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Does Affirmative Action Reduce Productivity? A Case Study of the Indian Railways

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Summary. — Our objective is to shed empirical light on a claim often made by critics of affirmative action policies: that increasing the representation of members of marginalized communities in jobs comes at the cost of reduced productive efficiency. We undertake a systematic empirical analysis of productivity in the Indian Railways—the world's largest employer subject to affirmative action—in order to assess whether higher proportions of affirmative action beneficiaries in employment have reduced efficiency in the railway system. We find no evidence for such an effect; indeed, some of our results suggest that the opposite is true.

Key words — affirmative action, labor markets, productivity, railways, Asia, India

1. INTRODUCTION

Affirmative action (AA) encompasses public policy measures designed to reduce the marginalization of members of groups that have historically suffered from discrimination, exclusion, or worse. Starting in India a century ago, and accelerating after World War II, a great variety of AA policies have been applied in many countries of the world. Such policies are most often highly controversial, and their efficacy is highly contested. In particular, it is often argued by critics that any possible gains in inclusivity are outweighed by significant costs in economic efficiency. Our objective in this study is to subject this argument to rigorous empirical testing, in the context of a particularly important case of AA that has implications for many similar AA policies around the world.

India has not only the longest history of AA policies but also the most comprehensive system of AA, reaching far more people than all such policies elsewhere. In India the most prominent form of AA takes the form of "reservations" or quotas for the "Scheduled Castes" (SCs), now called Dalits, and the "Scheduled Tribes" (STs), called Adivasis. Together 22.5% of all seats in central-government-supported higher educational institutions and public sector jobs are reserved for these groups, corresponding to their share of the overall population in the 1950s. [1]

Criticism of AA policies in India is much the same as in most other countries where AA policies have been implemented. It is argued that such policies conflict with considerations of merit because less qualified candidates are selected in place of more qualified candidates, so that poorer academic performance and poorer quality of work on the job is to be expected from AA beneficiaries. [2] But advocates of AA—in India as elsewhere—argue that hiring is otherwise often far from truly meritocratic, and that workforce diversity may actually generate efficiency gains. [3]

To shed empirical light on this debate we focus on the world's largest employer subject to AA—the Indian Railways (IR), with roughly a million and a half employees—in an effort to assess the effects on productive efficiency of its reservations on behalf of Scheduled Castes and Tribes (henceforth "SC/STs"). [4] In the United States, where AA in hiring has been practiced in many industries since the 1960s, a variety of studies of this kind have been carried out. [5] In developing countries, however, such studies are very few in number. The only studies assessing the impact of AA in India focus either on electoral representation (Besley, Pande, Rahman, & Rao, 2004; Munshi & Rosenzweig, 2009), or on higher education (Bertrand, Hanna, & Mullainathan, 2010; Robles & Krishna, 2012). To our knowledge there has not yet been any systematic quantitative study of the effect of AA in the labor market on enterprise efficiency.

For our study of the IR we first compiled data from various zonal annual reports on productive inputs and outputs, distinguishing SC/ST employees from non-SC/ST employees at different job levels, for eight regional railway zones from 1980 through 2002. [6] Using the employment data we then constructed variables representing the SC/ST percentage of IR employees (SCS/T%), first for all employees and then for high-level employees only. We consider the latter SC/ST% to be the better indicator of the effect of AA on IR operations, because almost all SC/ST employees in high-level positions are AA beneficiaries—i.e., they would not have been able to

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reach such positions in the absence of India's reservation policies.

Our approach to analyzing the effect of reservations on productivity in the IR is as follows. First, we estimate total factor productivity (TFP) in each zone-year using a Cobb–Douglas production-function framework, accounting for zone-level fixed effects and employing the Levinson–Petrin correction for simultaneity (i.e., the possibility that input use could itself be influenced by anticipated productivity shocks). In some specifications we include a measure of SC/ST% as an independent variable and examine its significance. In other specifications we proceed to a second stage, in which we either regress the TFP estimate on an SC/ST% variable or correlate it with an SC/ST% variable, and then examine the significance of the result.

As an alternative to traditional production function analysis, we make use of the non-parametric Data Envelopment Analysis (DEA) technique, which requires no *a priori* assumptions about the functional form of production relations and which allows for more disaggregation of input and output variables than is possible in production function analysis.[7] We use DEA to generate estimates of annual rates of change of TFP (henceforth "ΔTFP"), and then we examine whether variation in ΔTFP is related to variation in any SC/ST% variable.

The key findings of or study may be summarized as follows. The production function and data-envelopment analyses provide no evidence in support of the claim that higher proportions of jobs filled by SC/STs are associated with lower total factor productivity or its annual rate of change. Furthermore, under some specifications, higher proportions of SC/ST employees in high-level positions—who are most likely to be AA beneficiaries—are positively associated with higher TFP or ΔTFP. These findings resonate very strongly with studies assessing the impact of workforce diversity on enterprise productivity in the US, which have found either a positive or null effect, but no evidence of a negative effect (Barrington & Troske, 2001).

Our interpretation of the results of this empirical analysis might be contested on the grounds that we have not actually identified the causal relationship at issue. If SC/ST% were itself influenced by a productivity variable, or if both these variables were influenced by other relevant variables omitted from our analysis, then our statistical results could not be interpreted as suggesting the presence or absence of an impact of SC/ST% on productivity. We therefore examined in some detail the processes by which IR jobs are filled, and we considered several specific ways in which SC/ST% in the IR might be thought to be a function of IR productivity or of omitted variables reflecting SC/ST education or ability. We also addressed the concern that our quantitative measures of IR output—and hence productivity—do not encompass potentially qualitative aspects of IR performance that might be especially sensitive to the competence of railway employees. Our analysis of these issues gives us greater confidence that we can interpret the statistical findings of this study as shedding light on the effect of affirmative action on productivity in the IR.

The rest of this paper is organized as follows. In Section 2, we briefly describe the Indian Railway system and discuss the way in which we have compiled the data available from the IR; we pay close attention to the relationship between reservation policies and our SC/ST% variables. In Sections 3 and 4, we explain our production-function and DEA analyses, respectively, and we present the results of these analyses. In Section 5 we address several possible alternative explanations of our findings; and in Section 6, we consider the concern that we have failed to capture key qualitative aspects of IR performance. The concluding Section 7 returns to the general debate about the impact of AA on productivity: we suggest some mechanisms that could explain our findings in the case of the Indian Railways, and we discuss the implications of our analysis for other countries in which AA policies have been or may yet be introduced.

2. AN OVERVIEW OF THE DATA

As noted above, the IR is divided for administrative convenience into regional zones.[8] From 1952 through 2002, there were nine zones in operation:: Central Railway (CR), Eastern Railway (ER), Northern Railway (NR), North-Eastern Railway (NER), North-East Frontier Railway (NFR), Southern Railway (SR), South Central Railway (SCR), South Eastern Railway (SER) and Western Railway (WR). Because separate data on SC/ST employment were not available for the NR, we had to drop that zone from our database; and because of insufficient data availability prior to 1980, our time horizon for analysis was limited to the period from 1980 to 2002.

The IR as a whole in recent years has been operating about 9,000 passenger trains, which transport 18 million passengers daily; its freight operations involve the transport of bulk goods such as coal, cement, foodgrains, and iron ore. The IR makes around 65% of its revenues, and most of its profits, from the freight service; a significant part of these freight profits are used to cross-subsidize passenger service, enabling it to charge lower fares to consumers. During the period from 1980 to 2002, IR gross receipts (earned from passenger and freight traffic) grew consistently from 26 to 411 trillion rupees at current prices; this represents a fourfold increase at constant prices.

While total track kilometers in the Indian Railway system increased modestly from 104,880 km in 1980 to 109,221 in 2002, the percentage of electrified routes increased more rapidly, from just 7% to more than 20%. Coal had long been the main source of fuel for the IR; but by 2002 almost all IR's operations were fueled by more efficient (and less polluting) diesel or electric power. Since the 1980s there have also been significant technological improvements in the form of track modernization, gauge conversion, and upgrading of signaling and telecommunications equipment. In the 1990s the IR switched from small freight consignments to larger container movement, which helped to speed up its freight operations.

In specifying the variables needed for our production-function and data-envelopment analyses, we sought as far as possible to make use of physical rather than value measures. We did so because the IR is not a profit-oriented enterprise. While it does seek to cover its costs, it has numerous politically-determined objectives—as reflected in the cross-subsidization of passenger by freight traffic—that make profitability a poor standard by which to evaluate IR performance, and that lead to pricing decisions that do not necessarily reflect the marginal cost or benefit of the commodity in question. In the following paragraphs, we describe in broad terms how we defined and measured the variables used in our analyses.[9]

(a) *Output variables*

The output produced by the Indian Railways consists of passenger service and freight service, measured physically in terms of passenger-kilometers (PK) and net ton-kilometers (NTK), respectively. For both passenger and freight service,