



# Labor pooling as an agglomeration factor: Evidence from the Brazilian Northeast in the 2002–2014 period

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## Abstract

This is a pioneering study of Brazil of the importance of labor pooling to explain industrial agglomeration in the Northeast of Brazil, employing firm-level microdata. We applied the theoretical model proposed by Krugman (1991) (labor market pooling model) with the adaptations by Overman and Puga (2010) to examine how firms react to shocks in the labor market that influence their productivity. For this purpose, we applied regression models in which we regressed the Ellison and Glaeser (1997) index as a function of a proxy for labor pooling, to capture exogenous shocks in the labor market while controlling for observed sector characteristics that vary in time and sector fixed effects. The results are consistent with a reduction in the level of industrial concentration in the period from 2002 to 2014. Regarding labor pooling, the evidence theoretical hypothesis that spatially concentrated firms can benefit from labor pooling, making them more productive compared with similar firms that are isolated.

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## 1. Introduction

The agglomeration of industrial activity can be observed in many countries, including Brazil (Sobrinho and Azzoni, 2016). Given that the distribution of industries can be a determining factor of the growth and development of regions, many studies have been carried out to shed light of the effects of industrial concentration. Among these are works to construct concentration indicators (e.g., Ellison and Glaeser, 1997; Maurel and Sédillot, 1999; Duranton and Overman, 2005) and empirical studies of the aspects underpinning the concentration of productive agents (e.g., Rosenthal and Strange, 2001; Resende and Wyllie, 2004; Ellison et al., 2010; Overman and Puga, 2010; Burki and Khan, 2013).

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On the other hand, the literature has been less effective in distinguishing the sources of productivity gains derived from agglomeration (Overman and Puga, 2010). Although formal micro-founded theoretical models exist (see Krugman, 1991; Fujita and Thisse, 2013; Duranton and Puga, 2004), from an empirical standpoint the distinction among these different mechanisms is complex. This complexity, in turn, mainly results from all these theories predictive productivity gains with agglomeration but through mechanisms that are hard to trace (Duranton and Puga, 2004; Overman and Puga, 2010).

Among these mechanisms, labor pooling, initially highlighted by Marshall (2009), can act as a force of attraction, leading industries to concentrate. This centripetal force results from the advantages that can be obtained by firms that are concentrated in places where labor is abundant (Marshall, 2009). A formalization of this argument was proposed by Krugman (1991), called the “labor market pooling model”, in which an establishment adjusts its level of production and employment in response to idiosyncratic productivity shocks. This model suggests that establishments tend to concentrate spatially in places with a large number of workers having the skills necessary for their production. The firms can obtain advantages from this labor supply and adapt better to exogenous productivity shocks without significant declines in expected profits in function of adjustments in local wages. The model predicts that the effect of labor pooling will be as stronger as greater for the heterogeneity of the establishment-specific shocks in the sector. According to Overman and Puga (2010), the intuition is that with concentration of workers, an establishment can better adjust the number of workers in response to an exogenous productivity shock without incurring significant wage adjustments if changes in the wages of their workers are different from the average of the other firms. In this case, in periods of economic expansion, for example, that wages tend to grow, if firms react differently to these shocks, it is possible to increase the demand for labor without a significant increase in wages paid, since other firms are not increasing the demand for labor in the same proportion.

To empirically test the hypothesis of the theoretical model in the United Kingdom, Overman and Puga (2010) regressed a measure of spatial concentration, the Ellison and Glaeser (1997) Index, as a function of a variable meant to capture the potential for labor pooling by sectors, with sectorial controls. The index used by the authors has the advantage of being weighted by the firm size, so that the problem of firm dimensionality does not influence the magnitude of the index. Another advantage is that the index is formally developed and supported by a macro-founded model. In turn, the labor pooling variable was proposed by Overman and Puga (2010) to capture the effect suggested by the theoretical model that the sectors in which idiosyncratic shocks are more heterogeneous across firms tend to be spatially more concentrated. In support of this, the authors argued that if wages are high when a firm intends to increase its workforce in response to a positive shock, compatible with the situation that most firms in a specific sector are also increasing their workforce, for example, this reduces its ability to adjust the wages paid. On the other hand, when changes in the firm’s headcount are not accompanied by significant wage increases, the advantage is greater to be located in regions with a large concentration of workers with the skills necessary for that firm’s production. Starting from this idea, according to Overman and Puga (2010), to isolate the direct<sup>1</sup> effect of heterogeneity, it is necessary to consider the difference between the percentage change of the establishment’s employment and the percentage change of employment in the industry (sector) in absolute value. This variable will take higher values when an establishment is expanding employment while the rest of the industry is contracting, and vice versa, capturing the heterogeneity of the shocks.

In Brazil, despite the availability of data disaggregated by geographic region and sector, few studies have analyzed the industrial concentration in the country with careful theoretical and empirical support. Besides this, the majority<sup>2</sup> of studies applying the Ellison–Glaeser index have done so for the entire country. The exceptions are the studies of Maciente (2008), who compared the indicators obtained for the country’s macro-regions, and Araujo (2016), who obtained evidence from this index for transformation industry clusters in the Northeast. Araujo (2016) did an exploratory analysis of the EGI for the Northeast and shows that there is a spatial concentration of the industry in the region, but he not explain the local factors that may explain its results.

<sup>1</sup> The authors argue that studies such as Rosenthal and Strange (2001) incorporated the pooling effect indirectly through labor skills and that this type of proxy might not be suitable to isolate the effect, capturing effects other than labor pooling.

<sup>2</sup> Biderman (2004), Resende and Wyllie (2005), Laurent and Araújo (2007).

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