Efficiency in the use of natural non-renewable resources from mining and quarrying in Italy

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Abstract Political reasons have been pushing towards a process of decentralization of powers and responsibilities since last twenty years in Italy. The regional management of mining and quarrying (m&q) should be an interesting case study of this change. This process has begun in the '70s with the Pres. Decree N. 616 of 1977. By examining administrative data and Regional Laws, this paper highlights how misleading is the awareness of policy makers of the real value of raw mineral resources domestically extracted: they seem closer to *common goods* rather than to *public goods*. By combining data on local governance with official statistics of Economy-wide Material Flow Accounts (EW-MFA), our econometric analysis intends to verify both the existence of an inverse supply curve between m&q domestic producer price index (as dependent variable) and no-energy producing mineral quantity extracted and the effect of Italian Regions Responsibility about m&q activity on m&q domestic producer price index, controlling for construction sector value added, R&D national expenditure, Openness to international trade. The years considered for the analysis are 1980-2009.

1 Are raw minerals treated as common or public goods? Evidence from Regional laws on quarries and mines

The Royal Decree N. 1443/27 and then both the Pres. Decree N. 616/77 and the Legis. Decree N. 112/98 have transferred the administrative and legislative responsibility of m&q from the State to Regions. Regional legislative competences also emerged in Constitutional Law n. 3/2001. Since the late '70, Regional laws have been approved to regulate this sector of activities with important implications for landscape changes [5]. Regions are obliged to issue a Regional Plan of Extractive Activities (PRAE) in order to efficiently manage: extraction sites at every stages (identification, exploitation and

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remediation phases), natural resources use and environmental protection. The Regional legislation framework on m&q still appears varied and incomplete, but the usual dualism among northern and southern Regions does not apply. Many areas of Italy are lacking of adequate regulation as well as a quarry Plan (Table 1). Moreover, the time gap between the Pres. Decree N. 616/77 and the issuing of Regional laws is huge, as in the '90s only three Regions were involved in the deliberation of a PRAE, in 2004 ten Regions and in 2010 a total of twelve Regions.

Table 1: License Fees (€/m³) and the PRAE existence in Italian Regions

Regions	License Fees*		PRAE Existence
	sand & gravel, limestone, clay, peat	ornamental stones	
Piemonte**	0.50	0.78	YES
Valle d'Aosta	0.30	FREE	YES
Lombardia**	0.72	3.50	YES
Province of Trento	on the basis of the quarry size		YES
Province of Bolzen	0.53	0.55	YES
Veneto	0.53	0.75	NO
Friuli Venezia Giulia	0.47	0.65	NO
Emilia Romagna**	0.67	unavailable	YES
Liguria	0.77	0.82	YES
Toscana	0.35	local fees	YES
Umbria	0.39	0.45	YES
Marche	0.70	0.80	YES
Lazio	0.35	2	NO
Abruzzo	0.89	9.70	NO
Molise	0.58	2	NO
Campania	0.93	1.60	NO
Puglia	on the basis of the quarry size		YES
Basilicata	FREE	FREE	NO
Calabria	FREE	FREE	NO
Sicilia	FREE	FREE	YES
Sardegna	FREE	FREE	NO

Source: Regional Laws, Provincial Laws and Administrative Acts containing data and information
Note: * Licence fee about "sand and gravel, limestone, clay and peat" are estimated as average of the fees of these types of materials by each Region updated to 2010. ** Provincial Plans only.

To analyse if raw construction minerals are economically treated as *common goods* or *public goods*, we summarize licences and fees for the m&q cultivation using Regional laws. License and fee structure can reduce the incentive, as in Pigouvian theory[2], on taking hazardous behaviours against the environment, due to regulating tools on m&q activities. Low fees instead seem to indicate the low value attributed to raw mineral and its scarcity. Some Regions allow companies to extract all materials for free and even if there is a tariff on the quantity extracted, the level is extremely low.

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[2]   According to Pigouvian theory (Welfare Economics 1920) public interest of Institutions should be the maximization of citizens' welfare. To this end, local governments should fix adequate licenses fees taking into account negative externalities produced by natural resource exploitation.

Regions leave most of the rent to firms, although they should become financial self-sufficient in a federalism structure.

2 Official statistics on mining and quarrying activities

In our analysis, we use data from official statistics on m&q domestic production taken from Satellite Environmental Accounts of National Accounting, in particular the Economy-wide Material Flows Accounts (MFA)[3], a system of accounts specifically dedicated to measure natural resources extracted in unit of weight [1,4], offering an overview of the phenomena of environmental pressure and land morphology changes over time. The accounts are compiled by ISTAT through estimation procedures, setup by using information of several sources. Regions are obliged to collect data on m&q activity to send to Ministry of Economic Development and ISTAT. Data were provided yearly on provincial basis through the "Statistics of quarries and peat bogs" survey and reported in the Report on mining and statistics of extractive industries in Italy, edited by the Ministry, until 1986. The Report was no more compiled after shifting the legislative powers on m&q activity to Regions. From '90s, questionnaires have continued to be sent at the Ministry and ISTAT but the number of provinces, providing information, gradually decreases over time. As a result, statistical data at regional level became incomplete and discontinuous. Since 1997, more complete information on quarries' production are supplied by the PRODCOM (Community Production) sample survey. It provides yearly structural data of industrial production at national level (EU Regul. N. 3924/91). By integrating the two sources (old surveys' questionnaires and PRODCOM data) ISTAT could have compiled a long time series (1980-2009), at national level, on physical flows of *no-energy producing minerals* domestically extracted, based on EW-MFA methodology [2,3].

3 The empirical estimation and results

The aim of our paper is to verify the effect of Italian Regions Responsibility, about m&q activity on m&q domestic producer price index. While all variables used are drawn from ISTAT and Eurostat datasets, we built Italian Region Responsibility i.e. cumulative number of Regions that have adopted a Quarry Plan per year, as a good proxy for the governance degree of m&q resources use. Although some missing data, the period analysed comes from 1980 to 2009. To achieve our goal, we estimate the following equation, after controlling for unit root and cointegration:

(1) $M\&Q\ producer\ price\ index_t = \alpha_0 + \alpha_1 M\&Q\ quantity\ extracted_t + \alpha_2 QPlan_t + \alpha_3 Openness_t + \alpha_4 VA\ Construction\ sector_t + \alpha_5 R\&D_t + u_t$

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[3]   Satellite Environmental Accounting is object of the EU Regulation N.691/2011. EW-MFA time series 1980-2009 is available from www.istat.it.

where *M&Q producer price index* is the log of the m&q domestic output price index based on the 2005 year; *M&Q quantity extracted* is the logarithm of the m&q quantity extracted in millions of tonnes; *QPlan* represents the presence of Quarry Plan (PRAE) in the Italian Regions; *Openness* measures the degree of openness to international trade of Italy, expressed in logarithm term; *VA Construction sector* is the logarithm of the value added of the construction sector, the most important sector in the use of raw minerals, *R&D* is the log of the R&D national expenditure and u_t represents the error term. Results in Table 2 confirm: i) supply curve is negative sloped in the market of no-energy producing minerals, as the relation between *M&Q producer price index* and *M&Q quantity extracted* is negative; ii) Regional Responsibility does not improve the efficiency use of these non-renewable natural resources, as shown by *QPlan* negative sign (in fact PRAE plans have been adopted only in the last decade and by half of Regions and m&q license fees fixed are very low); iii) Regional governance about m&q seems to have or any weight or rather a negative effects on the pricing of raw minerals. It was also found that both local and central governments do not pay enough attention to production of statistical regional data, strong support for knowledge and governance. We conclude policy makers show a lack of awareness of raw minerals value as they consider these goods closer to *common goods* rather than to *public goods*.

Table 2: First difference estimation. Dep. Var.: D1.M&Q producer price index

	(1)	**(2)**	**(3)**	**(4)**	**(5)**
D1.M&Q quantity extracted	-0.27*	-0.27*	-0.21**	-0.22**	-0.23**
D1.Q Plan		-0.01	-0.02*	-0.02*	-0.01
D1.Openness			0.43**	0.45**	0.45**
D1.VA Construction sector				0.44	0.47
D1.R&D					-0.08
Constant	0.04**	0.04**	0.02	0.01	0.02
Observations	27	27	27	27	27
R-squared	0.25	0.29	0.55	0.60	0.60

Note: * significant at 5% level; ** significant at 1% level

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