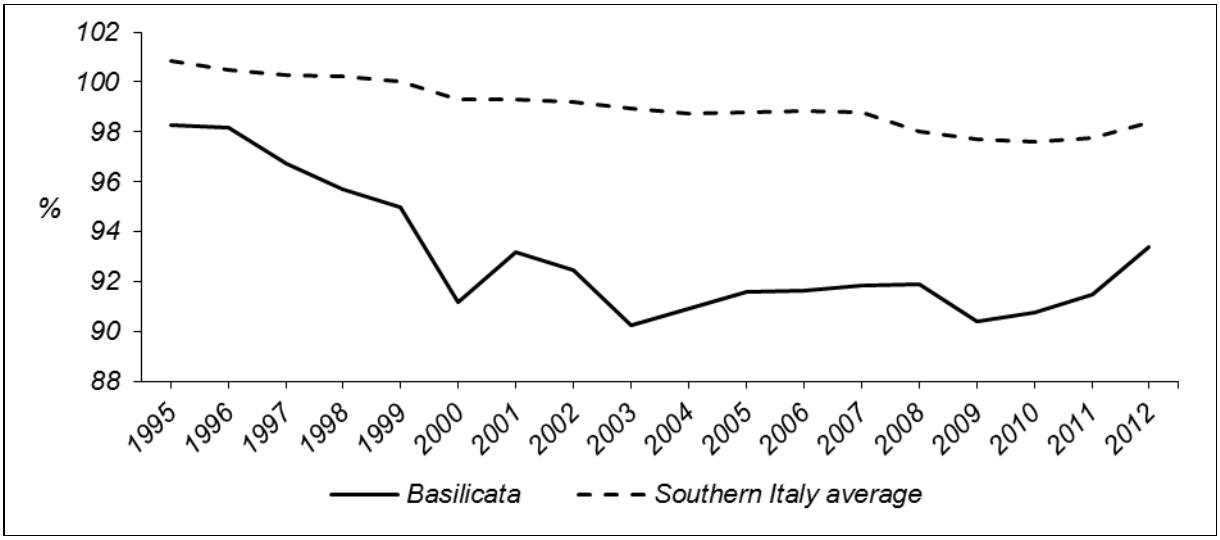
The Basilicata region is a typical case of a region lagging behind the rest of the national economy. Despite the presence in its territory of the largest onshore oil field in Europe, the economy of Basilicata shows strong difficulties compared with the rest of the country, with a poverty index more than double the national average (Istat, 2014).

When oil fields were discovered in the Agri valley (in the south-western part of the region) in the early '90s, they were considered as an important opportunity for the regional economy. The oil regional industry currently produces about 16,137 ton/d of crude oil: in 2013 the production was about 5.48 million tons, i.e. 9.3% of the gross national domestic consumption and about 71.7% of Italy's total crude oil production (Ministero dello Sviluppo Economico, 2014). The oil industry is carrying out further investments that are expected to produce in the next years a substantial increase of produced quantities. There are also good opportunities for regional economic development (in addition to the direct and indirect impacts of the oil industry expansion) from the fiscal earnings connected with the exploitation of these resources. In Italy oil revenues from the exploitation of on-shore fields are taxed by 7% (royalties) above a small output threshold. The entirety of these fiscal revenues accrues to local institutions (Regional government and Municipalities of the drilling area) when the extraction is carried out in the Southern regions. Moreover, a recent national regulation (N° 99/2009) allocates an additional 3% of earnings to the households living in the area as vouchers to purchase fuel (fuel card: Nomisma, 2012).

Surprisingly, the development of the oil sector have not had a great impact on the local economy. The regional GDP grew quite steadily till 2008, when it experienced a decline - partly due to the overall economic recession - resulting in a decrease of employment to 195 thousand labour units recorded in 2012. In accordance with the national trend, the unemployment rate increased starting from 2007 up to 16% in 2013 (Istat, 2014).

These figures show a loss of competitiveness, in terms of labour productivity (Figure 1). While the average productivity of the other southern regions of Italy slightly decreased, between 1995 and 2009 the Basilicata region experienced a considerable decline: although the regional employment till 2003 grew more rapidly than in the neighbouring regions, this did not result in a substantial increase in terms of productivity.

Figure 1 GDP per labour unit - ratio between different areas



In the last years a set of empirical studies used a variety of approaches to evaluate the impact the development of the oil industry had on the economic development in the Basilicata Region. Using a regression discontinuity design approach with geographic forcing variables, Percoco (2012) evaluates the impact of oil extraction on the creation of new firms finding evidence of a significant even small positive impact at the regional level. Conversely, Florestano (2013), based on a set of VAR models with macroeconomic variables (such as GDP, employment, value added of the construction sector), finds a very weak evidence that hydrocarbon exploitation produced economic growth in Basilicata. More recently Iacono (2015) carried out an impact evaluation exercise comparing the economic performance of the Basilicata region with that of a "counterfactual" control region created using synthetic control techniques. The provided evidence suggests that the development of the oil industry had no detectable effects on the Basilicata's economy. The author proposes a set of possible political economy explanations, such as the structure of control rights, the low level of taxation of oil revenues and the quality of institutional settings (presence of organized crime in the region). According to this view the lack of any evident positive impact on the regional economy may be a signal that at least some of the possible causes of the "resource curse" proposed in literature (Van der Ploeg, 2011) were at work, even if Iacono's empirical exercises doesn't allow an empirical test of any possible causal chain. On the contrary, in her unpublished PhD dissertation, Biasi (2015) submits to empirical test the hypothesis of the presence of a "Dutch disease" mechanism among the causes of the negligible impacts of oil extraction on regional performances. According to her analysis employment and investments in the regional manufacturing sector were negatively affected by the development of the oil industry.

Despite these empirical analyses provide still a mixed evidence on the impacts of the oil sector on the regional development, all the cited authors share the concern for the possible missing of development opportunities and the unsustainable exploitation of a non-renewable resource.

After almost two decades the question on how to link oil extraction with regional economic development is still at stake. One of most important policy tool the local institutions have to affect

the performance of the regional economy is the allocation of the fiscal revenues from oilfield exploitations. Between the start of drilling in 1997 and the end of 2013, the Regional balance has matured over 1,166 M€ (2013 prices) of earnings from oil extraction. In this paper, following previous analyses (Rocchi et al 2015, Viccaro et al. 2015) we propose an overall ex-post evaluation of the impact that the allocation of these fiscal windfalls was likely to have on the regional economy.

2.The use of non-renewable resources at the regional level: a weak sustainability approach

The analysis is developed within a "weak sustainability" perspective[1]. According to this view the exploitation of a non-renewable resource such as oil, should not be considered as a production activity among the others, given the likely dynamic effects it may produce on the growth path of the economy. Non-renewable natural resources are indeed one of the (unproduced) *assets* the economy is endowed of to realise his performance. Their exploitation, while positively affecting incomes in the short-run, at the same time modifies the capital endowments available in subsequent periods. It is possible to show that a necessary condition for a non-decreasing growth path is the maintenance through time of a non-negative rate of "genuine" saving, that is saving of the economy corrected to account for non-renewable natural assets exploitation (Atkinsons and Hamilton, 2006). The main policy prescription that such a theoretical framework suggests is well represented by the so-called "Hartwick rule" according which the rents from the exploitation of exhaustible resources should be invested in produced capital assets (Hartwick, 1995).

In a recent empirical work Biasi (2015) estimated the "genuine saving" of the Italian regions from 1995 to 2006. During the period the Italian economy showed a positive though decreasing genuine saving rate, according to estimates provided by the World Bank (Bolt et al., 2002). Such a positive performance, however, hides an uneven geographical distribution of sustainability costs. Among the twenty regions, only Basilicata shows a negative GS rate starting from 2004 onward. Such a result is mainly due to the exploitation of oil resources that was not compensated neither by an increase in aggregate saving of the economy nor by new investments in human capital and environmental assets (such as forest area). Despite the earnings from taxation represent only a minor share of the total revenues from oil extraction, a proper allocation of the royalties may produce a counterbalancing positive impact on genuine savings. The estimates provided by Biasi suggest on the contrary that the allocation of royalties was mainly oriented towards current expenditure. In the following section the allocation of royalties will be analysed and expenditures classified between of investments and current expenditure.

A further aspect that will be considered in the following section refers to the social implications of sustainability. According to a widely shared vision, sustainability should include not only a concept of intergenerational justice (long-run economic and environmental sustainability of

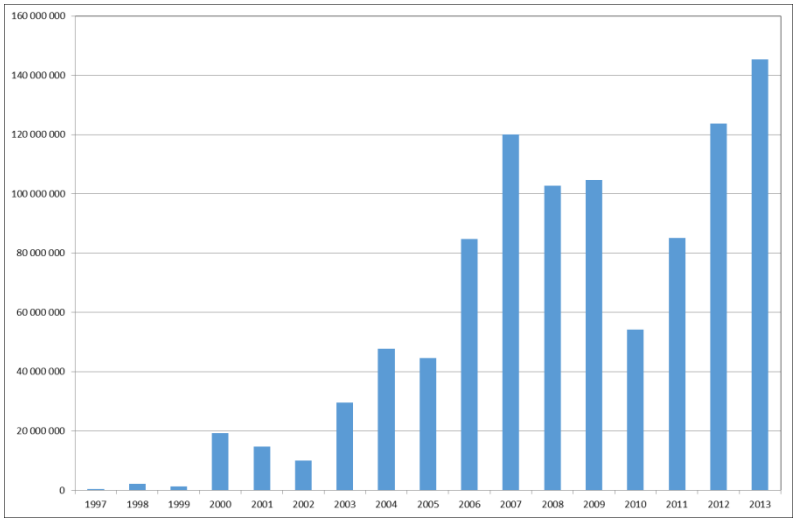
[1] The term "weak" is used to contrast this stream of literature with a rival one based on a "strong" concept of sustainability, assuming non substitutability between natural and produced assets. See among others (Common and Perrings, 1992) for a thoroughly discussion of the differences between the two approaches.

development) but also a concept of intra-generational equity (social sustainability). The reconciliation of these two goals may be controversial. Using a SAM based model of the regional economy Rocchi et al. (2015) stress the existence of a *structural* trade-off between growth and equity in the Basilicata region. In what follows the impact of royalty allocation in the Basilicata region will be analysed also in its distributive features using an improved, bi-regional SAM model of the regional economy.

3. Figures on oil royalties

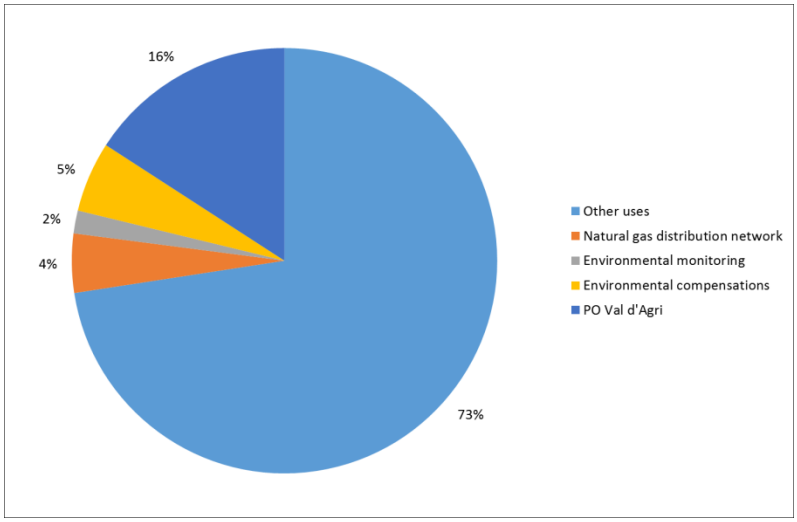
From 1997 to 2013 the total amount of earnings from taxation of oil extraction accruing to the regional Government of Basilicata was about 990 M€ in current terms, corresponding to 1,116M€ valued at 2013 prices. Figure 1 shows the distribution of revenues across the considered period.

Figure 1 Royalties revenues
1997 – 2013 (Euros – current prices)



A substantial increase of earnings dates to 2007, with the doubling of the production lines. From 2007 onward the royalties on average represented about 3% of annual total expenditure of regional public administration (Rocchi et al, 2015). After 2013 a temporary decrease is expected due to the negative trend of oil prices. However, the future expansion of production with the starting of operations in the new oilfield of Tempa Rossa will probably more than compensate these losses.
In Figure 2 the total amount of royalties (expressed in 2013 values) is classified by use. Three minor shares refer to investments in infrastructures (natural gas distribution network and environmental monitoring) and to actions compensating environmental costs in the extraction area. A 16% of the total was allocated to the Programma Operativo Val d'Agri (POV), an program aiming at fostering the economic development and increase the well-being of population in the area of extraction activities.

Figure 2 Royalty allocation by use



About three quarters of the total simply financed the budget of the regional Government (Other uses). The royalties represented a strategic funding source during the considered period, especially after 2007, when the financial instability caused by the macroeconomic downturn resulted in decreasing transfers from the national Government to the regional one. For the largest part the royalties were used by the regional Government to finance current expenditures and social transfers.

Overall, the investment expenditures during the considered period can be estimated equal to 324 M€. This figure represents only 29.9% of the total, for the largest part imputable to the POV where investments represented more than 97% of total uses.

Starting from 2009 a further 3% of the revenues from the oil extraction were kept within the regional economy as a contribution to the "Fund for the reduction of fuel price", according to National regulation n. 99/2009. This further financial flow directly accrues to households of the regions where extraction is carried out, even if the distribution among families is regulated at the regional level. In the Basilicata region these sums were distributed as a voucher for the purchase of motor fuels (Fuel Card). In Table 1 the total amount of these transfers for the first two years of the programme and the number of beneficiaries are provided.

Table 1. The *fuel card* program

Year	Total payments (M€)	Beneficiaries (n)	Per capita payments (€/year)
2009	32.22	320,000	101
2010	44.88	320,000	140

Despite the relevant amount of the available resources the distribution criteria adopted (flat payment to all adults with the driving licence) over extended the number of beneficiaries, resulting in a quite negligible per capita annual transfer. After the first two years the Fuel Card program

was suspended and is currently under revision with the aim of improving its targeting towards the more disadvantaged social groups.

4. The impacts of royalty allocation

The impact of the allocation of the oil royalties on the regional economy was estimated using a model based on a bi-regional (Basilicata - Rest of Italy) social accounting matrix (SAM) of the Italian economy for 2010. The SAM is a highly disaggregated one, including more than 300 accounts. The economy of Basilicata is completely represented, including accounts for 37 industries, 54 goods and services, 3 production factors and 10 household groups (by decile of equivalent per capita income). Good and services and financial flows between Basilicata and the rest of Italy are completely represented.

The SAM was used to calculate the matrix of multipliers. An additive multiplier decomposition (Dietzenbacher, 2002; Miller and Blair, 2009) was carried out to decompose total impacts among direct, indirect, induced and interregional impacts. According to the available information the total amount of allocated royalties was reclassified to compose a set of exogenous shocks directed towards different sectors of the regional economy [2].

In the first column of Table 2 the impacts of the allocation of royalties for the whole period 1997 – 2013 is quantified according with the matrix of SAM multipliers. Figures are provided on the impacts on output, value added and households' (gross) income. During a period of 17 years the allocation of 1,166 M€ generated an increase 1,027M€ of output, 593 M€ of value added and 668 M€ of gross income of households. The estimated impact on employment amounts to 10,258 full time labour units (about 600 units per year). On average the allocation of 1 € of royalty receipts produced 0.88€ of additional output, 0.51€ of value added and 0,57€ of households' income. The allocation of 1M€ of royalties yielded 9 full time labour units.

Table 2. Impacts of royalty allocation
1997 – 2013 (2013 M€)

	Allocation type		
	Total	Other actions	POV
Royalties receipts	1,166	786	203
Total impacts:			
Output	1,027	432	370
Value-added	593	274	194
Households' income	668	402	111
Labour unit (n)	10,258	4,422	3,634
Average impacts:			
Output	0.88	0.55	1.82
Value-added	0.51	0.35	0.95
Households' income	0.57	0.51	0.55
Labour unit (n per M€)	9	6	18

[2] The linear model was solved assuming as exogenous the current accounts of National and regional Governments, the capital formation accounts and the accounts recording real and financial flows with the rest of the world. Further details on the model and simulation strategies can be found in (Viccaro et al, 2015).

The other two columns in table 2 contrast the impacts of two really different forms of utilization of the royalties: as stressed above, while the POV program includes almost only investment expenditures, the "Other uses" for the largest part consist in expenditures within the current account of the regional Government. Despite the short-run, static nature of the simulation, the two typologies of allocation show a well differentiated pattern in their impacts on the regional economy. The unitary impacts of the royalties allocated to the POV program were on average three times the impacts of "Other uses" in terms of value added and employment; even larger impacts were generated in terms of output. The main reason of this differentiation is the concentration of investments expenditures towards the construction sector, an industry largely based on local firms.

The SAM model takes into account the structure of the interdependencies among industries and sectors as well as the leakages towards the rest of Italy due to the typical openness of a small regional economy like that of the Basilicata region. The figures in table 2 provide a simplified, overall picture on the magnitude of the impacts that the allocation of royalties likely produced within the regional economy. A more precise characterization is presented in table 3, where a "counterfactual" evaluation of impacts for the year 2010 (the reference year of the SAM) is carried out.

Table 3 Impacts of the allocation of royalties in 2010 - Counterfactual analysis (M€)

	Baseline	*Impact*	*SAM Total*	*% Ratios*
Royalties		54		
Basilicata				Impact/Baseline
Output	21 203	66	21 268	+0.31
Value Added	12 245	36	12 281	+0.30
Households' income	12 544	30	12 574	+0.24
Rest of Italy				Impacts Rest of Italy/Basilicata
Output	3 041 624	35	3 041 659	52.92
Value-added	1 742 931	20	1 742 952	56.58
Households'income	1 697 044	14	1 697 058	47.18

The first column of the table shows the totals of output, value added and households' income that would have been produced in the Basilicata region and in the Rest of Italy in absence of any allocation of royalties (Baseline). Actually, in 2010 54 M€ of royalties were allocated for different uses, yielding the impacts in the second column, corresponding to an increase of 0.31% of total regional output, 0.30% of GDP (value added) and 0.24% of gross households' income. Interestingly, the impacts generated outside the regional borders in the rest of the Italian economy are comparable in magnitude with those affecting the regional economy: for example 20M€ of additional increase in the value added were generated in the rest of Italy (equal to 56% of the value added impacts generated *within* the Basilicata region). Such a large leakage is expected, given the small economic dimension of the region, but also represents a potential space for the expansion of

the regional economy that may be partially recovered by an improvement of its competitiveness. A further reason to shift the large share of royalties allocated to current expenditure towards investments.

In a previous study Rocchi et al. (2015) showed that a structural trade-offs exists in the Basilicata's economy between growth and equity. Due to the structure of the regional economy, in the short-run, uses of the fiscal earnings optimized to improve economic growth are also likely to generate adverse distributive effects, such as an increase in inequality and asymmetric distributive effects among urban and rural households. A sustainable management of these additional financial resources should pursue a good balance between investment programs, aiming at improving the economic performance of the regional economy, and social transfers compensating the adverse effects of growth on income distribution. From this point of view the Fuel Card may be an promising policy tool for the regional Government.

An analysis of distributive impacts of the Fuel Card program showed that its targeting may be largely improved. In table 4 the results of such an analysis are presented.

Simulations were again based on the SAM model, that provided the average increase of household's incomes by income decile produced by all indirect impacts generated by consumption after the distribution of social transfers. The sample of the European Survey on Incomes and Living Conditions (EUSILC) for the Basilicata region was used to calculate a set of inequality and poverty indexes before and after the distribution of support[3].

The first column of the table shows the baseline values of a set of indicators, in absence of the Fuel Card transfer[4]. The baseline Gini index is about 33,3% while the relative poverty threshold (60% of the median of the equivalent per capita disposable income) is fixed at 7,233€/year. The median of incomes of the at-risk-of-poverty households is the 40.2% of the poverty line itself, showing a concentration of poor households in the left tail of income distribution. Almost 18% of households is below the poverty line, needing on average an 8.7% increase of income to exit the poverty condition (Poverty Gap). The Poverty Severity Index confirms the inequality of income distribution among the poor[5].

[3] The EUSILC sample hab been used in the construction of the SAM itself to disaggregate the households sector by decile of equivalent per capita net income. The microeconomic information was used to allocate the total amount of support among income deciles. The extra income generated by the Fuel Card payments was simulated to generate an exogenous shock on final demand, according with the expenditure composition in each income decile as recorded in the SAM. The average increase of gross incomes in each decile generated by each simulation was used to calculate the ex-post income of each individual household in the sample. Given the small size of the regional sample, the estimates of inequality and poverty indexes were carried out using a robust method based on the Pareto distribution, correcting estimates for the presence of extreme outliers. The analysis was implemented using the R package *leaken* (Alfons and Templ, 2013).

[4] All the simulations hypothesize a budget equal to the average of payments made on 2009 and 2010 (Table 2).

[5] The Headcount ratio, the poverty gap and the poverty severity index correspond to the Forrest-Greene-Thorbecke inequality indicator respectively with alpha equal to 0, 1 and 2 (Fields, 2002).

Table 4. Impacts of the fuel card on inequality and poverty – Actual use and alternative scenarios 2010

	Baseline	Flat Payments		Decreasing payments by income band		Social Card
		to adults with driving licence	to adults	to adults with driving licence	to adults	
Gini Index	0.333	0.330	0.330	0.330	0.330	0.319
Relative Poverty Threshold (€)	7 233	7 334	7 337	7 339	7 340	7 248
Relative median at-risk-of-poverty gap (%)	40.2	39.5	39.5	39.5	39.5	29.9
Headcount Ratio	0.177	0.171	0.171	0.171	0.171	0.179
Poverty Gap Index	0.087	0.085	0.085	0.085	0.085	0.064
Poverty Severity Index	0.065	0.062	0.062	0.062	0.062	0.036

The implementation of the Fuel Card during the first year of the program corresponds to the scenario represented in the second column (flat payment to all adults with driving licence). Not surprisingly the distributive impacts are negligible. An almost identical situation is showed by the scenario corresponding to the second and (till now) last year of implementation of the Fuel Card, when the payments were slightly differentiated by income band. Similar outcomes would be yielded by extending the entitlement for transfers to all adults, both with flat and with decreasing payments.

The last column represent an alternative approach to the distribution of the support mimicking the proposals currently debated in the Basilicata region. In this case the payments would be targeted only towards at-risk-of-poverty households (all included in the two first deciles) and proportionally to their individual poverty gap. The indicators show an overall improvement of equality in income distribution. The Gini Index decreases by 1.4%. This is mainly due to the reduction of inequality among the poor. In fact, the relative median at-risk-of-poverty gap decreases be more than 10 percentage points, while the Poverty Severity Index is reduced by 45% (from 0.069 to 0.036) and the Poverty Gap decreases from 0.087 to 0.64. These positive outcomes more than compensate the slight increase in the headcount ratio generated by the overall increase of incomes due to indirect impacts. A small number of families with incomes close to the initial poverty line and not entitled to receive the support, would be included in the at-risk-of-poverty group due to small increase of the relative poverty thresholds. However, their absolute position in term of income would not worsened.

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