



# Speaking in numbers: The effect of reading performance on math performance among immigrants



Ingo E. Isphording<sup>a,\*</sup>, Marc Piopiunik<sup>b</sup>, Núria Rodríguez-Planas<sup>c</sup>

<sup>a</sup> Institute for the Study of Labor (IZA), Germany

<sup>b</sup> Ifo Institute–Leibniz Institute for Economic Research at the University of Munich, Germany

<sup>c</sup> City University of New York (CUNY), Queens College, United States

## HIGHLIGHTS

- We estimate the causal effect of reading performance on math performance among immigrants.
- We combine PISA data with an innovative measure on language differences.
- Simple OLS regressions of reading on math performance are prone to ability bias.
- Exploit exogenous variation in reading performance due to differences in age-at-immigration across different linguistic distances.
- We find strong effects of reading performance on math performance.

## ARTICLE INFO

### Article history:

Received 2 October 2015

Received in revised form

20 October 2015

Accepted 25 November 2015

Available online 21 December 2015

### JEL classification:

I21

I24

Z13

### Keywords:

Immigrants

Language

Math performance

Linguistic distance

Age-at-arrival

Instrumental variable

## ABSTRACT

This paper is the first to estimate a causal effect of immigrant students' reading performance on their math performance. To overcome endogeneity issues due to unobserved ability, we apply an IV approach exploiting variation in age-at-arrival and the linguistic distance between origin and destination country languages. Using four PISA waves, we find a strong influence of reading performance on math performance, highlighting the importance of early language support for immigrants for their educational career.

© 2015 Elsevier B.V. All rights reserved.

## 1. Introduction

With international migration on the rise, the growing number of school-aged immigrants has raised concerns about their well-documented school performance disadvantages and the subsequent implications for future labor market assimilation around the world. Proficiency in the destination country language deserves special attention when searching for the roots of

these disadvantages because language proficiency is not only an important target of the educational process, but also key in the acquisition of further skills (Dustmann and Glitz, 2011; Akresh and Akresh, 2011). Against this background, this paper is the first to estimate the causal effect of reading performance on math performance among immigrants. Assessing the influence of reading on math skills provides important insights into the reasons behind the poor math performance of immigrant students (Dustmann and Glitz, 2011) and offers support for the hypothesis that language skills are a requisite for acquiring other types of skills.

\* Correspondence to: IZA, Schaumburg-Lippe-Str. 5-9, 53113 Bonn, Germany.  
E-mail address: [isphording@iza.org](mailto:isphording@iza.org) (I.E. Isphording).

Naïve correlations between reading and math test scores are likely driven to some extent by common unobservable factors such as ability or motivation. To identify a causal effect of reading on math performance, we exploit quasi-experimental variation by comparing immigrants with differential age-at-arrival and linguistic origin. We assume that differences in age-at-arrival patterns by linguistic background affect math performance only because of differences in the costs of acquiring reading skills. Immigrant children learn a new language easier and faster the linguistically closer their mother tongue is and the younger their age is at migration. This provides an exogenous source of variation in the destination country language skills, which is uncorrelated with unobservable math determinants such as ability and motivation.

Specifically, we use the interaction between age-at-arrival and linguistic distance between origin and destination country languages as an instrument for the reading skills of 15-year-old first-generation immigrants surveyed in the Programme for International Student Assessment (PISA). Our identification strategy builds upon the approach by [Bleakley and Chin \(2004\)](#), enhancing it by using multiple destination countries and a continuous measure of linguistic distance.

The strong effect of reading on math skills that we uncover in our analysis indicates significant gains and externalities of supporting the language acquisition of immigrant children. Our results suggest that providing language training for immigrant children immediately after arrival significantly facilitates the acquisition of other skills that are equally important for labor-market success ([Hanushek et al., 2015](#)).

## 2. Data

To assess the importance of reading skills for acquiring math skills, we combine internationally comparable student performance data for first-generation migrants with a unique cardinal measure of the linguistic distance between the migrant's origin and destination country languages.

Data on students' math and reading performance, socioeconomic background, and school characteristics come from the PISA assessments in 2003, 2006, 2009, and 2012, conducted by the OECD. Our sample contains all first-generation migrants, given that the migrant's origin country is observed. To ensure that our empirical strategy works properly, we restrict our sample to (1) origin countries for which we observe emigrants in at least two different destination countries, (2) destination countries in which we observe immigrants from at least two different origin countries, and (3) origin country–destination country cells with at least 10 students. Our estimation sample includes 11,582 first-generation migrants from 47 different origin countries, living in 16 different destination countries.<sup>1</sup>

We combine the PISA data with a unique measure of linguistic distance. This measure is based on an algorithm comparing the pronunciations of common words and has been shown to be an excellent summary statistic of language differences in vocabularies, phonetic inventories, grammars, and scripts ([Petroni and Serva, 2010](#)). The closest linguistic distance (apart from native speakers such as Britons in Australia) is experienced by Belgian and German migrants in the Netherlands and by Ukrainian migrants in the Czech Republic. The largest linguistic difference in our sample is faced by Vietnamese migrants in Australia and by Turkish migrants in Denmark.

As linguistic differences between populations may not be orthogonal to other dimensions of international differences, we isolate the effect of linguistic differences on students' reading skills by additionally controlling for cultural differences (using information on genetic distances between populations following [Spolaore and Wacziarg, 2009](#)) and for the geographic distance between the capitals of the origin and destination country. Summary statistics of the key variables are reported in Table A-1 in the web appendix (see [Appendix A](#)). Table A-2 reports summary statistics by destination country.

## 3. Empirical strategy

Naïve (partial) correlations between reading and math test scores do not provide insights into how reading performance affects math performance as both types of skills are driven by unobservable common factors such as ability and motivation. We achieve identification of a causal effect of reading performance on math performance by using a quasi-experiment, comparing migrants with different ages-at-arrival and linguistic distance between their origin and destination country languages. Immigrating at later ages increases the costs (in terms of effort) of becoming proficient in the destination country language, with a distinctive structural break in early adolescence commonly referred to as the “critical period” ([Ohinata and van Ours, 2012](#)). This effect of age-at-arrival on the language acquisition strongly differs with the linguistic distance between the mother tongue of the migrant and the language in the destination country: the larger the linguistic distance the more detrimental is a late arrival to acquiring the new language ([Isphording, 2014](#)). Hence, we estimate a two-stage least squares model. In the first stage, we estimate the following OLS equation:

$$\text{reading}_{ijkt} = \gamma_0 + \gamma_1 \text{AAA}_{ijkt} + \gamma_2 \text{LD}_{ijkt} + \gamma_3 \{ \text{AAA}_{ijkt} \times \text{LD}_{ijkt} \} + \mathbf{X}_{ijkt} \rho + \tau_j + \tau_k + \tau_t + \omega_{ijkt}$$

where  $\text{reading}_{ijkt}$  is the reading performance of immigrant  $i$  from origin country  $j$  living in destination country  $k$  in PISA wave  $t$ .  $\text{AAA}_{ijkt}$  is the migrant's age-at-arrival to the destination country  $k$ ,  $\text{LD}_{ijkt}$  is the linguistic distance between the migrant's origin and destination country languages,  $\{ \text{AAA}_{ijkt} \times \text{LD}_{ijkt} \}$  is the interaction between both variables,  $\mathbf{X}_{ijkt}$  is a vector of sociodemographic controls (explained below), and  $\tau_j$ ,  $\tau_k$ , and  $\tau_t$  are origin country, destination country, and PISA wave fixed effects.

The coefficient on the interaction between age-at-arrival and linguistic distance on immigrants' reading performance,  $\gamma_3$ , captures the variation in immigrants' reading competencies that can be attributed to differences in the age-at-immigration across different linguistic distances. These differences are unrelated to differences in unobserved factors such as ability, motivation, or family background that are known to affect math performance. Thus, our key identification assumption is that differences in the age-at-arrival effect on the reading performance can solely be attributed to differences in the linguistic distance and have no direct effect on the math performance.<sup>2</sup>

It is important to note that neither age-at-arrival nor linguistic distance are used as instruments for migrants' reading performance since both variables might have a direct effect on migrants'

<sup>1</sup> Destination countries are Australia, Austria, Belgium, China, the Czech Republic, Denmark, Finland, Germany, Great Britain, Ireland, Israel, Latvia, Luxembourg, the Netherlands, New Zealand, and Switzerland.

<sup>2</sup> Conditional means of the socio-economic background by language background and age-at-arrival (Table A-3 in the web appendix) support this assumption since there are no systematic differences in the age-at-arrival gradients of the socio-economic background between native-speaking and non-native-speaking migrants.

Download English Version:

<https://daneshyari.com/en/article/5058465>

Download Persian Version:

<https://daneshyari.com/article/5058465>

[Daneshyari.com](https://daneshyari.com)