Ecological Economics 93 (2013) 249–259

Contents lists available at SciVerse ScienceDirect

Ecological Economics

journal homepage: www.elsevier.com/locate/ecolecon

Analysis

Local exposure to toxic releases: Examining the role of ethnic fractionalization and polarisation

Matthew A. Cole *, Robert J.R. Elliott, Khemrutai Khemmarat

University of Birmingham, UK

ARTICLE INFO

Article history:
Received 20 June 2012
Received in revised form 28 February 2013
Accepted 22 May 2013
Available online 28 June 2013

JEL classification:
Q53
Q56
D70

Keywords:
Pollution
Ethnic divisions
Fractionalization
Polarisation
Community characteristics
Environmental justice

ABSTRACT

This paper examines the role played by community characteristics in influencing local exposure to toxic releases, focusing specifically on ethnic fractionalization and polarisation. In contrast to the previous literature, this study argues that it is the fractionalization and/or polarisation of ethnic groups that is the relevant consideration, rather than the population share of ethnic minorities, since such ethnic divisions may significantly increase the difficulty of coordinating community action. Using toxic release data for the periods 1990 to 1995 and 2000 to 2005 we find that measures of ethnic divisions have a positive relationship with toxic releases. This finding persists across a range of robustness exercises.

1. Introduction

In recent years the public disclosure of countries' major industrial polluters has become increasingly commonplace. Referred to by some as the third wave of environmental regulation after command and control and market instruments (Tietenberg, 1998), the intention is that schemes such as the US Toxic Release Inventory (TRI) and the Canadian National Pollution Release Inventory will provide information to the public regarding the sources of industrial pollution within their locality.[1] A large literature has emerged to examine how various stakeholders, including investors and consumers, once armed with such information, may pressurise polluters to reduce their emissions (Antweiler and Harrison, 2003; Hamilton, 1995; Khanna et al., 1998). However, the majority of studies within this literature focus on the role played by community characteristics and examine whether the presence of certain characteristics such as income and unemployment is likely to increase or decrease pollution within that locale (Arora and Cason, 1999; Becker, 2004; Cole et al., 2005; Kahn, 1997; Pargal and Wheeler, 1996).

In this paper we focus on environmental injustice, a key theme within this broad body of literature. Environmental injustice is said to occur if certain racial or socioeconomic groups experience a disproportionate share of the negative environmental consequences of industrial activity. With regard to race, GAO (1983) and United Church of Christ (1987) were the first to raise the possibility that US hazardous waste sites were disproportionately located in areas with large concentrations of ethnic communities. A twenty-year update of the 1987 report by Bullard et al. (2007) claims that racial disparities in the distribution of hazardous waste are greater than previously reported. Goldman and Fitton (1994) and Boer et al. (1997) also find a positive relationship between race and pollution while Davidson and Anderton (2000), Hamilton (1995), Anderton et al. (1994) and Jenkins et al. (2004) find less compelling evidence of a link between race and hazardous waste or landfill sites. Arora and Cason (1999) find that race does play a role, but only in 'non-urban' areas of the Southern USA. More recently, Chakraborty (2009) considers the health impact of exposure to transportation-related emissions instead of fixed sources and finds that ethnicity is a persistent determinant of the distribution of health risks from vehicular emissions.[2]

* Corresponding author.
E-mail address: m.a.cole@bham.ac.uk (M.A. Cole).

[1] Other public disclosure schemes include the UK's Pollution Inventory, Australia's National Pollutant Inventory, Indonesia's Program for Pollution Control, Evaluation and Rating, the Philippine's EcoWatch scheme and the Chinese GreenWatch programme.

[2] See Brulle and Pellow (2006) and Kingham et al. (2007) for other studies of transport related studies of environmental justice. For other recent reviews see Pastor, 2007 and Boyce, 2007).

0921-8009/$ – see front matter © 2013 Elsevier B.V. All rights reserved.
http://dx.doi.org/10.1016/j.ecolecon.2013.05.011

Three recent studies have further stimulated the environmental justice debate. Wolverton (2009) finds that race is positively and significantly related to plant location when using *current* socio-economic data, but does not find such a link between plant location and race at the time of siting. Ash et al. (2010) find evidence to suggest that urban areas containing minorities do experience greater pollution exposure and this affects all population sub-groups, including whites. Their conclusion is that environmental justice is good for everyone, not just ethnic minority groups. Finally, Gray et al. (2010) examine whether environmental injustice may occur through reduced regulator activity in poor or ethnic communities but find little evidence to support this.

The principle argument linking ethnicity to pollution is that the presence of ethnic groups may limit the ability of communities to lobby against polluters and regulators and to mobilise collective action more generally (Hamilton, 1993). Communities inevitably vary in their ability to overcome the free-rider problem to engage in collective action and the presence of ethnic groups may be one factor which limits this ability, perhaps because of language barriers or unfamiliarity with local political processes. However, to date, the literature examining the link between ethnicity and pollution has done so by looking only at the *share* of certain ethnic groups within each area. One barrier to collective action may be ethnic *divisions*, measured in terms of fractionalization or polarisation, as this is likely to increase coordination problems, and hence transaction costs, associated with such action. A growing number of studies now link ethnic fractionalization to various aspects of economic and social activities with several focusing on the provision of public goods (Alesina et al., 1999; Miguel and Gugerty, 2005; Vigdor, 2004). These studies typically argue that ethnic divisions imply the heterogeneity of preferences in a community which, by creating disagreement surrounding public good provision, reduces the community's ability to engage in collective action.[3] However, as far as we are aware, no studies have yet examined the role played by ethnic divisions (fractionalization or polarisation) in potentially reducing the ability of a community to informally regulate local polluters. The contribution of this paper is therefore to provide the first analysis of how ethnic fractionalization and polarisation may influence local environmental quality, as proxied by local toxic air releases.

Using data from the Toxic Release Inventory (TRI) for 1990–1995 and demographic data from the 1990 US Census of Housing and Population, we examine how ethnic fractionalization and polarisation affect zip-code level, toxicity weighted, toxic air releases. As part of our sensitivity analysis we repeat the analysis using toxic releases for 2000–2005 using the 2000 US Census of Housing and Population at the county-level. We find evidence to suggest that the volume of industrial toxic releases within a zip-code increases with the degree of ethnic divisions within a community. Furthermore, our findings suggest that the relationship between ethnic divisions and toxic releases exists in both of the periods that we investigate.

The remainder of the paper is structured as follows: Section 2 outlines the measurement of fractionalization and polarisation, Section 3 discusses our data and methodology, Section 4 provides our results and Section 5 concludes.

2. Ethnic Divisions: Fractionalization and Polarisation

2.1. The Link between Ethnic Divisions and Toxic Releases

Those who suggest that there may be a causal link from ethnicity to pollution provide two reasons as to why plant location, and hence toxic releases, may be influenced by the presence of ethnic communities (Hamilton, 1993).

First, based on Coase (1960), firms will locate where the valuation of environmental quality and hence the damage for which they would be required to compensate, is lowest. Since, as Wolverton (2009) points out, local willingness to pay for environmental quality is a positive function of income, a firm locating in a low income area, in which ethnic minorities are likely to be present, is likely to be required to make smaller compensation payments.

Second, plants will locate where the likelihood, and strength, of collective action is lowest. If formal environmental regulations fail to ensure that local environmental quality meets local preferences, there is significant evidence to suggest that communities 'informally' regulate polluters themselves through bargaining and lobbying (see e.g. Hartman et al., 1997; Pargal and Wheeler, 1996). Such collective action may take the form of the direct lobbying of firms or alternatively regulators may be targeted as communities try to achieve political influence to ensure regulations are strengthened or more effectively enforced. It is possible that the existence of ethnic divisions within a society may reduce its ability to undertake collective action, perhaps by limiting social capital. The presence of social capital, typically defined in terms of trustworthiness, social networks and the existence of informal rules and institutions, is often seen as an important facilitator of such collective action (Ostrom and Ahn, 2008). If the cultural and linguistic differences between ethnic groups serve to reduce trustworthiness and limit the creation of community networks then social capital will be limited, the costs of working together will be increased and collective action is less likely to occur (Ostrom, 1994). While the ethnic *share* within a society could also potentially cause such effects, we believe that ethnic divisions will have the more direct impact on social capital and hence collective action.

2.2. Measuring Fractionalization and Polarisation

The majority of empirical studies that examine the effects of ethnic divisions do so using fractionalization indices, the most common being the index of ethnolinguistic fractionalization (ELF). The ELF index can be defined as follows:

$$ELF_j = 1 - \sum_{i=1}^{I_j} \left(\frac{n_{ij}}{N_j}\right)^2 = 1 - \sum_{i=1}^{I_j} \left(\pi_{ij}^2\right) \quad (1)$$

where n_{ij} is the number of people that belong to ethnolinguistic group i in country j, N_j is the size of country j's population, I_j is the total number of ethnolinguistic groups in country j, and π_{ij} is the share of population belonging to group i in country j. Therefore, the index increases when the number of groups increases.

While different versions of the ELF index exist, based on different definitions of ethnic groups and different data sources, there are two reasons for the popularity of the index. First, it is easy to interpret and simply represents the probability that two randomly drawn individuals from the population in a given geographical area will not belong to the same group. The index ranges from 0 (perfectly homogenous) to 1 (each individual belongs to a different group). Second, the index is relatively easy to compute and requires only the population shares of each group within each area. That said, the index has received some criticism relating to the difficulty of identifying *relevant* groups (Posner, 2004) and the fact that the index may not adequately capture the depth of group divisions. For example, the index assumes that individuals within a group are identical while individuals in different groups are totally different and the difference between them is the same irrespective of which groups they belong to (Lind, 2007).

An alternative way of capturing ethnic heterogeneity is through the concept of polarisation. In general, polarisation captures the idea that society tension is driven by an individual's sense of identification

[3] Ethnic divisions have also been linked to economic growth (Easterly and Levine, 1997), interpersonal trust (Alesina and la Ferrara, 2002; Leigh, 2006) and the likelihood of civil war (Collier and Hoeffler, 1998, 2004).