Inequality of Opportunity and Economic Performance: Empirical Evidence from Indian States

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Abstract

This study tests the effects of inequality of opportunity on the economic performance of Indian states. This is first such attempt using Indian data, and the case is relevant because Indian society is divided into different castes and religious groups. Using two rounds of employment survey data conducted from the National Sample Survey (NSS), a state-level analysis is performed. The paper employs the recently-developed method proposed by Ferreira and Gignoux (2011), and computes a state-level analysis of inequality of opportunity in income due to caste, religion and gender. Results suggest that there is wide heterogeneity among Indian states in inequality of opportunity. Models overcoming the endogeneity problem in the estimation confirm the effects of inequality of opportunity on economic performance. Specifically, the results of the analysis suggest that the impact is negative and moderate on per capita income. These findings validate the theoretical argument that a greater equity of opportunities leads to enhanced productivity and efficiency. Conversely, a high level of inequality of opportunity in the job market is likely to hurt economic performance.

JEL Classification: D31, D63, J15, O15, O40
Keywords: Income inequality, inequality of opportunity, economic performance, caste, religion

1. Introduction

Issues related to the link between growth and inequality are classic concerns in the economics and development literatures. The question of the impact of inequality on growth, though appearing to be simple and uncomplicated, remains unresolved and open for debate, both in the theoretical and empirical literatures. Some of the recent theoretical models of growth and inequality, especially those developed in the last two decades, show that inequality inversely impacts growth (e.g. Deininger and Squire 1998; Knowles 2005), whereas many others argue that inequality may have some beneficial effects (e.g. Bénabou 2000; Forbes 2000). Empirical analyses on the issue also yield

contradictory findings (e.g. Barro 2000; Marrero and Rodríguez 2013; Babu et al 2016).

This paper focuses on inequalities stemming from opportunities and effort (Roemer 1998). Inequality stemming from variations in individual effort may be acceptable and encouraged. In contrast, inequality arising from circumstances, for instance, gender, ethnicity, caste and family background, and religion, are usually considered unfair and unethical for society (Roemer 1998; Roemer et al 2003; Peragine 2004). Moreover, it has been argued that inequalities arising from personal effort are fair and society should not compensate those who receive less, while inequalities arising from factors beyond individual responsibility are unfair and thus need to be compensated by society (e.g. Peragine 2004). Inequality in opportunity stemming from circumstances wastes productive potential, and contribute to social instability and institutional frailty, possibly dampening economic growth prospects (Ali 2007; Hassine 2012). Thus, Roemer (1998) argues that equality of opportunity is crucial for efficient use of human resources, increased social unity, and contributes to long term growth and development.

The empirical literature on the effect of inequality of income on growth is mixed. While some studies (e.g. Deininger and Olinto 1999; Bénabou 2000; Forbes 2000), have estimated a positive impact of inequality on growth, several other studies reported a negative linkage (e.g. Alesina and Rodrick 1994; Perotti 1996; Deininger and Squire 1998; Barro 2000; Knowles 2005; Ostry et al 2014). The mixed findings could result from several shortcomings. For instance, the empirical literature uses different channels of effects, which made the empirical relationship between inequality and growth quite ambiguous. Furthermore, quality and type of data, the inconsistent nature of inequality measures and indexes (e.g. Székeli 2003; Knowles 2005), and econometric techniques and model specification (e.g. Forbes, 2000; Panizza 2002) could be reasons behind inconsistent findings in the existing empirical literature.

One of the crucial factors that the related empirical literature has widely ignored is to differentiate between inequality of opportunity (IO) and inequality of effort (IE) when testing the effect on growth. This could be an important reason behind the mixed findings. Marrero and Rodríguez (2013) have argued that inequality of opportunity would reduce growth as it favours human capital accumulation by individuals from advantaged social settings. For example, in India, society is widely divided by caste and religion. The deep-rooted division is not only significant for social outcomes, but also has important implications for economic outcomes, such as inequality of opportunity in job markets (e.g. Zacharias and Vakulabharanam 2011; Singh 2012). A lower-caste worker may be less likely to be employed in a high-caste owned business enterprise in some regions of the country. Similarly, a Muslim worker is less likely to be employed in a Hindu owned enterprise. Moreover, India is a large country and there is a remarkable heterogeneity among states. For instance, in some states minorities and backward castes are in the majority and dominate politically, socially and

economically. Consequently, it is important to analyse issues at the state-level instead of at the nation-state level.

Against this background, the present paper estimates the inequality of opportunity at state-level, and tests its impact on the relative economic performance of Indian states. In doing so, the paper makes several contributions to the existing literature. First, as discussed, there is no dearth of studies which test the effects of inequality and economic growth. However, barring two studies – Marrero and Rodríguez (2013) and Ferreira et al (2014) – the empirical literature is focused mainly on overall inequality and the growth linkage. As noted previously, inequality stemming from effort and circumstance may have different impacts. Second, for studying circumstance-based inequality, or inequality of opportunity, the Indian case is best suited because of historical caste and religious diversity in the society. Since some Indian states are more prosperous than others, we attempt to answer whether inequality of opportunity has a role in such disparity. Third, data from two recent rounds of the National Sample Survey (NSS), 2004-2005 (61st round) and 2009-2010 (66th round), are extracted. The coverage of NSS data is enormous and it includes almost all districts of all Indian states. For example, in the 66th round, 100,957 households were surveyed (59,129 rural, 41,828 urban), comprising 459,784 individuals (281,327 rural, 178,457 urbans). Moreover, the database suits the present analysis as it contains information on income, education, religion, caste and the gender of workers.

The final contribution is in terms of methodology. To estimate IO, parametric and non-parametric approaches are widely used for analysis. The main idea behind earlier approaches is that in a world of equal opportunities, circumstance should not matter and therefore the regression should have a weak fit (Juarez and Soloaga 2014). The key shortcoming of this idea is that it offers only lower bound estimates of IO. Under this method the unobserved circumstances quite often credit effort incorrectly in driving inequality of opportunity. Methods proposed by Ferreira and Gignoux (2011; 2013), for continuous variables, overcome this problem. Therefore, we use this approach as it is likely to yield better and more accurate estimates of IO. Furthermore, it is pointed out by several authors (e.g. Ferreira et al 2014; Babu et al 2016) that endogeneity is an important issue in the estimation of models of inequality and growth. We therefore use an instrument-based technique to overcome this potential problem.

In order to elucidate these themes, the rest of the paper is organised as follows. Section 2 sets the context by providing background information on castes and religions in India, and discusses concepts of inequality of opportunity and the related literature. Section 3 explains the data and estimates inequality of opportunity. Section 4 presents and discusses the empirical models and the empirical results. Section 5 concludes and discusses the implications of the findings.

2. Background: Castes and Religions in India and Inequality-Growth Issues

2.1. Castes and Religions in India

Caste and religious diversity is an important characteristic of Indian society. The diversity is deep-rooted and has a strong historical background, but despite several legislative and administrative attempts to abolish discrimination since the country's independence, along with rapid economic progress in the last two and half decades, it still affects the daily lives of the people. In Hindu society, the caste system has been one of the most enduring institutions in India. The system consists of social categories, which include forward castes (Brahmans, Kshatriyas and Vaishyas), backward castes (Shudras) and scheduled castes and tribes (Dalits and Adivasi). The system has created social, cultural, and political barriers in Indian society, for example, inter-caste marriage is often restricted. The system also has serious economic implications, as caste is hereditary and connected to occupation.

It is clearly stated in the Indian constitution that:

> The state shall promote with special care the educational and economic interests of the weaker sections of the people, and, in particular, of the Scheduled Castes and the Scheduled Tribes, and shall protect them from social injustice and all forms of exploitation (The Directive Principles of State Policy (DPSP), Part IV (Article 36-51) of the Constitution of India)

With these objectives, the provision of reservation has been made for a list of castes and tribes that are entitled to compensatory discrimination via reserved positions, both at the national and sub-national levels. This makes a mandatory allocation of seats in public education institutions and public service appointments for the reserved categories of castes. Initially, these provisions were only for Scheduled Castes and Scheduled Tribes, but later they were extended to other backward castes.

The country also has several religions' followers. According to the latest census of the country, the Hindu population is 79.8 per cent, Muslim is 14.2 per cent, Christian is 2.3 per cent, and Sikh is 1.7 per cent (Census of India 2011). Religious groups are regionally concentrated, for instance Hinduism is a major religion in large states, which are geographically located in central, western, and southern parts of the country. Muslims are in the majority in some remote states, like Jammu and Kashmir and Lakshadweep. The Christian population is in the majority in several small and hilly north-eastern states, like Meghalaya, Mizoram, and Nagaland. Sikhism is a major religion in Punjab, where they comprise 58 per cent of the population. It has been reported that individuals are discriminated because of their religion (e.g. Robinson 2008).

2.2. Concept of Inequality of Opportunity (IO)

Roemer (1998) has proposed that inequality can be separated into: (i) that which is a consequence of differential effort levels; and, (ii) luck and circumstance. It can be argued that inequality resulting from differing effort levels cannot be considered an objectionable feature of a society: different effort

levels lead to different outcomes, hence it is desirable for a society to reward greater effort. In contrast, inequality stemming from circumstances beyond the control of individuals is considered morally undesirable. This is because circumstances cover factors that cannot be changed through effort, yet still affect the economic outcome.

Roemer (1998) and Bowles et al (2005) have argued that circumstances can affect the realisation of talent and, thus, inhibit the full attainment of a purely meritocratic society. It is also shown by them that even if individuals have high inborn talent, they still need social conditions and circumstances to help them realise this. For example, admission to university or access to employment is crucially affected by social conditions, and without proper social support the talent may not be realised.

The importance of the issue of inequality of opportunity has been increasingly appreciated in the two last decades. Two broad approaches, which are potentially inverse to each other, are adopted by researchers. The first is an *ex-ante* approach that promotes inequality of outcomes among some group members with the similar set of initial conditions, by keeping their outcome values (e.g. income, consumption) as equal as possible. This approach argues that there is equality of opportunity if the set of circumstances is the same for all individuals, irrespective of their different initial conditions. Inequality of opportunity decreases when inequality between individual opportunity sets decrease. This framework is offered in theoretical studies (Ok 1997; Ok and Kranich 1998), while other studies combine theoretical and empirical analysis (Bourguignon et al 2007; Ferreira and Gignoux 2008; Lefranc et al 2008).

The second is an *ex-post* approach of inequality of opportunity, that compensates the inequality generated by diverse initial conditions among individuals with similar characteristics. Under this approach, those who exert the same effort end up with the same outcome that is considered to be the equality of opportunity. The level of inequality of opportunity decreases if outcome of inequality decreases among individuals with the same degree of effort. This concentration on *ex-post* compensation of outcomes is used largely as a significant part of the axiomatic theory of fair social orderings (e.g., Bossert, 1995; Fleurbaey 1995). Some studies (e.g., Lefranc et al 2008; Pistolesi 2009; Checchi and Peragine, 2010) estimate empirically the measurement of inequality of opportunity using this approach.

Some scholars argue that personal responsibility can be more than an instrumentally valuable tool for securing other values. For instance, Hild and Voorhoeve (2004), criticise Roemerian statistical approaches on the ground that it is unrealistic because effort cannot be framed to be morally valuable *per se*. It can be considered that in a world where individual choices are events and all events are caused by prior events, accountability can make sense pragmatically and instrumentally in various settings, but it may not be sensible to use it in a normative sense under scrutiny. Accordingly, personal responsibility cannot be enclosed and portrayed as a single metric, because it contains

numerous groupings of morally relevant characteristics. The ranking of monotonically-increasing functions of effort makes hardly any sense without framing them in a multidimensional environment. Others, like Currie and Steedman (1993, 1997) and Skott (1997) have argued that the concept of effort is somewhat amorphous and suggest that effort is a multi-dimensional concept that encompasses alertness, perseverance, concentration, care, enthusiasm, initiative and dynamism.

2.3. Methods of Estimation of Inequality of Opportunity (IO)

A range of techniques are used to compute inequality of opportunity in the empirical literature. For instance, Lefranc et al (2008) employed stochastic dominance rankings of distributions, conditional for this purpose. However, this estimation method requires a large sample for each type of circumstance. This limits the number of circumstances that can be included in the estimation. Others, like Checchi and Peragine (2010) have adopted non-parametric methods that decompose total inequality into 'between-group' and 'within-group' components, which require larger sample sizes. In the case of smaller samples, the estimation often yields inconsistent and unreliable results. Bourguignon et al (2007) used a formal parametric method that overcomes earlier problems, by employing the OLS estimator. This approach considers the outcome on circumstance and effort to generate a smooth distribution that is conditionally related to the circumstances that compute inequality of opportunity. This approach is developed by Ferreira and Gignoux (2011) and has become a generally preferred method for empirical assessments of inequality of opportunity.

2.4. Empirical Findings

Several theoretical models are proposed – by Galor and Zeira (1993), Easterly and Levine (1997) and Gradstein and Justman (2002) – which suggest that racial and ethnic heterogeneity restrict access to credit, which may have a negative effect on inequality of opportunity with regard to investment and growth. Inequality in general, and inequality in opportunity in particular, affects economic performance by reducing the health of low income households, which in turn reduces human and physical capital accumulation (Galor and Moav 2004). It also affects labour productivity, as children from poor households are unable to afford quality education, in particular higher education, which ultimately has serious implications for productivity and growth (Stiglitz 2012). Inequality in opportunity can also potentially depress skills development among workers of low income and lower caste or ethnicity, both in terms of the quantity and quality of education, and skill proficiency (e.g. see Cingano 2014). Furthermore, Rajan (2010) argues that higher inequality is associated with economic slumps, by intensifying leverage, overextension of credit, and a relaxation in mortgage-underwriting standards.

Inequality of opportunity particularly exacerbates crisis by impacting the economics of conflict, as it may increase the trust deficit among certain groups

that can reduce the opportunity costs of initiating and joining a violent conflict (see also Lichbach 1989). Marchionne and Parekh (2015) analysed a sample of multiple countries and found that higher income inequality shows lower threshold points. In addition to this, further increases in debt reduce growth, and there is a higher sensitivity of growth to debt changes. Hence, the more even is income distribution, the more a country should be fiscally virtuous, avoiding an impact on growth. Recently, Sharma and Paramati (2017) measure the inequality of opportunities in the Indian states. The outcome of their analysis indicates that the socially backward groups have an economically disadvantageous position in some Indian states. However, the degree of circumstances based on inequality varies largely among states.

As discussed previously, there is no dearth of empirical studies analysing the linkage between inequality and growth. However, inequality is an aggregate concept of inequality of circumstances and inequality resulting from different levels of effort. Each type of inequality is expected to have a different impact on the growth of an economy. Consequently, if the effects of aggregate inequality are tested on economic growth, the results of estimated coefficients of aggregate inequality hardly tell us anything. Ferreira et al (2014) also argue that such empirical models suffer from misspecification bias.

To the best of our knowledge, only two attempts have been made to estimate the effects of inequality of opportunity on economic growth. Marrero and Rodriguez (2013) conducted the first study using the refined data of the PSID database for 26 U.S. states in 1970, 1980, and 1990. The study found robust support for a negative relationship between inequality of opportunity and growth, and a positive relationship between inequality of effort and growth. Their findings also indicated that the opportunity-related inequalities associated with parental education and race lead to lower growth. However, the impact of opportunity-related inequalities due to parental occupation, nationality or geographical location on economic growth, could not be established in their analysis.

Ferreira et al (2014) conducted the second study using 118 household surveys and 134 demographic and health surveys, in a cross-country study, to consider the association between inequality with economic growth. They were interested, in particular, in examining whether inequality of opportunity — driven by circumstances at birth — had a negative effect on the subsequent growth. Their analysis failed to provide any clear evidence regarding the effects of inequality of opportunity on economic growth. Nevertheless, in some samples and specifications, overall wealth inequality and inequality of opportunity were found to have a negative effect on growth. But, these results were not robust and quite sensitive to relatively minor changes in model specification. Although their main results were suggestive of a negative association between inequality and growth, the different data at their disposal could not yield a robust conclusion as to whether inequality of opportunity is bad for growth.

In the Indian case, there are some studies that have tested the inequality-growth inter-relationship. Using data from various government sources, such as the National Sample Survey (NSS), government accounts, and a dataset compiled by the World Bank, Ghosh and Pal (2004) examined the effect of inequality on growth among Indian states. Their analysis suggested that inequality influences negatively the growth of total output. It was also clear that the indicator of inter-sectoral inequality is quite important in explaining sectoral output growth. Recently, Babu et al (2016) assessed the impact for a panel of emerging economies, including India, after controlling for re-distributive transfers. Inequality was estimated to have a significant negative effect on growth in the long run. However, these studies on India have failed to differentiate between forms of inequality. It is the effects of inequality of opportunity on the basis of caste or religion that the present paper seeks to explore.

3. The Data and Estimation of Inequality of Opportunities

3.1. The Data

The National Sample Survey (NSS) on employment and unemployment contains data on wages, occupation, gender, caste, age, and employment of workers. The data for this study has been collected from the surveys of round 61, conducted from July 2004 – June 2005, and round 66, conducted from July 2009 - June 2010. For simplicity we shall refer to these as the 2004 and 2009 rounds. In the NSS, a nationwide enquiry was conducted to provide estimates of various characteristics relating to employment and unemployment in India. Data concerning labour market characteristics at the national and state levels was also collected. The data contain information about individuals being regularly employed, self-employment, or casual workers. Note, a large proportion of the self-employed did not report any earnings for the week in which the data were collected. This poses a problem for empirical analysis regarding data on income. Therefore, we have excluded the self-employed from our analysis and focused primarily on employees.

The analysis in this study covers all 35 states of India. It is noteworthy that there are sufficient observations to allow us to undertake a state-wise analysis estimating inequality of opportunity, even when the focus is only on regular workers. For instance, in the majority of states, information about more than 500 individuals is available for the analysis. In some large states, like Maharashtra, around 5000 observations are available for analysis (see Table 1A of the Appendix). For the estimation of inequality of opportunity we have used information of individual workers' religion, caste and gender, to gauge the effect of circumstances, while education and occupation indicators represent the efforts of workers.[2] Our definitions of caste and religious groups are based on NSS data, which classify the population into three backward caste groups – the Scheduled Castes or the "Dalits" (SC), Scheduled Tribes or the "Adivasis" (ST) – and others classified as Other Backward Castes (OBCs). Similarly, the religion of workers, included in the survey, is also used in our analysis.

For our analysis, state-wise average per capita GDP (gdpcap) is sourced from the National Accounts Statistics database of the Central Statistics Office (CSO) of India. We have also utilised other important indicators for states that may potentially affect income, for instance per capita electricity production (elccap), road kilometres per one million population (road), the value of investment projects completed (invcap), the number of banking offices (bankcap) and the number of industrial units (indus). These indicators are taken from the States of India (2016) database provided by the Centre for Monitoring Indian Economy. These indicators are for the years 2003 and 2008, and converted into logarithms.

3.2. Estimation of Inequality of Opportunities

To test the effects of inequality of opportunity on economic performance, we need to estimate inequality of opportunity in the Indian states. For this we adopt the method developed by Ferreira and Gignoux (2011). The approach can be explained as: y is the income of an individual, and C is a matrix of circumstances which are beyond the control of the individual, such as caste and religion. The approach differentiates income by the vector of circumstances and effort. In a general way, we can describe this by expected income:

$$\hat{y} = E[y|C] \tag{1}$$

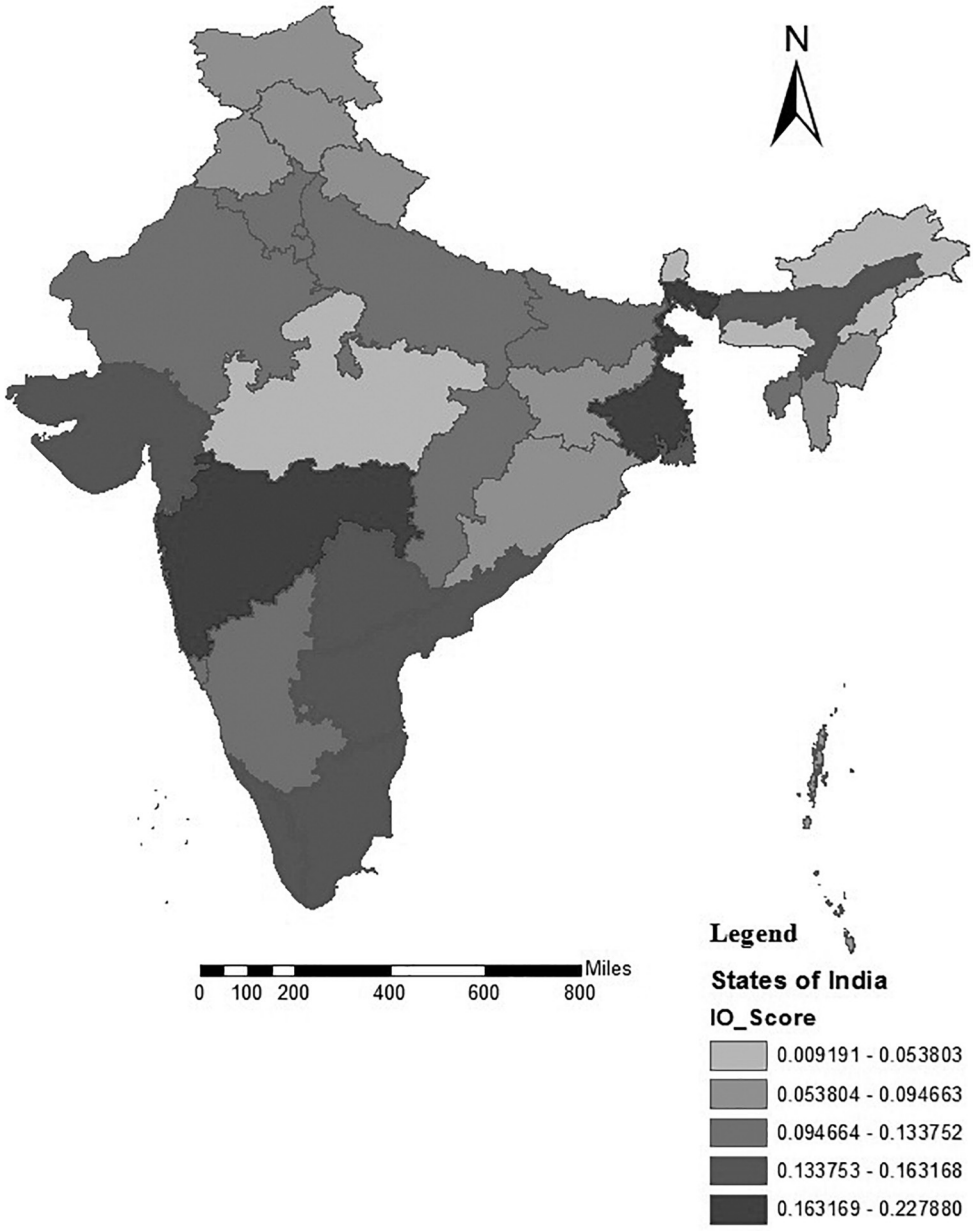
The equation is estimated using OLS, with individual income as the dependent variable. To compute absolute inequality, a common inequality measure $I(.)$ is applied to $\hat{y}$. Absolute inequality is measured as $\theta_a = I(\hat{y})$. All variation in the vector $\hat{y}$ is caused exclusively by circumstances, hence it refers to the inequality of opportunity. After estimating absolute inequality, we can obtain a relative measure of inequality of opportunity by dividing the absolute inequality measure by the same metric applied to actual outcome. Specifically, a relative measure of inequality of opportunity is computed as follows:

$$\theta_r = I(\hat{y})/I(y) \tag{2}$$

For circumstance (C), we use important and relevant circumstances in Indian society, such as dummy variables for castes (ST, SC, and OBC), religion (Islam, Christianity, and Sikhism) and gender (female), to estimate the inequality of opportunity. Workers' salary, or wage, is considered to be y. Separate dummy variable for SC, ST, OBC, Islam, Christianity, Sikhism and female are used. Effort is proxied by education, and occupation indicators in the models. The estimated $\theta_r$is considered as a measure of income inequality in opportunity for further empirical analysis.

We now turn to the results of the estimated inequality in opportunity score. The results of the analysis regarding relative inequality of opportunity are presented on the Indian map (Figure 1) and Table 1A of the Appendix. The estimated average inequality of opportunity of both rounds indicates that,

Figure 1: Estimated IO Scores of the Indian States



Note: The score is average of estimated IO of rounds of 2004 and 2009 (see Table 1A of appendix for individual round score).
Source: Author's estimate.

except Puducherry, and Daman and Diu, most of the large states, for example, Madhya Pradesh, West Bengal, Karnataka, Uttar Pradesh, and Andhra Pradesh, have higher inequality in opportunity, while small and remotely located states, especially in the north eastern region of country like Sikkim, Mizoram, and Manipur, have relative low estimated inequality in opportunity. A relatively urbanised and industrialised state, Maharashtra, and agriculturally rich state, Punjab, have relatively low levels of inequality in opportunity. Economically well off states – for instance, Gujarat and Delhi – and a less developed and urbanised state, Bihar, have surprisingly similar levels of estimated inequality in opportunity. Importantly, the difference in computed inequality of opportunity scores, and the rank of states, do not differ in both rounds of the NSS. However, it is worrying that the computed scores show that inequality in opportunity has increased marginally in most states over time.

4. The Empirical Model and Results

4.1. The Model

The main task of this paper is to estimate the effects of inequality in opportunity on the economic performance of Indian states. To carry out this task, we attempt to form a simple benchmark model. Earlier studies, e.g. Castelló-Climent (2010) and Marrero and Rodríguez (2013), have used the growth rate as the dependent variable. We consider per capita income as a measure of economic performance and use this as the dependent variable.[3]

In our view, relative per capita income and inequality in opportunity in states are not fast-changing variables. Hence, to establish the link between relative economic performance and inequality in opportunity, we look at their levels instead of first differences. Moreover, our model will tell us that whether some states are relatively economically well off because of the low level of inequality in opportunity. Our benchmark model is:

$$y_i = \beta_1 + \beta_2 IO + \beta_3 X_i + e_i \quad (4)$$

where y is average per capita GDP and IO is inequality of opportunity score of Indian state *i*. *X* is the vector of explanatory variables which potentially impact the economic performance and growth of states, for instance, electricity, road, banking system and investment in the state. We prefer to use infrastructure indicators as control variables because previous studies on India have shown that these indicators are crucial drivers of Indian economic growth (e.g. Mitra et al 2002; Hulten et al 2006; Sharma and Sehgal 2010; Mitra et al 2016). We form an index of inequality in opportunity from the computed inequality in opportunity scores of states. For the analysis, all variables are transformed into logarithms. We are especially interested in the estimated value of β_2, which will tell us whether inequality of opportunity in Indian states is an obstacle to economic performance or not. We estimate equation 4 for the 2004 and 2009 round data separately. For round 2004, we employ average GDP for the period

2000–2004, while for round 2009, the average GDP value for the period 2005–2009 is taken. Control variables are taken at a one-year lag. For instance, for the 2004 model, the road and electricity value is taken at 2003.

4.2. Empirical Results

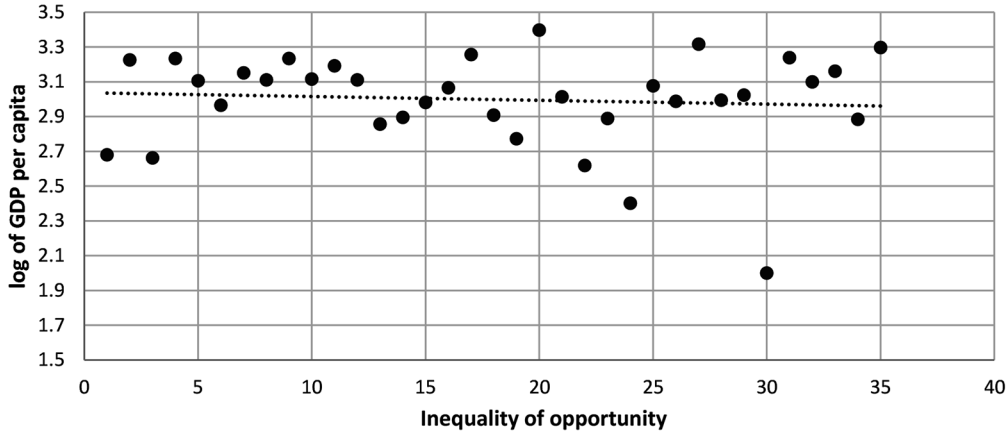
We begin our analysis by plotting inequality of opportunity and per capita income of India's 35 states. Figures 2 and 3 show a simple relationship between the inequality of opportunity index and economic performance, for 2004 and 2009 respectively. The fitted line indicates that there is a negative relationship between inequality of opportunity and per capita income in both rounds. To understand the linkage more clearly, we subsequently estimate model 4 for each round separately, in several alternative ways, and report the results in Tables 1 and 2 for years 2004 and 2009.

The models are estimated using OLS. Column 1 of Table 1 presents the results of a simple model that includes only inequality of opportunity as an independent variable. The results indicate that it has a negative effect on economic performance and the estimated coefficient shows that a state with 1 per cent higher inequality of opportunity has 0.065 per cent lower per capita GDP. In the next column, we present the result of the model which includes electricity and road variables, along with inequality of opportunity. Electricity and inequality of opportunity are estimated to be statistically significant, with a sizable elasticity. In column 3, we include bank branches as the proxy of financial development. Inequality of opportunity is again estimated to be statistically significant, along with other control variables. The final column reports the results that also include lagged investment. Inequality of opportunity is robustly estimated to be negative, sizable (0.055) and statistically significant.

Importantly, all control variables turn out to be statistically significant. Table 2 reports the results for 2009, which are not different from that of 2004. This confirms that inequality of opportunity has a negative and statistically significant effect across the specifications (see columns 1 to 4 of Table 3). The results of other control variables are also found not to be greatly different from the results of 2004 and all control variables, except investment in completed projects, are estimated to be significant and positive.

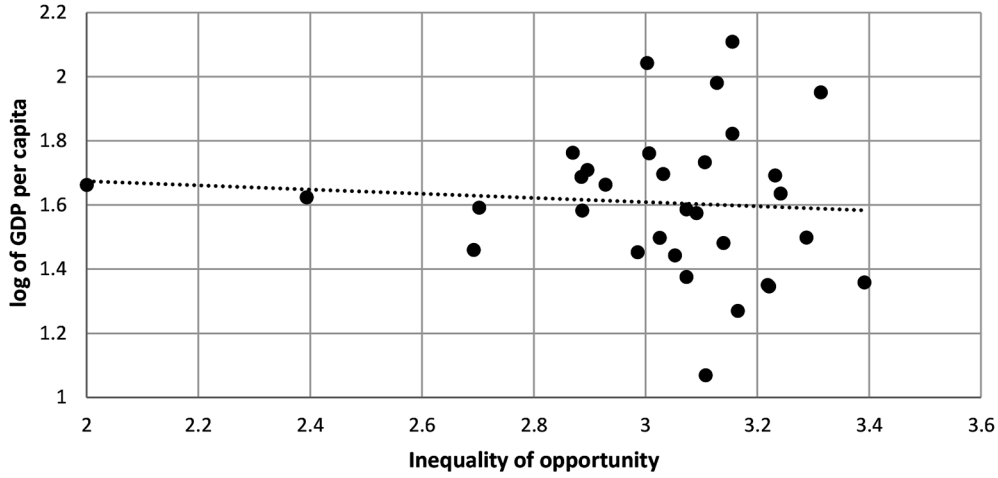
Next, we pool both rounds of data and estimate equation 4 again. In the pooled specifications, a dummy variable for the 2009 round is included in the models, thereby incorporating the time effect. The coefficient of inequality of opportunity is estimated to be negative and statistical significant across the specifications (see Columns 1 to 4 of Table 3). However, the size of the effect is estimated to be marginally lower than that of individual rounds. For instance, the result reported in column 4 is estimated to be –0.022, while in the individual round, it was estimated to be around 0.055. Control variables estimated to be positive for individual rounds are also estimated for the pooled data. Overall some of our models, especially of columns 3 and 4 of Tables 1, 2, and 3, exhibit reasonable fit.

Figure 2: Estimated IO and Per capita GDP of Indian States (2004)



Note: the fitted trend line shows the relationship between log of index of inequality of opportunity (X axis) and log of GDP per capita (Y axis) for Indian states.
Source: Author's estimate

Figure 3: Estimated IO and Per capita GDP of Indian States (2009)



Note: The fitted trend line shows the relationship between log of index of inequality of opportunity (X axis) and log of GDP per capita (Y axis) for Indian states.
Source: Author's estimate

Table 1: Effects of inequality of opportunity on economic performance for 2004: OLS estimation

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap	(4) lgdpcap
liop	–0.0651**	–0.0599**	–0.0574**	–0.0555**
	(0.0140)	(0.0153)	(0.0097)	(0.0184)
lelccap		0.500**	0.360**	
		(0.102)	(0.0650)	
road		0.0327	0.104*	0.168**
		(0.141)	(0.0686)	(0.041)
lbankcap			0.853**	0.981**
			(0.131)	(0.141)
linvcap				0.105**
				(0.0413)
_cons	1.572**	1.327	-0.765	0.0702
	(0.420)	(0.822)	(0.600)	(0.784)
N	31	31	30	23
adj. R^2	0.032	0.098	0.574	0.760

Standard errors in parentheses
* p<0.10, ** p<0.05

Table 2: Effects of inequality of opportunity on economic performance for 2009: OLS estimator

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap	(4) lgdpcap
liop	–0.0652**	–0.0599**	–0.0563**	–0.0548**
	(0.0152)	(0.0102)	(0.00893)	(0.00974)
lelccap		0.573**	0.272**	
		(0.0814)	(0.115)	
road		0.129**	0.151*	0.127**
		(0.00897)	(0.0745)	(0.0312)
lbankcap			0.545**	0.887**
			(0.185)	(0.121)
linvcap				0.0293
				(0.0552)
_cons	1.805**	–0.293	–1.051*	–1.238**
	(0.461)	(0.585)	(0.523)	(0.589)
N	32	31	30	30
adj. R^2	–0.027	0.610	0.717	0.657

Standard errors in parentheses
* p<0.10, ** p<0.05

Table 3: Effects of inequality of opportunity on economic performance for the pooled data: OLS estimator

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap	(4) lgdpcap
liop	–0.0493	–0.0350	–0.0385*	–0.0262**
	(0.103)	(0.102)	(0.0146)	(0.0119)
dummy09	0.141**	–0.123	–0.141**	–0.214**
	(0.0564)	(0.0955)	(0.0605)	(0.0786)
lelccap		0.449**	0.220**	
		(0.0732)	(0.0497)	
road		0.0723	0.120**	0.0438
		(0.0919)	(0.0575)	(0.0650)
lbankcap			0.836**	0.911**
			(0.0905)	(0.0914)
linvcap				0.0586*
				(0.0316)
_cons	1.616**	0.834	–0.926**	–0.734*
	(0.309)	(0.547)	(0.384)	(0.432)
N	63	62	60	53
adj. R^2	0.065	0.204	0.679	0.716

Standard errors in parentheses
* p<0.10, ** p<0.05

Several previous studies have pointed out that models such as ours may suffer from the presence of endogenous regressors due to reverse causation (e.g. see Babu et al 2016). In our case, we cannot discount the possibility that per capita GDP may determine inequality of opportunity. Random shocks that affect state-level per capita GDP probably also affect inequality of opportunity, therefore in this paper inequality of opportunity is treated as an endogenous variable in the model. We believe that the correlation between IO and the error term, *u*, is not equal to zero; because of that we are considering IO as an endogenous regressor. For the estimation, we should have at least one additional variable available that is correlated with IO but uncorrelated with *u*. We have further estimated equation 4, but in this case we used a single-equation instrumental-variables (IV) regression. We utilise the state literacy rate as an instrument for IO and estimated equation 4 for both rounds, as well as using pooled data.

The results of estimation for year 2004 using the IV estimator are reported in Table 4. The size of coefficients of IO on GDP per capita do not turn out to be very different from the OLS results. The sizes of the coefficients do, however, decrease to some extent across the models reported in columns 1 to 4. Specifically, except for column 2, the estimated coefficients are statistically significant at the 5 per cent or 10 per cent level and lie between –0.021 and

–0.025. Furthermore, the estimated results regarding other control variables also indicate that road, electricity, and banking infrastructure are important contributing factors in the economic growth of the Indian states. Focusing on the results of 2009 round data, it further confirms a negative and statistically significant effect of IO on the economic performance of Indian states (see Table 5). However, the size of the estimated coefficients varies marginally across specifications (see columns 1 to 4).

The estimated coefficients of IO compared with the OLS model indicate that overcoming the endogeneity problem has marginally moderated the size. The infrastructure indicators, namely road, electricity, and banking, have become significant and positive. Finally, Table 6 presents the results of pooled data, which suggests a significant and negative effect of IO, yet the size is estimated to be marginally smaller than the OLS estimates. Specifically, the results presented in column 1 indicates a large coefficient of IO, while the inclusion of control variables in columns 2 and 3 moderates the size of the IO coefficient, even though it is statistically significant. The dummy for 2009 is significant and negative, while the infrastructure indicators perform well in controlling the models; and are statistically significant, positive, and sizable across specifications.

Table 4: Effects of inequality of opportunity on economic performance for 2004: IV estimator

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap	(4) lgdpcap
liop	–0.044** (0.0203)	–0.0353** (0.016)	–0.0233* (0.013)	–0.0215* (0.012)
lelccap		0.721** (0.367)		0.405** (0.175)
road		0.316** (0.033)	0.371** (0.062)	0.348** (0.066)
linvcap			0.0485 (0.69)	0.073 (0.550)
lbankcap			0.512** (0.098)	0.500** (0.099)
_cons	0.762 (0.078)	0.51 (0.54)	0.83 (0.25)	–0.72 (0.223)
N	31	31	23	23

Standard errors in parentheses
* p<0.10, ** p<0.05

Table 5: Effects of inequality of opportunity on economic performance for 2009: IV estimator

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap	(4) lgdpcap
liop	–0.0320**	–0.0311**	–0.0354**	–0.0326**
	(0.0031)	(0.0044)	(0.0073)	(0.0029)
lelccap		0.635**		0.751**
		(0.0454)		(0.161)
road		0.0868**	0.044**	0.034**
		(0.0407)	(0.0382)	(0.0304)
linvcap			0.374*	0.328*
			(0.252)	(0.178)
lbankcap			0.342**	0.257**
			(0.369)	(0.374)
_cons	1.24	1.31	1.32	1.099
	(0.958)	(1.819)	(0.921)	(0.717)
N	31	31	30	30

Standard errors in parentheses
* p<0.10, ** p<0.05

Table 6: Effects of inequality of opportunity on economic performance for the pooled data: IV estimator

	(1) lgdpcap	(2) lgdpcap	(3) lgdpcap
liop	–0.0788**	–0.0506**	–0.02285*
	(0.033)	(0.0147)	(0.114)
dummy09	–0.206*	–0.88	–0.144
	(0.120)	(0.181)	(0.294)
lelccap		0.125**	
		(0.018)	
road		0.096**	0.0848*
		(0.044)	(0.0511)
lbankcap		0.680**	0.416**
		(0.014)	(0.075)
linvcap			0.0562
			(0.392)
_cons	0.979*	1.367	–0.301
	(0.596)	(0.2068)	(0.378)
N	62	60	53

Standard errors in parentheses
* p<0.10, ** p<0.05

A comparison with the findings of the previous studies reveals that our results lie between the findings of Marrero and Rodríguez (2013) for the U.S., and Ferreira et al (2014) for a cross-country sample. The findings of Marrero and Rodríguez indicated a strong impact which was found to be robust across models. Ferreira et al found an insignificant impact of IO. In our case, it is negative and statistically significant, although comparatively weak and robust across the models. It is noteworthy that Marrero and Rodríguez (2013) used only 'race' and 'father's education' as circumstances in the IO estimation, while we have considered a more comprehensive range of circumstances. Electricity and road variables are also found to be significant and sizable.

The results of infrastructure variables on economic performance are contrary to the recent findings for developed countries (Crescenzi and Rodríguez-Pose 2012), but similar to the earlier findings of studies on India, as evident in Mitra et al (2002), Hulten et al (2006), Sharma and Sehgal (2010) and Mitra et al (2012, 2016). The elasticity of infrastructure at the aggregate level or individual level is generally estimated to be quite large in the case of India. It is argued that since the country faces a serious deficiency in public infrastructure – road, electricity and other economic infrastructure – the elasticity is relatively larger in size, especially in comparison to more developed countries. This lends some support to the argument that the lack of infrastructure can impede the growth of developing economies (see World Bank 1994 for a detailed discussion). Our findings regarding infrastructure are important because recent Indian studies, for example Sharma and Sehgal (2010) and Mitra et al (2016), have mainly focused on national-level analysis, while the evidence in the present study is at the state level.

It seems that enhancing infrastructure, such as road and electricity, can provide an important push to Indian states' growth. Total investment in completed projects is not found to be a significant factor, and it is consistent across the estimators, specification, and time horizon. It is notable that we also try to use other control variables, i.e., number of factories and government expenditure; however, these indicators do not improve the models and are found to be statistically insignificant. Some estimated OLS models, especially those reported in columns 3 and 4 of Table 1, 2, and 3, indicate higher goodness of fit, which may result from the higher explanatory power of infrastructure measures. Our IV estimator somewhat validates the OLS estimates and suggests that the bias caused by endogeneity only marginally affects the size of coefficients and the overall goodness of fit.

5. Conclusion and Implications

The findings of the literature (e.g. Barro, 2000; Galor and Zeira 1993) on the effect of income inequality related to growth, indicate that inequality can affect growth through several channels. However, the burgeoning empirical literature does not identify any channel that has a predominant influence. As a result, the empirical connection between inequality and growth is also ambiguous.

According to the literature, an important reason for this ambiguous relationship is that income inequality is essentially a combination of inequality of opportunity and inequality of effort. Specifically, total inequality can be considered a consequence of heterogeneity in circumstances, which involves individual initial conditions, and exerted effort has basically nothing to do with individual control variables. Hence, we hypothesise that IO has a negative effect on economic performance in a diverse society.

With some exceptions, a voluminous earlier literature on the effects of inequality related to growth failed to distinguish the effects of inequality stemming from effort and circumstance. Consequently, the findings suffer from a range of theoretical and empirical problems, which restricts the use of their outcomes for policy implementation. We specifically test the effects of inequality based on the circumstances or inequality of opportunity in the labour market on the economic performance of the Indian states. This is the first attempt using Indian data, and the case is suitable for such analysis because, historically, this society has been divided into different castes and religions. Previously, lower castes were discriminated against, socially and economically, but in recent years these castes have gained strength because of the reservation for them in jobs, education institutions, and political representation. Furthermore, we prefer a state-level analysis because Indian states are heterogeneous in terms of caste and religious demography, economic prosperity, and industrialisation.

We have utilised recent advances in econometric analysis and estimated state-level inequality of opportunity (IO). We have utilised important social variables, such as caste, religion, and gender, in the Indian context, for our empirical analysis. The data come from two recent rounds of a comprehensive household survey. Our results suggest that there is wide heterogeneity among Indian states. Large and major states like Madhya Pradesh, West Bengal, Uttar Pradesh, and Tamil Nadu have relatively higher IO, while small and hilly states, like Sikkim, Mizoram and Manipur, have comparatively lower IO. Maharashtra is a large industrialised state and has a below average IO. Subsequently, we test the estimated IO effects on states' per capita income. Although the OLS estimates indicate a role for IO in influencing economic performance, the incorporation of endogeneity in the estimation confirmed the effects (albeit with a lesser magnitude).

Specifically, IO has around a 4 per cent impact on the per capita income of states, which is moderate in size. More importantly, these results clearly indicate that the effect is negative. These findings validate the theoretical argument that greater equity through greater equality of opportunity of circumstance leads to the enhancement of productivity and efficiency; whilst a high level inequality of opportunity in the job market is likely to hurt economic performance. The comparison of our findings with the previous empirical studies, Marrero and Rodríguez (2013) and Ferreira et al (2014), shows concurrence with the findings of the former. This similarity may be because caste in India, and race in the U.S., have institutional similarities. Further, these discriminated categories form the basis for affirmative action in these countries.

The findings are subject to limitations, which in turn provide the opportunity for future research. It is argued in the related literature (e.g. by Roemer 1998) that institutional policies that help in equalising opportunity of different social groups in the labour market are much needed for economic growth and development. However, it has been observed in the Indian case that such polices often encourage social groups to pressurise the political leadership by identifying themselves as disadvantaged, thus escalating social tension. Since our empirical analysis does not deal with the evaluation of affirmative polices, we do not move further on these issues. Another noteworthy limitation of our analysis is the main focus on employees. However, it is important to note that according to ILOSTAT (2017) the self-employed comprise in excess of 80 per cent of total employment of India. Therefore, to cover the whole labour market, a future study may utilise consumption data instead of income data to analyse the effects of IO. Finally, diversity in Indian society may not be captured properly by state-level data, so district-level data can be used in future work.

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Appendix

Table 1A: Estimated inequality of opportunity in Indian states

NSS State Code	State	Estimated IOP	Bootstrap standard error	Estimated IOP	Bootstrap standard error	Observations
		61st round (2004)		66th round (2009)		
1	Jammu & Kashmir	0.087834	0.016929	0.097611	0.017204	1146
2	Himachal Pradesh	0.072162	0.018388	0.072438	0.0192	878
3	Punjab	0.090348	0.012154	0.098978	0.012299	1870
4	Chandigarh	0.084475	0.028178	0.09267	0.030661	309
5	Uttarakhand	0.07031	0.02	0.078107	0.022281	740
6	Haryana	0.065903	0.015308	0.068233	0.015535	1100
7	Delhi	0.119783	0.018008	0.123569	0.018775	954
8	Rajasthan	0.096823	0.01643	0.104012	0.011891	1358
9	Uttar Pradesh	0.132742	0.013763	0.134762	0.012518	2443
10	Bihar	0.117064	0.025558	0.118009	0.022133	702
11	Sikkim	0.009167	0.010181	0.009214	-0.01055	632
12	Arunachal Pradesh	0.042048	0.017767	0.046428	-0.01772	647
13	Nagaland	0.109282	0.032844	0.109006	-0.03227	592
14	Manipur	0.038082	0.014289	0.045395	0.013491	933
15	Mizoram	0.023102	0.011268	0.022802	0.012069	977
16	Tripura	0.115364	0.023739	0.113646	0.022799	677
17	Meghalaya	0.070951	0.01915	0.070951	0.018388	683
18	Assam	0.157339	0.019341	0.153242	0.017284	1310
19	West Bengal	0.18153	0.017443	0.178753	0.015869	2375
20	Jharkhand	0.106631	0.020113	0.108982	0.021407	842

21	Odisha	0.089088	0.016541	0.089158	0.016926	1227
22	Chhattisgarh	0.129826	0.022164	0.126981	0.020266	898
23	Madhya Pradesh	0.228983	0.017589	0.226777	0.016502	1830
24	Gujarat	0.118506	0.017829	0.117562	0.016897	1908
25	Daman & Diu	0.156982	0.092099	0.156982	0.090697	78
26	Dadra & Nagar Haveli	0.118319	0.047823	0.118319	0.047636	151
27	Maharashtra	0.094687	0.008453	0.093502	0.00847	4781
28	Andhra Pradesh	0.154306	0.013347	0.152329	0.014096	2791
29	Karnataka	0.165768	0.017682	0.160567	0.017932	1823
30	Goa	0.142695	0.041966	0.131666	0.04649	262
31	Lakshadweep	0.054254	0.039897	0.053352	0.040859	118
32	Kerala	0.074112	0.075733	0.070731	0.012918	1723
33	Tamil Nadu	0.158956	0.012552	0.157114	0.011514	3784
34	Puducherry	0.190091	0.040838	0.189541	0.040437	343
35	Andaman & Nicobar	0.043826	0.023243	0.131666	0.049582	262

Source: Author's estimation

Endnotes

1. Indian Institute of Management Lucknow, India. *Address for communication:* Indian Institute of Management Lucknow, Noida Campus, Sector 62, Noida 201 307, INDIA. E-mail: chandanieg@gmail.com. Acknowledgment: The author thanks two anonymous referees and Bruce Philp for their useful comments and helpful suggestions on the previous versions of this paper. Any errors or omission are solely of the author.

2. We use the categories of education and occupation in the NSS survey. There are 13 categories of education, in which the lowest rank is 1 for not literate, with the highest being 13 for the highest level of literacy (Ph.D.). Occupation is categorised into 7 types: 1 is the least skilled job, while 7 is the highest skilled jobs of workers.

3. Recent studies on the issue mainly use country panel data for their analysis. In these empirical models the growth rate is used as the dependent variable, while lagged terms of inequality, along with other control variables, are frequently used on the explanatory side (see Marrero and Rodríguez 2013).

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