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Analysis

Environmental justice and air pollution: A case study on Italian provinces

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ABSTRACT

This paper provides an empirical analysis on the relationship between income, demographic characteristics and concentrations of air industrial pollutants within the Italian provinces. Two general conclusions can be drawn from the empirical results. First, the estimates obtained are consistent with an inverse U-shaped environmental Kuznets curve: air pollution releases increase with income up to a turning point where the relation reverts. Second, there is evidence that air releases tend to be higher in provinces with high concentration of females as households' head and with high concentration of children. Since our findings do not point to environmental discrimination on the basis of ethnicity, this suggests that environmental justice issues in Italy are not likely to manifest themselves along racial and ethnic terms but instead in terms of social categories and gender composition. We also find that the proxy variables employed to measure the efficiency or inefficiency of law enforcement are associated with higher levels of pollution. In terms of policy implications, this result suggests the need to strengthen, all through the country, the local enforcement of environmental laws in order to possibly reduce the negative effects on ambient air pollution.

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1. Introduction

The relationship between income and environmental pollution has been the subject of a large amount of both theoretical and empirical studies[2] since the pioneering works by Grossman and Krueger (1991, 1993, 1995). An assessment of the existing literature suggests that there are two prevalent strands of literature focusing either on the nexus between income and environmental pollutants or between income, demographic composition of population and pollution, where little effort has been made to join these two strands of literature together. The aim of this study is an attempt to fill this gap. Basically, the literature on environmental pollutants and income aims to test the validity of the so-called environmental Kuznets curve (EKC) hypothesis which postulates an inverted U-shaped relationship between the level of environmental degradation and income similar to that suggested by Kuznets (1955) between income inequality and economic development. That is to say that the level of per capita income has a negative effect on environmental quality measured by the levels of pollution, but, beyond a certain level, per capita income has a positive effect on environmental quality. A crucial issue becomes the estimation of the turning point in such relationship (Grossman and Krueger, 1995; List and Gallet, 1999). The second strand of the literature looks at the causal relationship between income, on the one hand, and demographic and socio-economic characteristics of population, on the other hand. This gave rise to the environmental justice movement[3] that deals mainly with the question of whether disadvantaged population groups, such as racial and socio-economic minorities, suffer from living in more polluted areas and whether demographic composition influences the amount of pollution. The key concept of environmental justice issues is that low-income groups and ethnic minorities bear disproportionate

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[2] In particular, Grossman and Krueger analyze the EKC through the discussion of three different mechanisms: scale effect, composition effect and technique effect. Scale effect shows that even if the structure of the economy and technology does not change, an increase in production will result in an increase of pollution and environmental degradation. Economic growth through scale effect has a negative impact on the environment. On the other hand, the authors argue that composition effect may have a positive impact on the environment. Pollution increases in the earlier stages of development, while in the later stages of development pollution decreases as the economic structure moves towards services and light manufacturing industries. Therefore, composition effect could lower environmental degradation through this change in the structure of production. Finally, technique effect captures improvements in productivity and adaptation of cleaner technologies, which will lead to an increase in environmental quality.

[3] Environmental justice is a movement that emerged in the United States in the 1980s and has become a concern in the US federal policy agenda in the early 1990s. In 1994, in fact, environmental justice was institutionalized at federal level through an Executive Order, which focused attention on human health and environmental conditions in low-income and minority communities (Title VI of the Civil Rights Act of 1964 prohibits discrimination on the basis of race, color, or national origin).

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environmental burdens, in the form of polluted air and water, unsafe jobs, under-enforcement of environmental laws, etc. (Evans and Kantrowitz, 2002; Ringquist, 1997).

A broad empirical literature has attempted to assess both hypotheses (i.e., the EKC and the environmental justice) finding, however, sometimes contrasting results (Anderton et al., 1994; Arora and Cason, 1999; Been and Gupta, 1997; Brown, 1995). There is, in fact, no general agreement neither on the existence of an environmental Kuznets curve, nor on whether minorities or disadvantaged groups face more pollution, and if so which minorities (racial, age, gender) are more at risk.

Moreover, most empirical investigations have focused on North America, this leaving the European case partially under investigated. Specifically, there is only scant evidence in Italy on the impact of socio-economic factors on environmental outcomes. In fact, empirical analyses on Italian data with focus on social inequalities in exposures to traffic emissions have only been done with regard to the city of Rome (Forastiere et al., 2007), and on waste generation and landfill diversion (Mazzanti et al., 2009). This study attempts to fill this gap in the empirical literature by investigating whether income and the ethnic and social composition of population in Italy may have a role in explaining air emissions. Moreover, following Costantini et al. (2013) we implement our analysis taking into consideration three further elements which might affect polluting emissions, namely: technological factors, local environmental regulations and spatial clustering effects. The analysis is conducted at provincial level[4] to investigate the existence of differences in the determination of environmental pollution. Air pollution emission data (from 2005) were combined with data from the 2001 Italian Census.

The results obtained show i) the existence of an inverted U-shaped relationship between income and pollution, ii) no evidence of environmental inequity against the foreign component of the population but significant evidence that releases are higher in provinces with higher percentage of both children and female-headed households, and iii) that judicial inefficiency is associated with higher levels of air pollution. These results imply that, in Italy, environmental injustices are more likely to be observed in terms of social conditions that in terms of racial discrimination.

The remainder of the paper is organized as follows. Section 2 presents a review of the key conceptual issues that are addressed in the literature. Section 3 presents the theoretical framework and the empirical model specifications. In Section 4 the datasets used in the analysis are discussed. Section 5 presents the estimations' results, and Section 6 concludes.

2. Key References in the Literature

Since Grossman and Krueger's (1991) seminal paper, a large volume of scientific research has been conducted to investigate the hypothesis of an inverted U-shaped relationship between a measure of environmental quality (such as, CO_2 emissions per capita) and the gross domestic product (GDP) per capita. This hypothesis assumes that in the early steps of a country's economic growth, pollution tends generally to increase rapidly because the country's priority is production and minor attention is devoted to the environmental impact of growth. This implies that increases in economic production determine, throughout a "scale effect", more pollution and environmental degradation (Beckerman, 1992; Bousquet and Favard, 2000; Dinda, 2004). However, in the following phases of growth, as national GDPs keep rising, the need of a cleaner environment increases as individuals, businesses and institutions are willing to invest for improving the environmental quality (Bhagawati, 1993; Dinda, 2004; Kijima et al., 2010).

Since the early 1990s the empirical literature on the relationship between economic growth and environmental pollution has dramatically increased with plenty of empirical studies finding evidence of the existence of the EKC (Cole and Neumayer, 2005; Coondoo and Dinda, 2002; Copeland and Taylor, 2004; Grossman and Krueger, 1991, 1995; Koop, 1998; Panayotou, 1993, 2000; Selden and Song, 1994; Shafik and Bandyopadhyay, 1992; Stern, 2004) but also with several studies finding little evidence of the EKC (e.g., Dinda, 2001; Harbaugh et al., 2002; Soytas et al., 2007). Given that the relationship between income and environmental degradation has been observed to vary widely according to the type of pollutant taken into account (Bruvoll and Medin, 2003; Cole et al., 1997), several are the factors that have been put forward to explain the different results, such as the timeframe considered, the countries (i.e., developed or developing), the measurement method of emissions, and the estimation model.

Grossman and Krueger (1995) argue that knowing the shape of the relationship between environment and income could help policy makers in improving or developing new environmental policies. However, as de Bruyn et al. (1998) point out, studies on EKC are based on reduced-form models. This means that the endogenous variable (environmental quality) is expressed only as a function of predetermined variables, and no indication about the direction of causality (whether growth affects the environment or vice versa) is known. As stated by Cole et al. (1997, p. 401) reduced-form relationships "reflect correlation rather than causal mechanism".

Another source of discontent associated with EKC studies refers to the fact that several other variables might affect pollution levels. As already mentioned, the so-called environmental justice approach aims to expand the structural factors assumed to drive the environmental Kuznets curve relationship, in order to better integrate economic and social issues with environmental issues. Ethnic diversity and race have been the most significant variables which have been neglected in empirical studies (for example, Cole et al., 1997; Selden and Song, 1994) on the EKC, but that have started to be used by the environmental justice literature to investigate the possible causal relationship between income inequalities and pollution levels.[5]

Over the last two decades, environmental justice literature has grown very rapidly. Numerous studies provide evidence of inequities in the spatial distribution of environmental quality (e.g., Aradhyula et al., 2006; Bullard, 1983; Bullard and Wright, 1987, 1989; Bullard et al., 2010; Goldman, 1991; Hamilton, 1993, 1995; Nieves and Nieves, 1992). However, some others find limited or no support for the existence of environmental inequities (e.g., Anderton et al., 1994; Been and Gupta, 1997 and more recently Cory and Rahman, 2009). Anderton et al. (1994), using the 1980 US census data and employing multivariate regression techniques to investigate environmental equity in the demographics of dumping, find that education and occupation, but not race, are significant indicators of waste facilities in a census tract. Been and Gupta (1997) using 1990 US census data, obtain mixed evidence on environmental inequities: while waste disposal sites proved to be correlated with race and income, neither the percentage

[4] In Italy, a province is an administrative sub-division of a region, which is an administrative sub-division of the State. A province consists of several administrative subdivisions called "comune". Italy was divided into 103 provinces at the time we collected our data; as of 2011, there are 110 provinces. Provinces are equally distributed on the territory between northwest, northeast, center and south, even though the level of urbanization is higher in the northern part of the country.

[5] On the causal relationship between poverty/inequality and pollution there is a broad ongoing debate. Poor people, in fact, are assumed to have a lower willingness to pay for a clean environment, thus showing a higher willingness to live in damaged environmental and social areas. The underlying question posed by several authors (e.g. Thurow, 1980) is "Can we really expect people who suffer severe problems of poverty to care about urban air pollution?" — which is not any easy question to answer. As observed by Martinez-Alier and Guah (1997), in fact, also the poor are 'environmentalists', though it is not always this very term that is being used to describe their concern for the environment. Their environmentalism is to be distinguished from that of rich people as it is usually associated with ecological distribution conflicts; accordingly, these two varieties of environmentalism have been characterized by the authors as the environmentalism of the affluence or of the 'enhanced quality of life', on the one hand, and as the environmentalism of survival or livelihood, on the other.

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