

Immigration and the path dependence of education: the case of German-speakers in São Paulo, Brazil (1840–1920)[†]

By BRUNO GABRIEL WITZEL DE SOUZA*

This article studies the path dependence of human capital accumulation in the state of São Paulo, Brazil. It focuses on the impacts of German-speaking immigrants on education through three channels: their share of the population in the nineteenth century, their on-the-job skills, and the schools they founded. Using a new dataset based on almanacs from 1873 and 1888, these effects are evaluated for the nineteenth, early twentieth, and early twenty-first centuries. The article shows that the institutionalized demand for education of these immigrants, reflected by the establishment of schools, was their main contribution to the accumulation of human capital. The effect of German schools on educational levels required a period to mature and dissipated over time. Nevertheless, its influence was substantial at the beginning of the twentieth century, affecting enrolment levels in private and state schools, a result that suggests the existence of spillover and contagion effects. Moreover, current indicators for stocks and flows of human capital in São Paulo are strongly associated with their historical levels. At the same time, this path dependence is conditional on the type of school: while a positive persistence is found for the private system throughout the twentieth century, convergence occurred in state schools.

In the past two decades, the literature on the deep determinants of economic development has raised many new research questions by using historical events to explain current economic performance. One cornerstone of this approach is to explain the historical dynamics of institutions by focusing on their colonial origins.¹ A more recent strand of this literature shows that the relationship between current outcomes and historical determinants can vary substantially according to the period and region covered.² By moving away from cross-country studies towards regional analyses, this strand has suggested that external shocks can—at least partially—

*Author's Affiliation: Georg-August-Universität Göttingen.

[†]The author wishes to thank Stephan Klasen, Simon Lange, Renato Colistete, Philip Keefer, Leonardo Gardenal, and Lea Strub for their valuable support. Three anonymous referees and the editor Jaime Reis contributed fundamentally to the arguments of the article. The contributions of Atika Pasha, Daniel Franken, Felipe Loureiro, Hillel Rapoport, Inmaculada Zarzoso, Manuel Santos Silva, Marlene Waske, Matthias Blum, Pedro Funari, Sabino Porto Jr., Sebastian Vollmer, Thales Pereira, and Thomas Kang are gratefully acknowledged. Finally, the author is indebted to the financial support received from the German Research Foundation (DFG) in the context of the Research Training Group 1723—‘Globalization and Development’. The usual disclaimers apply and the author is solely responsible for the final content of this article.

¹ Acemoglu, Johnson, and Robinson, ‘Colonial origins’; eisdem, ‘Reversal of fortune’; Mariscal and Sokoloff, ‘Schooling’; Sokoloff and Engerman, ‘History lessons’.

² Glaeser, La Porta, Lopez-de-Silanes, and Shleifer, ‘Do institutions cause growth?’; Nunn, ‘Importance of history’; Nunn, Qian, and Sequeira, ‘Migrants’; Pande and Udry, ‘Institutions’; Przeworski, ‘Last instance’; Summerhill, ‘Colonial institutions’.

divert outcomes from a path set early on by institutions in colonial times. Such changes in path dependence seem to be particularly important for the accumulation of human capital, and recent literature focused on Brazil has emphasized how external shocks, especially immigration, were able to influence path dependence in a positive manner.³

In an attempt to contribute to this literature, this article explores whether German-speaking immigrants impacted the accumulation of human capital in the province/state of São Paulo, Brazil, in the period 1840–1920. The underlying hypothesis is that these immigrants had a positive influence on the path dependence of education in the province/state because of their relatively high levels of human capital, compared to the Brazilian average, in terms of both schooling and on-the-job skills. It is argued that the influence of these immigrants can be seen as an exogenous shock to the accumulation of human capital in the nineteenth century—one that reverberated down into the twentieth century, indirectly influencing current educational outcomes at the municipal level.

This article shows that the presence of German-speaking immigrants per se had no impact on the historical accumulation of human capital. However, a positive influence emerges where these immigrants were able to institutionalize their higher levels of education through founding schools. This historical impact of German schools required a maturation period and dissipated over time, having its strongest influence at the beginning of the twentieth century. German schools robustly influenced enrolment in both private and state schools in the 1910s. This result suggests the existence of spillovers and contagion effects in the supply and demand for education, respectively. The article also demonstrates that indicators for current stocks and flows of human capital are strongly associated with their historical counterparts. The path dependence of current enrolment is additionally shown to be conditional on the type of school. On the one hand, a positive persistence was found for private schools, showing that municipalities that had more of this type of school at the beginning of the twentieth century retained an advantage in this modality of education almost a century later. On the other hand, the negative relation between current and historical enrolment in state schools favours the hypothesis of convergence in the capacity to accumulate human capital in this type of educational institution.

The analysis presented here focuses on a historically-specific process and a geographically-delimited area, which gives this approach two empirical advantages. First, São Paulo is culturally and institutionally more homogeneous than larger units of aggregation, which reduces concerns about unobserved heterogeneity.⁴ Second, the immigration of German-speakers is seen as an exogenous shock to the demand for education in the state. Conditional on further controls, the initial allocation of these immigrants, mostly contract labourers on plantations or settlers in rural colonies, is argued to be exogenous to the contemporary educational levels of the municipalities where these plantations or rural colonies were located. In addition, incentives to accumulate human capital among these immigrants were

³ Carvalho Filho and Colistete, 'Education performance'; Carvalho Filho and Monasterio, 'Immigration'; Musacchio, Fritscher, and Viarengo, 'Colonial institutions'; Rocha, Ferraz, and Soares, 'Human capital'; Stolz, Baten, and Botelho, 'Growth effects'.

⁴ Gennaioli, La Porta, Lopez-de-Silanes, and Shleifer, 'Human capital', pp. 119–26; Pande and Udry, 'Institutions', pp. 3, 17, 19.

also associated with cultural traits, such as religion, being therefore more exogenous to prevailing economic conditions than current decisions to invest in education.⁵

The choice of the state of São Paulo as the unit of analysis has important implications, especially for the emerging strand of literature focused on the historical accumulation of human capital in Brazil. Although São Paulo currently has the highest absolute level of income of any Brazilian state, during most of the colonial era it was considered a region of marginal importance. Changes in the state's relative economic position began to occur mainly during the second half of the nineteenth century, around the time that São Paulo became the most attractive destination for immigrants in Brazil.⁶ The immigration of German-speakers, in particular, presented different features in São Paulo compared to other provinces: while immigrant communities in southern Brazil were more isolated and ethnically homogeneous, in São Paulo integration into the native population was faster and smoother.⁷ This increased the likelihood of spillover and contagion effects among immigrants and natives, a result that is indeed confirmed by the empirical analysis described here.⁸

Region-specific characteristics can clarify to some extent the diverse mechanisms described in the literature to explain how immigration impacted on long-run economic performance across Brazilian states. Carvalho Filho and Colistete, and Rocha et al., find a positive and significant impact of European immigrants on the accumulation of human capital in São Paulo during the first decades of the twentieth century.⁹ These results are similar to those of Stolz et al., who use numeracy and assess the impact on the country as a whole.¹⁰ The last two studies also explore on-the-job skills as a further transmission channel. Carvalho Filho and Monasterio, in turn, argue that lower inequality associated with German immigrants in Rio Grande do Sul had a larger impact on development than transfers of human capital.¹¹ Although they differ in the specific transmission channels they assess, these studies agree on the positive relationship between immigration and long-run development. Musacchio et al., on the other hand, argue that the political economy of financing education is the main factor behind the reversal of educational performance across Brazilian states.¹²

⁵ For a recent evaluation of religious and cultural determinants in general, see Becker and Woessmann, 'Was Weber wrong?'; eisdem, 'Effect of Protestantism'.

⁶ Summerhill, 'Colonial institutions', p. 13, asserts that the state underwent its own 'reversal of fortune', an argument that is similar to that found in Musacchio et al., 'Colonial institutions', pp. 731–3.

⁷ Holanda, 'Prefácio', pp. 23–4; Tschudi, *Viagem*, p. 178. Naturally, this does not imply that the integration process was without its conflicts. For a summary of problems associated with German schools even before the nationalization laws of the Brazilian government, passed in the late 1930s, see Witzel de Souza, 'Combined effect', pp. 24–7.

⁸ The term 'native Brazilian' has been used throughout this article to refer to individuals of Brazilian, Portuguese, or Brazilian-Portuguese descent. The term 'German-speakers', in turn, refers not only to foreign-born immigrants of such origin, but also to Brazilian-born German-speakers descended from the original immigrants, identified by their surnames.

⁹ Carvalho Filho and Colistete, 'Education performance'; Rocha et al., 'Human capital'.

¹⁰ Stolz et al., 'Growth effects'.

¹¹ Carvalho Filho and Monasterio, 'Immigration'.

¹² Musacchio et al., 'Colonial institutions'. On p. 747, the authors find a negative correlation between immigration and educational expenditure. They explain this result by observing that the demand for education among the main immigrant nationalities (Portuguese, Italian, and Spanish) was already comparatively low in their countries of origin.

The rest of this article is organized as follows. Section I provides an overview of the history of German-speaking immigration to São Paulo, from which the working hypothesis is derived. Section II presents the data, while sections III and IV focus on the methodology. Section IV, in particular, discusses the use of different estimation strategies in the light of historical evidence. Results are presented in section V, and section VI contains some concluding remarks.

I

The immigration of German-speakers to the countryside of São Paulo can be separated into two phases. From 1847 to the early 1870s the main modality was the immigration of contract labourers to coffee plantations. Problems with the applicability of labour contracts in a slave-based society, where the institutional framework did not favour workers' claims, led to a series of riots which undermined this type of privately led immigration.¹³ A new wave and a new modality of immigration of German-speakers started in the 1870s, becoming particularly relevant in the first decades of the twentieth century; namely, immigration to settlement colonies that were either officially established by the government or set up by private land sellers.¹⁴

The first wave of immigration is associated with the process of abolition of the transatlantic slave trade, culminating in its prohibition in 1850. As early as 1847, looking for new sources of abundant and cheap labour, the firm Vergueiro & Cia., with public financial support, contracted the first 376 immigrants from Holstein and Rhineland for its farm, named Ibicaba.¹⁵ Due to financial constraints and lack of collateral on the part of the immigrants, the farmers' method of attracting labour was to supply loans for transatlantic travel and for the maintenance of immigrant families, who were meant to pay back the debt with the yearly outcomes of coffee harvesting under sharecropping contracts. This constituted the first large-scale use of non-slave labour in the plantations of São Paulo.¹⁶ The turning point of this phase was the outbreak of the Sharecroppers' Riot in 1856, led by the Swiss Thomas Davatz, who triggered it by sending to Europe a report in which he demanded an official inspection of the living and working conditions on the plantations.¹⁷ In the aftermath of the riot, especially in the 1860s, the sharecropping system gradually declined and was replaced by other types of labour contract.

The riot had major diplomatic consequences, including the enactment of Heydt's Rescript in Prussia in 1859. This act prohibited propaganda encouraging immigration to São Paulo and led to a sharp decline in the number of German-speaking immigrants to Brazil.¹⁸ Those who continued to arrive in the province did so mostly through a new modality of immigration involving official rural

¹³ The vast body of literature on the transition from slavery to contract labour in São Paulo includes Dean, *Rio Claro*; Witter, *Ibicaba*; Stolcke and Hall, 'Introduction of free labour'; Lamounier, 'Formas de transição'; and Viotti da Costa, *Da senzala à colônia*. For archival research, see Heflinger, *Ibicaba*; idem, *A revolta dos parceiros*.

¹⁴ Heinke, 'Geschichte'; Sommer, 'São Paulo und die Deutschen'. Notice how these phases overlap with the work of Naritomi, Soares, and Assunção, 'Institutional development', on early and late expansions of coffee plantations.

¹⁵ Heflinger, *Ibicaba*, pp. 34–8; Perret-Gentil, *A colônia*, pp. 36–7.

¹⁶ Dean, *Rio Claro*; Viotti da Costa, *Da senzala à colônia*.

¹⁷ Davatz, *Memórias*.

¹⁸ Heflinger, *A revolta dos parceiros*, pp. 55–62, 107–8.

settlements. The most well-known settlement colonies with a major presence of German-speakers were Campos Salles (in Cosmópolis) and Nova Europa (in Ibitinga).¹⁹ In the Republican period (starting in 1889), colonies populated mostly by German-speakers were established in the western areas of the state, and were reached by the agricultural frontier and railroad infrastructure during the early decades of the twentieth century. These included rural settlements in the municipalities of Presidente Venceslau, Assis, and Araçatuba.²⁰

Although contract labourers (who arrived mostly during the period 1840–70) and official settlers (who arrived mostly during the period 1870–1920) had different cultural, social, and economic backgrounds, their mechanisms of integration into São Paulo were rather similar. In most cases, the economic integration of German-speakers occurred when they left the rural areas where they had been working and set themselves up as specialized craftsmen in economically dynamic urban centres. Our disaggregated data based on the almanacs show that German-speakers were overrepresented in urban activities, especially in manufactures and services; and despite being an ethnic minority, they had a near monopoly on some specialized jobs. In 1873, 80 per cent of brewers, 71 per cent of cart manufacturers, 67 per cent of tanners, 60 per cent of gunmakers and sellers, and 47 per cent of machinists and watchmakers had surnames that could be traced back to German-speaking countries. In 1888, these proportions diminished substantially as a result of new waves of immigration from other countries. Nevertheless, German surnames still appeared frequently in cart production (67 per cent), mechanized manufactures (38 per cent), breweries (34 per cent), tanning (33 per cent), and watchmaking (26 per cent).

Moreover, once settled, these immigrants had a major impact on formal schooling.²¹ Despite the frequently precarious educational conditions and high opportunity costs that children faced in the plantations, in the nineteenth and early twentieth centuries German-speaking immigrants were, on average, better educated than Brazilians. They had the highest literacy rates of all immigrants in the period 1908–32 and founded the largest number of immigrant schools in the country by the early decades of the twentieth century.²² In the countryside of São Paulo, we identified 44 schools that were established by German-speaking communities, 14 of them founded before 1900.

The most direct effect of German schools was to increase the number of pupils so that all the available educational places were filled. However, indirect effects may also be observed. First, teachers trained in those schools may have gone on to teach in the Brazilian public education system. Second, spillovers might have fostered the enrolment of native Brazilians in German schools. Finally, contagion effects could have led to an increase in the demand for education from other Brazilians, prompted by their perceptions of the German-speaking community. The relatively smoother integration and more frequent interactions between German-speakers and the local population in São Paulo (compared to southern Brazil) implies that

¹⁹ Keller, *Bericht*, pp. 10–11; Sommer, ‘São Paulo und die Deutschen’.

²⁰ Bezerra, ‘Educação étnica’, pp. 74–7; Silva, ‘A educação alemã’, pp. 53–68.

²¹ The vast historiography on German schools in São Paulo includes Gringer, ‘Imigração suíça’; Karastojanov, ‘Vir’; Bezerra, ‘Educação étnica’; Nobre, ‘Associação dos professores’; Kreutz, ‘Escolas étnicas’; Ribeiro, ‘Memória’; Silva, ‘A educação alemã’; Gouvêa, ‘Os imigrantes alemães’.

²² Kreutz, ‘Escolas étnicas’, pp. 92–3.

if spillover and contagion effects with natives occurred, they were more likely to be observed in the province/state of São Paulo.

The existence of these diverse effects can be tested by examining the impact that German schools had on enrolment in different types of educational institutions. The dataset used in this study allows this disaggregation for enrolment in municipal, state, and private schools. Given that German schools were classified as private,²³ their impact on the public education system can be interpreted as evidence of the above-mentioned spillovers and contagion effects. As will be discussed, this is indeed what is found in the analysis for the beginning of the twentieth century.

Based on this historical evidence, the hypothesis of this article is that the relative advantage in human capital of German-speaking immigrants constituted an initial shock in the period 1840–1920 whose effects persisted over time.²⁴ Support is provided for this perspective by an exploratory approach with difference-in-means tests (table 2) which shows that municipalities with proportionally more German-speaking immigrants than the mean for the whole sample performed better in terms of literacy in 1872 and total enrolment in the 1910s. This relation becomes stronger if the identifier for the groups is the existence of a German school in a given municipality.

II

The dataset for this study was constructed with information for three periods: 1872, 1903–14, and 1999–2011. For each, three sets of variables were compiled at the municipal level: educational performance, economic conditions, and local characteristics. Although different sources were used, standardizations of the covariates and of the geographical units of analysis (minimum comparable areas based on municipalities) were made to allow for long-run assessments and comparisons over different specifications, as explained in this section.

The almanacs edited by Luné and Fonseca (1873) and Seckler (1888) are the sources for most of the economic variables for the first period.²⁵ An empirical innovation of the current study is the transformation of the nominal lists in those almanacs into quantitatively valid indicators for the sector composition at the municipal level. However, the sources for 1873 and 1888 are not directly comparable, since the editors used different classifications for economic activities and frequently registered different types of professions. To create variables that

²³ More precisely, German schools could be either private or associative. The first implied the payment of fees by the individuals responsible for the pupils. The second had its funds raised by the community of immigrants, as an association. In both cases no direct or continuous public intervention occurred, such that these schools were always classified as 'private'. For a study of their structure, see especially Bezerra, 'Educação étnica'. Witzel de Souza, 'Combined effect', pp. 24–7, provides a discussion of the financial structure of some German schools. Public schools, in turn, are defined here as organizations maintained primarily by public funds and under different spheres of governmental administration. This study differentiates between municipal and state schools, which are both in this category.

²⁴ The quantitative analysis focuses on long-run effects. Nevertheless, the empirical section starts with an evaluation of the contemporary impact of those immigrants in 1872. The objective is to test whether the effects of the German schools required a certain period of time to mature or were immediate. I thank an anonymous referee for discussion of this matter.

²⁵ Luné and Fonseca, *Almanak*; Seckler, *Almanach*.

are consistent over time, all different economic activities were classified into the following six categories: rental activities; manufacturing; services; public administration; trade and commerce; and advanced technology.²⁶ Therefore the variables for sector composition measure the share of professionals per category with respect to the total number of professionals in a municipality. This estimated composition includes only professions mentioned in the almanacs, which are biased toward urban activities. Furthermore, such variables reflect only the share of people working in each activity, and not other productive assets, such as capital.

The almanacs also permit the compilation of variables for the share of German-speakers in each sector, reflecting their on-the-job skills. The absence of a complete list of immigrants for the period is a limitation, since descendants cannot be differentiated from the original immigrants. This is a minor concern for this article, however: the almanacs date from 1873 and 1888, and thus reflect a time when Brazilian-born descendants of German-speaking immigrants were, at most, second-generation Brazilians—and thence still probably shared common cultural traits, such as language and religion.

Variables for education and municipal characteristics for the nineteenth century were compiled mostly from the Brazilian census of 1872.²⁷ For the beginning of the twentieth century, data for education come from the *Annuarios de Ensino do Estado de São Paulo*. These are official publications from the state education inspectorate and contain information about enrolment in different types of schools. Averages of these indicators were calculated for the years 1908–11, 1913, and 1914. Variables for economic performance were based on the official statistical yearbook of the state, the *Anuario Estatístico de São Paulo, 1904–1907*, and on the *Estatística Agrícola e Zootécnica do Estado de São Paulo, 1904–1905*, an agricultural census that includes classification of properties by nationality.²⁸ Complementary information about economic performance was obtained from the *Erstes Jahrbuch für die deutschsprechende Kolonie im Staate São Paulo, 1905*, an almanac published by the German-speaking community.²⁹ For the most recent period, data for economic and educational performance are obtained from Fundação Sistema Estadual de Análise de Dados (SEADE), compiled using the dataset ‘Informações dos Municípios Paulistas (IMP)’.³⁰

Given the expansion of the agricultural frontier, the political borders of the municipalities underwent continuous change in the period studied. To unify the data, minimum comparable areas (MCAs) from Carvalho Filho and Colistete were used, with two major modifications.³¹ First, ‘Grande Limeira’ was created

²⁶ This category included steam machinery and mechanized tools in agriculture and manufacturing. It was not used in the econometric analysis to avoid double counting, and due to the somewhat vague definitions of these items.

²⁷ Brazil, Directoria Geral de Estatística, *Recenseamento Geral do Brazil de 1872*. The author would like to thank Carvalho Filho and Colistete for kindly providing the compiled information from the Brazilian 1872 census.

²⁸ São Paulo, Secretaria dos Negócios da Agricultura, Commercio e Obras Públicas, *Estatística Agrícola* (the author would like to thank Carvalho Filho and Colistete for kindly providing the compiled information for this source); São Paulo, Repartição de Estatística e do Archivo de São Paulo, *Anuario Estatístico do Estado de São Paulo, 1904*; idem, *Anuario Estatístico do Estado de São Paulo, 1905*; idem, *Anuario Estatístico do Estado de São Paulo, 1906*; idem, *Anuario Estatístico do Estado de São Paulo, 1907*.

²⁹ Uhle, ed., *Erstes Jahrbuch*.

³⁰ SEADE, ‘Informações dos Municípios Paulistas’.

³¹ Carvalho Filho and Colistete, ‘Education performance’. Other minor modifications include (i) classifying Itápolis, S. J. do Rio Preto, and S. Rita do Passa Quatro as independent MCAs; (ii) correcting the label attributed

as an independent MCA and its municipalities were subtracted from 'Grande Campinas'.³² The reason is that the axis formed by the municipalities Campinas, Limeira, and Rio Claro concentrated most of the German-speakers from the first immigration wave. To include Limeira in the MCA of Campinas, which already had a dynamic economy in the nineteenth century, would inflate the impact of these immigrants. Second, the MCA 'Grande São Paulo' was excluded, since the capital of the state is an outlier in terms of the number of German schools.³³ However, the MCAs for Santana do Parnaíba, Santo Amaro, and Itapeverica da Serra were retained. The last two, in particular, had official colonies of German-speakers that were already settled by the 1820s.³⁴

Current geographical units were matched to their correspondents in 1905, leading to the definition of 145 MCAs out of 645 current municipalities. There are two concerns here. First, the MCA 'Fronteira Oeste', on the agricultural frontier at the beginning of the twentieth century, is now disproportionately large and comprises 269 municipalities. We tested for the sensitivity of the results by excluding this observation, and they remained fundamentally unaltered: up to the 1910s, the region was sparsely occupied, such that the results do not change; the coefficients for the 2000s are slightly different, but no substantial modification in terms of significance is noticeable. Second, the paucity of information from the nineteenth century constituted a limitation because municipalities which had not been officially founded up to 1905 were classified as missing values. In order not to bias the results towards the average of the MCA in which the nonexistent municipality would be inserted and considering that the official creation of a municipality is a political decision with major institutional consequences, a deliberate decision was made not to input zeros, nor to make geographical interpolations. However, this led to a sample with unbalanced missing values and varying numbers of observations in different regressions.³⁵

Summary statistics are provided in table 1, based mainly on data from the almanacs. The relative stability in the sector composition of the workforce between 1873 and 1888 suggests that the standardization of the different sources can be trusted. In line with section I, the statistics show that German-speaking immigrants were prominent in manufacturing and services, having mean shares in those sectors that are above the means in total activities. In line with the historiography, it is also noticeable that their presence was minor in rental activities in 1873, given financial constraints and greater difficulties in acquiring land.³⁶

to S. Rita do Passa Quatro when it actually referred to S. Rita d'Oeste and inclusion of the latter in the MCA 'Fronteira Oeste'; (iii) matching districts from almanacs into MCAs.

³² 'Grande Limeira' includes the municipalities of Limeira, Cordeirópolis, and Itacemópolis. 'Grande Campinas' comprises Campinas, Americana, Artur Nogueira, Conchal, Cosmópolis, Engenheiro Coelho, Holambra, Hortolândia, Jaguariúna, Mogi Mirim, Nova Odessa, Paulínia, Santo Antônio da Posse, Sumaré, and Valinhos.

³³ Witzel de Souza, 'Combined effect', p. 39.

³⁴ For a comprehensive case study of these colonies, see Lambert-Siriani, *Uma São Paulo alemã*. Sommer, 'São Paulo und die Deutschen', also discusses these colonies in detail.

³⁵ The interested reader is referred to the online apps. for the following robustness checks: (i) sensitivity of the results to MCAs; (ii) bootstrapping with zero-inputted data; (iii) immigrants' selectivity on the degree of technological adoption of municipalities; and (iv) the impact of adding covariates related to official settlement colonies in the 1910s.

³⁶ On this issue, see especially Dean, *Rio Claro*, p. 122.

Table 1. *Summary statistics*

<i>Variable</i>	<i>Obs.</i>	<i>Mean</i>	<i>Std. dev.</i>	<i>Min.</i>	<i>Max.</i>
<i>Sector composition</i>					
Share of rental activities ¹⁸⁷²	72	0.2745	0.2004	0	0.9388
Share of rental activities ¹⁸⁸⁸	70	0.2567	0.1493	0	0.5952
Share of manufactures ¹⁸⁷²	72	0.1431	0.1000	0	0.4461
Share of manufactures ¹⁸⁸⁸	70	0.1610	0.0857	0	0.5112
Share of services ¹⁸⁷²	72	0.0749	0.1149	0	0.6553
Share of services ¹⁸⁸⁸	70	0.0995	0.0656	0	0.3000
Share of public administration ¹⁸⁷²	72	0.2081	0.1967	0.0141	0.8571
Share of public administration ¹⁸⁸⁸	70	0.2025	0.1403	0.0251	0.9412
Share of trade and commerce ¹⁸⁷²	72	0.1625	0.1095	0	0.6619
Share of trade and commerce ¹⁸⁸⁸	70	0.1756	0.0881	0	0.5215
<i>Education</i>					
Enrolment ¹⁸⁷²	73	293.08	215.99	15	1,082
Literacy ¹⁸⁷²	73	1,817.16	1,836.89	132	11,049
Total enrolment ^{1910s}	145	810.11	1,031.03	50.60	7,775
Enrolment in state schools ^{1910s}	145	571.56	625.94	50.60	4,624.40
Enrolment in municipal schools ^{1910s}	96	155.48	172.69	12	1,015.40
Enrolment in private schools ^{1910s}	102	192.78	411.10	8	3,087.20
Completion in state schools ^{1910s}	102	202.72	88.58	47.33	548.50
Average years of education ^{2000s}	139	6.43	0.7008	4.23	8.42
Educational component of MHD ^{2000s}	139	0.6664	0.0445	0.5530	0.7640
Illiteracy rates ^{2000s}	139	6.91	2.16	2.96	14.80
<i>German-speaking immigrants</i>					
Share of German-speakers ¹⁸⁷²	73	0.0042	0.0097	0	0.0439
German schools ¹⁸⁷²	145	0.0345	0.2476	0	2
German schools ^{1910s}	145	0.1103	0.6023	0	5
German schools ^{1930s}	145	0.3448	1.46	0	14
Share of German workers ¹⁸⁷²	72	0.0210	0.0392	0	0.1705
Share of German workers ¹⁸⁸⁸	74	0.0284	0.0543	0	0.3100
Share of Germans in manufacture ¹⁸⁷²	72	0.0406	0.0740	0	0.3929
Share of Germans in manufacture ¹⁸⁸⁸	70	0.0538	0.0920	0	0.5000
Share of Germans in services ¹⁸⁷²	72	0.0304	0.0666	0	0.3235
Share of Germans in services ¹⁸⁸⁸	69	0.0309	0.0502	0	0.2500
Share of Germans in trade ¹⁸⁷²	72	0.0219	0.0461	0	0.2500
Share of Germans in trade ¹⁸⁸⁸	73	0.0185	0.0422	0	0.2169
Share of Germans in rental activities ¹⁸⁷²	72	0.0070	0.0302	0	0.2414
Share Germans in rental activities ¹⁸⁸⁸	69	0.0354	0.1203	0	0.7692
No. of colonies ^{1850s}	145	0.7104	3.40	0	33

The term 'German' always refers to 'German-speakers', as defined in n. 8; the abbreviation is used only to facilitate the reading of the table.

In turn, the variables for education reflect the poor initial educational conditions in São Paulo.³⁷ The MCAs 'Grande Botucatu' and 'Grande Campinas', which in 1872 had the highest levels of enrolment and literacy, respectively, had enrolment and literacy rates (with respect to the population) of just 4.5 and 18.8 per cent. The situation did not improve much over time: in the 1910s, 'Grande Campinas' assumed the leadership in total enrolment, but this represented only 6.7 per cent of the population. Finally, with respect to the main independent variable of this

³⁷ For comparative figures, see Carvalho Filho and Colistete, 'Education performance', pp. 9–10; Musacchio et al., 'Colonial institutions', pp. 733–5.

Table 2. *Difference-in-means tests identified by the share of German-speaking immigrants and their schools*

	Enrolment ¹⁸⁷²			Literacy ¹⁸⁷²			Total enrolment ^{1910s}		
	Obs.	Mean	S.E.	Obs.	Mean	S.E.	Obs.	Mean	S.E.
Identifier 1									
Overall	73	293.08	25.28	73	1817.16	214.99	145	810.11	85.62
Proportionally more German-speakers ¹⁸⁷²	15	330.53	55.54	15	2641.60	716.34	15	1858.40	499.95
Proportionally fewer German-speakers ¹⁸⁷²	58	283.40	28.50	58	1603.95	192.38	130	689.15	70.01
Difference-in-means test	No difference: $\Pr(T > t) = 0.4551$			Higher average: $\Pr(T < t) = 0.0252$			Higher average: $\Pr(T < t) = 0.0000$		
Identifier 2									
Overall	73	293.08	25.28	73	1817.16	214.99	145	810.11	85.62
At least one German school	3	599.00	76.34	3	5913.00	2580.53	6	3106.45	1291.03
No German school	70	279.97	25.05	70	1641.63	176.52	139	710.99	60.44
Difference-in-means test	Higher average: $\Pr(T < t) = 0.0056$			Higher average: $\Pr(T < t) = 0.0000$			Higher average: $\Pr(T < t) = 0.0000$		

Notes: Identifier 1 determines whether an AMC had a share of German-speaking immigrants in 1872 that was larger than the mean for the province in 1872. Identifier 2 determines whether an AMC had at least one German school in the corresponding year (1872 or the average for the 1910s). The test is automatically reported as diff = mean(0) - mean(1), under the null hypothesis of no-difference in means (Stata 13.1), where the mean(1) refers to group of each identifier. $\Pr(T < t)$ therefore implies that the mean(1) > mean(0).

article, *German schools*_{*i*}, there is a noticeable increase over time, as new waves of immigrants arrived and older ones settled, clustered, and established their schools.

III

The quantitative analysis aims to identify the influence of German-speaking immigrants, their on-the-job skills, and their schools at the educational levels of municipalities in 1872, at the beginning of the twentieth century, and for the period 1999–2011. For 1872, this study investigates whether the immigrants had a contemporaneous impact on the educational performance of the recipient society. For the long-run analyses—that is, the 1910s and the years 1999–2011—the effects are evaluated for enrolment in different types of educational institutions: private; municipal; and state schools. Additionally, in order to assess the current determinants of education, the study looks at whether measures of stocks and flows of human capital in 1999–2011 were influenced by their historical counterparts. Combined with the categorization by type of school, this approach shows that the path dependence of education is conditional on whether the educational system is private or public.

For all three periods, the baseline is an ordinary least squares (OLS) estimation with the following functional form:

$$\begin{aligned} Educ_i = & \beta_0 + (\textit{German-speaking presence}_i)' \beta + X_i' \Gamma + Z_i' \pi + W_i' \rho \\ & + 1^{2000s} (Educ_i^{1910s}) + \varepsilon_i \end{aligned} \quad (1)$$

Different measures are used as the dependent variable in order to evaluate the impact of immigrants on diverse facets of education. For 1872, literacy and absolute enrolment are used as dependent variables, measuring human capital stocks and flows, respectively. For the 1910s and for 1999–2011, total enrolment is considered first.³⁸ This is subsequently separated into the specific type of school (state, municipal, and private). An indicator for the total number of children who completed the basic cycle in state schools complements those previous measures of flows.³⁹ This implies that the baseline models are always estimated five times for the 1910s. In addition to these measures of flows, for the period 1999–2011 stocks of human capital are also included, measured by average years of schooling, illiteracy, and an index from the educational component of the Municipal Human Development Index (MHDI).⁴⁰

The set (*German-speaking presence*_{*i*}) includes the main variables of interest: the share of German-speakers in the population in 1872, the number of schools

³⁸ This is the only variable created as the sum of enrolment in all types of schools. The subcategories had no interpolated data or inputted zeros.

³⁹ Absolute levels were preferred to the rates provided by the original source of data, because the latter are based on fixed estimates of the total number of school-age children.

⁴⁰ The municipal HDI adapts the calculation of global HDI to the level of Brazilian municipalities. The educational component is the geometric average of (i) the share of the population older than 18 with complete basic schooling (weight 1) and (ii) the flows of enrolment in primary and secondary schools categorized by age groups (weight 2). Source: Atlas do Desenvolvimento Humano no Brasil, 'O IDHM', http://www.atlasbrasil.org.br/2013/pt/o_atlas/idhm/ (accessed on 18 June 2015).

established in a municipality by those immigrants, and the on-the-job skill components of German-speakers. The latter is measured either as the share of those immigrants in all economic activities, or categorized as rental activities, manufacturing, services, and trade/commerce.⁴¹ These three variables are included jointly in the baseline models to assess the partial effect of the presence of immigrants per se, the institutionalized demand for education (creation of schools), and the on-the-job skill component of human capital. Due to a potentially high multicollinearity, the robustness checks assess the effect of including them either singly or in pairs. Nonsignificance in the individual case is interpreted as an indication that the corresponding variable is not significant in terms of explaining educational performance.

X_i comprises a set of geographical characteristics, including altitude, latitude, area, and average straight-line distance to the province/state capital, for all periods.⁴² For 1999–2011 data, annual average rainfall and temperature are also included. However, these are not taken as covariates in the historical analysis to avoid the assumption that they are constant over time.

Controls for economic characteristics and population are included in the set Z_i . Although it was not always possible to perfectly match such variables over time due to constraints imposed by different sources of data, controls are nevertheless included for the economic structure, fiscal situation, and population in all specifications.⁴³ Except for 1872, variables accounting for economic conditions were constructed using data at least one year earlier than the dependent variable to rule out direct simultaneity between educational and economic performances. The sector shares from the almanacs (categorized as rental activities, manufactures, services, trade and commerce, and public administration) are included in the regressions for 1872 and the 1910s. For the latter, the sector composition is based on the almanac from 1888, on the assumption that this structure was persistent over time. For the last period, the economic structure is based on the shares of value added by agriculture, industry, services, and public administration.⁴⁴

The set W_i includes period-specific characteristics. For 1872, municipal dependence on slavery is taken into account, measured by the recorded number of captives registered. Considering the relevance of international mass migration during this period, the share of non-German-speaking immigrants in 1872 and the proportion of foreign rural workers in the 1910s were controlled for in the respective specifications. Two measures of inequality are included. For 1872 the share of foreigners of any nationality in the public administration is used to assess the degree of local political openness. For the 1910s this is substituted by a measure of economic inequality which considers the share of farms owned by foreigners in 1905. Finally, for the 1910s the number of state schools in a municipality is added, to directly control for the supply of public education.

⁴¹ Since two almanacs were compiled, there are always two measures for each of the on-the-job skills.

⁴² By the definition of MCAs, area and distance to the capital from a specific point are constant over time, although they varied at the municipal level once the agricultural frontier expanded and new administrative units were created.

⁴³ The fiscal situation is measured in 1872 by the total municipal budget in that year, in the 1910s by the average total municipal expenditure, and in the 2000s by the average municipal expenditure on education.

⁴⁴ Further economic controls include the share of land dedicated to coffee production in the 1910s, for that period, and average municipal income in 1999–2004 for the 1999–2011 analysis.

Finally, to assess the path dependence of current levels of education, we added a historical indicator to the last period of analysis. The indicator $1^{2000s} (Educ_i^{1910s})$ implies that for the 2000s the correspondent historical educational component in the 1910s is included as a covariate to test for beta-convergence. Each dependent variable is matched here to its specific historical correspondent—that is, current enrolment in each type of school is regressed on that specific type of school in the 1910s (and the same for completion and total enrolment). However, this procedure has a problematic *ceteris paribus* interpretation: holding population constant, an increase in the number of pupils implies an increase in enrolment rates, which have already converged to 100 per cent in primary schooling for most municipalities.⁴⁵ For this reason, it is also necessary to evaluate the impact of historical schooling on current average years of education, illiteracy rates, and the educational component of the MHDI.

IV

This section discusses different estimation strategies based on the historical setting outlined in section I. It is argued that the estimation with OLS is sufficient to identify the impact of the variables in the set (*German-speaking presence_i*) both for 1872 and the 2000s, while an instrument is proposed for the variable *German schools_i* in the 1910s.

For the last period, it is not reasonable to expect that immigrants in the nineteenth century would self-select to specific municipalities based on the path of development of the educational system more than a century later. Nevertheless, one could still argue that the path dependence in economic performance (directly associated with human capital accumulation) creates a link between immigration in the nineteenth century and current educational performance in a manner that is non-orthogonal to the error term. The most obvious candidates for this case are omitted variables associated with formal institutions and cultural traits in the recipient society that were influenced by the immigrants. There is evidence, for instance, that German-speakers were pivotal in the formation of free labour relations on plantations formerly mainly based on slavery.⁴⁶ Another concern is the self-selection of immigrants based on the economic performance or wealth of the municipalities. These are expected to be directly correlated with the educational performance of a municipality later on. In order to accommodate these problems at least partially, all regressions include controls for the financial situation of the municipalities, and an indicator for their degree of economic prosperity, and for their economic structure.

For 1872, in turn, the immigration of German-speakers to São Paulo was at the inflexion point from contract labourers to official settlers. Although the contract labourers had had time to migrate internally in the province since 1847 and to self-select into municipalities with better education, the last sharecroppers and the first settlers were being allocated in a manner that was not systematically

⁴⁵ This ratio is above 1 in some cases because it is a five-year average, which does not penalize for repetition.

⁴⁶ See above, n. 13, for a bibliography on the theme.

related to the educational conditions of the municipalities.⁴⁷ Furthermore, older immigrants (1847–72) clustered around municipalities to which they had been allocated initially as sharecroppers. Therefore, if we accept that the allocation of contract labourers to farms was independent of the educational conditions in the municipality where those farms were located and that this phase set the path for future spatial distributions of immigrants, then there is less reason to expect simultaneity between educational conditions and the presence of German-speakers in a municipality, at least in 1872.

The claim that German-speaking sharecroppers did not know which farms they would be allocated to is supported by historical evidence. The so-called ‘transference clause’ in sharecropping contracts allowed a farmer who originally hired a family of immigrants in Europe to transfer its contracts to any other farmer. This implied that the immigrants could not know a priori whether the family would indeed be allocated to the farmer with whom they had signed the contract.⁴⁸ Moreover, the Swiss municipalities displayed a remarkable ignorance of living conditions in São Paulo: Thomas Davatz, the schoolmaster who led the Sharecroppers’ Riot, received a questionnaire from his municipal council in Switzerland which included a section on religion and education, with questions as basic as ‘Are there means of instruction? If so, what are they?’⁴⁹ If even the administrative boards of Swiss municipalities, which subsidized emigration, had no information on this topic, it is unlikely that immigrants would have had enough information to be able to select their initial allocation according to the educational conditions that prevailed there.⁵⁰

By the 1910s, however, most of the contract labourers and official settlers had had enough time to adapt to local educational conditions and to set up their own schools accordingly. The simultaneity of the variable *German schools_i* is therefore critical for the 1910s. For this reason, this covariate is instrumented with the variable *Number of colonies_i^{1850s}*, which measures the number of farms employing contract labour in the 1850s/60s.⁵¹ The instrument is highly correlated with the potentially endogenous variable.⁵² This shows that later waves of immigrants indeed tended to cluster around regions settled by previous immigrants; that is, in municipalities with farms that employed contract labourers in the nineteenth century. The existence of a sharecropping colony in a municipality in the 1850s is unlikely to have a direct influence on that municipality’s educational performance 60 years later. However, the presence of a colony might have an early impact on institutional and economic conditions related to educational performance. For this

⁴⁷ For the question of selectivity of European immigrants in official settlement colonies in São Paulo, see Rocha et al., ‘Human capital’, pp. 10–11.

⁴⁸ Dean, *Rio Claro*, p. 122; Lamounier, ‘Formas de transição’, pp. 28–9; Witzel de Souza, ‘Imigração alemã’, p. 87.

⁴⁹ Davatz, *Memórias*, app. 2, pp. 238–41.

⁵⁰ This argument ignores the fact that some immigrants were invited by kinsmen and acquaintances, who could provide better information on living standards. This concern is, however, mitigated by the fact that many of the letters sent to Europe were censored to give a better impression of the conditions on the farms. In this connection, see the original letters published in Heflinger, *A revolta dos parceiros*, pp. 50–5. For references to other letters, potentially used for propaganda, see idem, *Ibicaba*, pp. 39–46.

⁵¹ Constructed with data from Witzel de Souza, ‘Liberdade ou grilhões?’, pp. I–XIV. It should be emphasized, however, the literature is still missing a comprehensive list of farms employing contract labour in São Paulo.

⁵² The unconditional correlation between *Number of colonies_i^{1850s}* and *German schools_i* is the highest for the 1910s, reaching 0.82 against 0.72 and 0.47 for 1872 and the 1930s, respectively.

reason, all instrumental variable (IV) estimates control for the full set of covariates, including the proxies for economic performance and structure. Conditional on these, it is argued that the existence of a sharecropping colony in the nineteenth century passes the exclusion restriction and properly instruments *German schools_i* in the 1910s.⁵³

Finally, a set of three robustness checks, associated with the construction of the MCAs, is carried out. The first is the exclusion of the large 'Fronteira Oeste', which does not lead to any substantial modification in the results, as discussed above. In the second, 'Grande Campinas', 'Grande Limeira', and 'Rio Claro'—the axis here labelled as the 'old west'—are excluded simultaneously, to test for the specific impact of this first centre of German-speaking immigration. Once these are excluded, the variable *German schools* is omitted from the estimations for the 1910s because there is not enough variability in that covariate in the remaining sample. As a consequence, the IV estimates for this limited sample cannot be estimated either.⁵⁴ The third check circumvents this limitation and accommodates the subregional problem by including specific regional dummies. These are based on Holloway's regional classification, as provided by the MCAs of Carvalho Filho and Colistete.⁵⁵ With subregional dummies, the results for all periods remain fundamentally unaltered.⁵⁶

V

We now turn to the results, divided into periods.⁵⁷ For the nineteenth century (table 3), none of the variables in the (*German-speaking presence_i*) set has a significant effect, either on the measures of stocks or on flows of human capital.⁵⁸ In the baselines for enrolment and literacy in 1872 the share of German-speakers, their schools, and on-the-job skills proved to be statistically nonsignificant. The two exceptions in the robustness checks are for *German schools_i*¹⁸⁷² if included as the only control for the presence of German-speakers, or jointly with on-the-job skills. Nevertheless, given that these models omit an important variable—namely, the share of German-speakers—it is safe to conclude that the schools had no contemporaneous effect on either literacy or enrolment. This result could be expected for two reasons. First, only three MCAs had German schools in 1872: 'Grande Campinas', 'Rio Claro', and 'Santos'. Second, these schools had been established very recently, the oldest (the 'Reading-and-School-Association'

⁵³ The distance of *MCA_i* to the MCA 'Grande Limeira' was also proposed as instrument, because the corresponding MCA includes Cordeirópolis, the municipality where the first sharecropper colony was set up. This instrument proved to be extremely weak, however, and its addition always led to the non-rejection of the underidentification hypothesis. I would like to thank two anonymous referees for suggestions on this topic.

⁵⁴ An important difference occurs for the third period when the 'old west' is excluded: German schools turn out to have a positive and significant effect for current enrolment in private schools. This is a tentative result, potentially showing that the nonsignificance of that variable for current educational performance is led by the 'old west'.

⁵⁵ Carvalho Filho and Colistete, 'Education performance'.

⁵⁶ Although an evaluation of subregional disparities in the path of educational development is beyond the scope of this article, a more detailed analysis on the theme can be found in the online apps.

⁵⁷ Estimates with the categories for the on-the-job skills and further robustness checks are presented in the online apps.

⁵⁸ In the following interpretations, 10% was the minimum significance level considered.

Table 3. *Impact of German-speaking immigrants on enrolment and literacy (OLS estimates, 1872)*

	<i>Enrolment</i> ¹⁸⁷²	<i>Literacy</i> ¹⁸⁷²
German schools ¹⁸⁷²	119.15 (90.14)	486.77 (671.23)
Share of German-speakers ¹⁸⁷²	-2,028.59 (3,742.77)	23,104.08 (27,871.04)
Share of German workers ¹⁸⁷²	369.36 (982.94)	-8,641.25 (7,320.58)
Share of other immigrants ¹⁸⁷²	3,262.49** (1,458.99)	9,351.60 (10,864.56)
No. of slaves ¹⁸⁷²	-0.0838*** (0.0276)	-0.2983 (0.2055)
Population ¹⁸⁷²	0.0296*** (0.0075)	0.1804*** (0.0559)
Municipal budget ¹⁸⁷²	0.0047 (0.0044)	0.0833** (0.0331)
Share of immigrants in public administration ¹⁸⁷²	299.12 (712.78)	13,652.60** (5,307.84)
Municipal characteristics	Yes	Yes
Economic structure ¹⁸⁷²	Yes	Yes
Observations	40	40
Adjusted R ²	0.6735	0.7984

Notes: Robust standard errors if the hypothesis of homoscedasticity was rejected at the 10% level. ***p < 0.01, **p < 0.05, *p < 0.1. All models include an intercept, controls for municipal characteristics (average straight-line distance to the state capital, area, latitude, altitude) and economic structure in 1872 (share of employment in rental activities, manufacturing, services, public administration, and trade/commerce). The term 'German' always refers to 'German-speakers', as defined in n. 8; the abbreviation is used only to facilitate the reading of the table.

of Campinas⁵⁹ and 'Collegio Florence') being founded in 1863. This implies that these institutions had a timespan that was not long enough to influence the flows of human capital and certainly not long enough to impact on its stocks.

Although nonsignificant, estimates for the share of German-speakers have positive signs for literacy, but negative signs for enrolment. This pattern reinforces the argument that immigrants had an advantage in terms of literacy, but that their children faced high opportunity costs as rural labourers.⁶⁰ This frequently-observed historical argument is tested by adding the number of sharecropping colonies in the 1850s/60s as an additional covariate. The latter indeed turns out to be significant at the 10 per cent level (magnitude of -15) for enrolment, but not for literacy.⁶¹

Other independent variables behave as expected. First, there is a clear difference between enrolment and literacy when it comes to the impact of the share of non-German-speaking immigrants and slaves: enrolment is always significantly influenced by the two variables (in a positive and negative way, respectively), while literacy is not.

⁵⁹ Author's free translation from the original in German: 'Lese- und- Schulverein'.

⁶⁰ The vice-consul of Switzerland, for instance, reported that, in the 1840s, coffee harvest workers included five-year-old children of German-speaking immigrants; Perret-Gentil, *A colonia*, p. 53.

⁶¹ Not reproduced here for reasons of space.

Moreover, the substantial effect of the share of foreigners in the public administration on literacy deserves attention, as it is a variable which proxies for the degree of political openness. Evaluated at the mean, a one-percentage-point increase in this variable implies, *ceteris paribus*, 225.27 more literate people, corresponding to 12.40 per cent of the mean literacy in the municipalities.⁶² Combined with the nonsignificance of the coefficients for the share of German-speakers and other immigrants, this result helps to qualify some of the findings of recent literature focused on immigration in Brazil. The relative advantage of immigrants in terms of human capital can be seen as a necessary, but not sufficient, condition for enhancing local educational performance. The potentially higher demand for education arising from the cultural traits of the immigrants seems to require further adequate institutional and economic conditions for it to develop.⁶³ The nonsignificance of the presence of immigrants and the large effect of their participation in local politics support this perspective.

Turning to the second period, table 4 shows that the share of German-speakers in the nineteenth-century population is noninfluential for educational performance in the 1910s. German schools, however, had a strong impact on educational conditions at the beginning of the twentieth century, which, in turn, set the path for human capital accumulation in the long run. In the 1910s, 16 German schools were founded across six MCAs and had diverse timespans in which to influence local educational conditions.

When enrolment is categorized by type of school, a core result is that *German schools*_{*i*}^{1910s} has a significant and positive impact on enrolment not only in private schools, but also in state schools at the beginning of the twentieth century.⁶⁴ As a consequence, this variable has a positive effect on total enrolment. It has no effect, however, on enrolment in municipal schools, or on completion in state schools. To be clear, it should be noted that the significance of *German schools*_{*i*}^{1910s} is conditional on the inclusion of the on-the-job skills from 1873, but not for the corresponding values in 1888.

Were it not for its magnitude, the effect of German schools on the private system would be tautological, given that these institutions have always been classified as private in the dataset. However, the magnitude of the significant point estimate (95.90) is much larger than the mean enrolment in German schools (56.16).⁶⁵ Although the estimates of enrolment in German schools must be considered with caution, it is plausible that the scale of these educational institutions was not able fully to accommodate an increase in enrolment in private schools as large as its coefficient. A similar argument can be made about the impact of the German schools on enrolment in state schools, which is always significant and positive. This is a strong result, given that the supply of state schools is also controlled for in the regressions for the 1910s. These results suggest spillover effects in the supply

⁶² (Mean proportion of foreigners in public administration) * (Coefficient) = 0.0165 * 13,652.60 = 225.27.

⁶³ Glaeser et al., 'Do institutions cause growth?'; Pande and Udry, 'Institutions'; Acemoglu, Gallego, and Robinson, 'Institutions'. For the Brazilian case, see Musacchio et al., 'Colonial institutions'.

⁶⁴ *German schools*_{*i*}^{1910s} is significant in two out of four models in the baselines (tab. 4).

⁶⁵ Calculated with all available data, which are nevertheless scattered over time and across MCAs for the considered institutions.

Table 4. German-speaking immigrants, German schools, and on-the-job skills effects on enrolment per type of school and completion in state schools (OLS estimates, 1910s)

Variables	Total enrolment		Enrolment, state, 1910s		Enrolment, private, 1910s		Enrolment, municipal, 1910s		Enrolment, municipal, 1910s		Completion, state, 1910s		Completion, state, 1910s	
	1910s	1910s	state, 1910s	state, 1910s	private, 1910s	private, 1910s	municipal, 1910s	municipal, 1910s	municipal, 1910s	municipal, 1910s	state, 1910s	state, 1910s	state, 1910s	state, 1910s
German schools ^{1910s}	171.60** (67.45)	134.18 (79.57)	43.49*** (15.65)	33.36* (19.32)	95.90** (42.39)	73.41 (51.71)	19.51 (24.00)	19.08 (22.25)	19.08 (22.25)	19.08 (22.25)	-10.50 (16.95)	-14.63 (27.88)	-10.50 (16.95)	-14.63 (27.88)
Share of German-speakers ¹⁸⁷²	915.39 (4,549.10)	-2,193.96 (8,138.71)	1,019.36 (1,233.31)	299.84 (2,506.29)	-1,185.27 (3,280.88)	-985.26 (6,383.46)	-1,393.77 (1,398.89)	-1,403.98 (3,475.66)	-1,393.77 (1,398.89)	-1,403.98 (3,475.66)	-2,286.50 (1,709.58)	-3,269.60 (4,021.30)	-2,286.50 (1,709.58)	-3,269.60 (4,021.30)
Share of German workers ¹⁸⁷²	-2,368.20** (879.44)	-538.70 (348.43)	-538.70 (348.43)		-1,746.24* (950.77)		-237.03 (291.27)		-237.03 (291.27)		381.90 (408.10)		381.90 (408.10)	
Share of German workers ¹⁸⁸⁸		-43.54 (3,025.76)		89.83 (982.88)		-1,099.28 (2,229.32)		-273.28 (1,077.79)		-273.28 (1,077.79)		858.87 (1,396.64)		858.87 (1,396.64)
Share of foreign rural workers ^{1910s}	271.01 (196.61)	241.63 (196.07)	78.63 (48.53)	67.44 (49.68)	163.62 (175.39)	191.04 (178.45)	38.15 (126.19)	53.28 (111.70)	38.15 (126.19)	53.28 (111.70)	38.23 (110.12)	0.3109 (101.02)	38.23 (110.12)	0.3109 (101.02)
Share of foreign rural landowners ^{1910s}	42.52 (664.05)	39.69 (658.81)	73.16 (133.27)	48.21 (139.64)	128.25 (467.91)	140.56 (453.43)	540.57** (209.54)	552.36** (219.43)	540.57** (209.54)	552.36** (219.43)	317.73 (298.05)	298.35 (338.80)	317.73 (298.05)	298.35 (338.80)
Population ^{1910s}	0.0047 (0.0064)	0.0058 (0.0057)	0.0018 (0.0017)	0.0024* (0.0013)	-0.0033 (0.0040)	-0.0027 (0.0040)	0.0064*** (0.0019)	0.0060** (0.0023)	0.0064*** (0.0019)	0.0060** (0.0023)	1.47e-05 (0.0025)	0.0004 (0.0028)	1.47e-05 (0.0025)	0.0004 (0.0028)
Share of coffee area ^{1910s}	-281.48 (264.22)	-195.01 (286.19)	-71.16 (70.01)	-56.75 (78.50)	-152.47 (153.51)	-83.43 (196.03)	-27.35 (88.54)	-12.09 (93.46)	-27.35 (88.54)	-12.09 (93.46)	-13.81 (87.46)	-28.52 (106.47)	-13.81 (87.46)	-28.52 (106.47)
Municipal expenditures ^{1910s}	0.0015*** (0.0004)	0.0016*** (0.0005)	0.0002** (9.33e-05)	0.0002* (0.0001)	0.0011*** (0.0002)	0.0011*** (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)	0.0002 (0.0002)	3.81e-06 (9.57e-05)	1.63e-05 (0.0002)	3.81e-06 (9.57e-05)	1.63e-05 (0.0002)
State schools ^{1910s}	42.84*** (7.74)	40.77*** (7.41)	38.66*** (2.06)	38.09*** (1.92)	7.25** (3.25)	6.26 (4.74)	-2.11 (2.45)	-2.08 (2.58)	-2.11 (2.45)	-2.08 (2.58)	1.01 (2.22)	1.22 (2.23)	1.01 (2.22)	1.22 (2.23)
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic structure ¹⁸⁸⁸	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	47	48	47	48	38	39	38	39	38	39	40	41	40	41
Adjusted R ²	0.9624	0.9593	0.9945	0.9942	0.8457	0.8239	0.7129	0.7075	0.7129	0.7075	-0.2042	-0.1719	-0.2042	-0.1719

Notes: Robust standard errors if the hypothesis of homoscedasticity was rejected at the 10% level. ***p < 0.01, **p < 0.05, *p < 0.1. All models include an intercept, controls for municipal characteristics (average straight-line distance to the state capital, area, latitude, altitude), and economic structure in 1888 (share of employment in rental activities, manufacturing, services, public administration, and trade/commerce). The term 'German' always refers to 'German-speakers', as defined in n. 8; the abbreviation is used only to facilitate the reading of the table.

of education once a German school was established, and contagion effects in the demand for educational services.⁶⁶

In terms of the supply of educational services, the foundation of a new German school implied the possibility of enrolment of native Brazilians in it. In 1873, for instance, the 'School Germania' was a breakaway school founded by former members of the 'Reading-and-School-Association' of Campinas, who disagreed with the Association's strict rules of membership according to nationality.⁶⁷ Indirect effects could also be at work. Teachers trained in German schools had the potential to join the Brazilian public educational system at a later stage.⁶⁸ A relevant historical case in line with this explanation can be found in Rio Claro, where one of the founders of the first public school in the municipality was João von Atzingen, a first-generation descendant of Swiss and German immigrants.⁶⁹ Similarly, in 1873, five out of six teachers in the German School of Santos had Portuguese-Brazilian surnames; it is likely that they applied the skills acquired in the German schools, in which they were trained, in the Brazilian public education system.⁷⁰ To a lesser extent, textbooks and other material conditions could also bear positive externalities. A report about the German education system in Brazil in the late 1920s, for instance, recommended the use of books produced in Brazil, especially in the southern states, rather than importing them from Europe.⁷¹

As discussed in section I, explanations based on the demand for education must take into account the fact that German-speaking immigrants had a comparatively smoother integration process in São Paulo than in southern Brazil—with more intense and frequent contact with the native population.⁷² Indeed, the nominal lists in the almanacs show that German-speaking immigrants, their descendants, and native Brazilians jointly established a series of cultural associations in the countryside of São Paulo, including schools and reading clubs.⁷³ It is important to notice that this symbiosis was two-sided, with some German-speaking communities benefiting from the support of native Brazilians as well. In the 1920s, for example, the school of Kirchdorf, in Leme, even received financial support from the municipal chamber.⁷⁴ In this scenario, contagion in the demand for education is likely to occur. Natives could demand more education (privately or publicly) if influenced by the cultural traits of the immigrants or by the social perception about the German-speakers who attended schools. In this sense, in a report from 1874, José Vergueiro argued that one of the advantages of immigration was to increase the level of education 'with the Brazilians emulating the immigrants—because they [the natives] do not want to lag behind. We already have evidence of this'.⁷⁵

⁶⁶ This is in contrast with Musacchio et al., 'Colonial institutions', p. 739, who discuss the degree of substitution among state, municipal, and private schools.

⁶⁷ Karastojanov, 'Vir', pp. 109–11.

⁶⁸ Stolz et al., 'Growth effects', p. 115: 'Human capital intensive migration in contrast might . . . provide teachers and institutions . . . even for native Brazilians'.

⁶⁹ Penteadó, *Efemérides*, p. 30. I am indebted to Leonardo Gardenal for this important example.

⁷⁰ Compilation based on Luné and Fonseca, *Almanak*.

⁷¹ Bezerra, 'Educação étnica', p. 192; Keller and Linhart, *Entwurf*, p. 11. For a discussion of the educational materials and their relation to the Brazilian education system, see Nobre, 'Associação dos professores', p. 49.

⁷² Holanda, 'Prefácio', pp. 23–4; Carvalho Filho and Colistete, 'Education performance', p. 12.

⁷³ Witzel de Souza, 'Combined effect'; Kreutz, 'Escolas étnicas'.

⁷⁴ Information based on Instituto Martius Staden, São Paulo, Document: II. Einnahme, Kirchdorf, 1929/30.

⁷⁵ Vergueiro, *Memorial*, p. 9. Author's free translation from the original in Portuguese.

Finally, the two last columns of table 4 show that the determinants of completion of the basic cycle of primary schooling differed substantially from the determinants of enrolment. For this dependent variable, none of the covariates was significant, either individually or jointly.

The robustness checks in which the variable *German schools*_{*i*}^{1910s} was instrumented with the number of sharecropping colonies in the nineteenth century are presented in tables 5–9. The specifications in a given table vary in the controls used for the on-the-job skills of German-speakers.⁷⁶ The instrument performs well by always rejecting the under-identification hypothesis at the 1 per cent level and presenting a Wald F-statistic which is always above the 10 per cent critical value identified by Stock and Yogo.⁷⁷ The first stage proves to be robust and precise, with the point estimate for *Number of colonies*_{*i*}^{1850s} on *German schools*_{*i*}^{1910s} varying between 0.14 and 0.16, and being significant in all cases. Results are robust to this change of estimation procedure, especially the coefficients for German schools and their spillover effects on state schools. Estimates are precise and close to the baseline. The main differences are the positive impacts of *German schools*_{*i*}^{1910s} on enrolment in municipal schools and on completion in state schools. These results are not robust, since they occur in a single specification, in which the on-the-job skills component turns out to be significant.

Turning to the third period, we first investigate the path dependence of enrolment per type of school, illiteracy rates, average years of education, and the educational component of the municipal HDI. The objective is to assess whether current educational performance is correlated with its levels at the beginning of the twentieth century. In the sequence, the effects of German-speaking immigrants on these measures of stocks and flows of human capital are studied.

Table 10 provides robust evidence that enrolment and completion in state schools converged over time up to their current levels, as shown by the always significant and negative effect of enrolment and completion in this type of school in the 1910s. The historical correspondents for municipal schools also present suggestive negative signs, which are, however, nonsignificant. These results are expected, given that population is held constant in the models and enrolment rates in primary schooling converged to 100 per cent during the twentieth century. A strong persistence, in turn, is observed for enrolment in private schools, with positive effects which are significant and precise over all the specifications in the baseline. This implies that municipalities which started relying on this type of school still have an advantage in this modality of education: the coefficients show a partial effect of approximately three more students currently enrolled in private schools per additional student enrolled in the private system back in the 1910s.

The path dependence becomes weaker once we take into account measures for the stocks of human capital, rather than current flows (tables 11–13). In the baseline models, historical enrolment in state schools is the only variable systematically increasing current average years of education and reducing current illiteracy. Completion in this type of school in the 1910s is also associated with an increase in the average years of education for one of the baseline models. A

⁷⁶ Four cases: share of German-speakers in the total workforce for 1873 and 1888, as well as shares per category (rental activities, manufactures, services, trade, and commerce) for 1873 and 1888.

⁷⁷ Stock and Yogo, 'Testing'.

Table 5. *German-speaking immigrants, German schools, and on-the-job skills effects on total enrolment (IV estimates, 1910s)*

<i>Panel A: Second-stage estimates</i>				
<i>Variables</i>	<i>Total enrolment</i> 1910s	<i>Total enrolment</i> 1910s	<i>Total enrolment</i> 1910s	<i>Total enrolment</i> 1910s
German schools 1910s	152.06** (74.35)	136.12 (82.79)	113.85* (65.29)	112.42 (79.49)
Share of German-speakers 1872	1,198.61 (3,692.69)	-2,185.95 (6,283.36)	1,385.33 (3,087.16)	3,818.08 (7,385.61)
Share of German workers 1872	-2,202.66*** (686.29)			
Share of German workers 1888		-64.60 (2,337.44)		
Share of German manufacturing 1872			1,204.33* (713.29)	
Share of German services 1872			-1,031.83* (577.27)	
Share of German trade 1872			-2,654.02*** (973.32)	
Share of German rents 1872			3,328.98 (3,872.28)	
Share of German manufacturing 1888				-751.87 (920.26)
Share of German services 1888				-1,599.99 (1,990.74)
Share of German trade 1888				734.70 (1,494.10)
Share of German rents 1888				120.21 (605.53)
Population 1910s	0.0048 (0.0046)	0.0058 (0.0045)	0.0061 (0.0038)	0.0031 (0.0058)
% of foreign rural workers 1910s	252.71 (159.80)	243.54 (159.41)	175.23 (156.19)	403.20** (172.22)
% of foreign landowners 1910s	63.30 (509.73)	36.84 (522.80)	-231.34 (385.89)	161.79 (660.31)
Share of coffee area 1910s	-273.35 (203.23)	-195.50 (222.88)	-143.86 (212.35)	-114.05 (213.06)
Municipal expenditures 1910s	0.0016*** (0.0003)	0.0016*** (0.0004)	0.0018*** (0.0004)	0.0017*** (0.0003)
State schools 1910s	42.74*** (5.88)	40.77*** (5.77)	39.15*** (5.79)	42.85*** (6.44)
Municipal characteristics 1910s	Yes	Yes	Yes	Yes
Geographic characteristic	Yes	Yes	Yes	Yes
Adjusted R ²	0.9622	0.9593	0.9617	0.9542
<i>Panel B: First stage estimates (selected variables)</i>				
	<i>German schools</i> 1910s	<i>German schools</i> 1910s	<i>German schools</i> 1910s	<i>German schools</i> 1910s
No. of colonies 1850s	0.1405*** (0.0266)	0.1446*** (0.0309)	0.1384*** (0.0195)	0.1571*** (0.0208)
State schools 1910s	-0.0029 (0.0084)	8.47e-05 (0.0076)	0.0100 (0.0060)	0.0039 (0.0080)
Share of German-speakers 1872	-3.67 (6.90)	-19.88 (14.62)	0.9074 (5.52)	-7.33 (16.16)
Share of German workers 1872	6.19 (5.30)			
Share of German workers 1888		8.81 (8.34)		

Notes: *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. All models use robust standard errors. Panels A and B show the second- and first-stage estimates, respectively, for selected variables. All estimates include the full set of covariates as discussed in section III. All models instrument German schools 1910s with no. of colonies 1850s. No model suffers from the problem of weakness of instruments, as measured by the critical values of Stock and Yogo, 'Testing'. All models reject the under-identification hypothesis at the 1% level using the Kleibergen-Paap rk LM statistic. The term 'German' always refers to 'German-speakers', as defined in n. 8; the abbreviation is used only to facilitate the reading of the table.

Table 6. *German-speaking immigrants, German schools, and on-the-job skills effects on enrolment in state schools (IV estimates, 1910s)*

<i>Panel A: Second-stage estimates</i>				
<i>Variables</i>	<i>Enrolment, state 1910s</i>	<i>Enrolment, state 1910s</i>	<i>Enrolment, state 1910s</i>	<i>Enrolment, state 1910s</i>
German schools 1910s	40.95** (17.23)	36.39* (19.55)	39.33** (18.50)	32.94 (20.05)
Share of German-speakers 1872	1,056.14 (988.35)	312.38 (1,915.66)	746.69 (948.38)	-432.52 (2,035.01)
Share of German workers 1872	-517.21** (261.86)			
Share of German workers 1888		56.86 (752.72)		
Share of German manufacturing 1872			142.63 (181.21)	
Share of German services 1872			-67.73 (168.23)	
Share of German trade 1872			-460.15 (353.95)	
Share of German rents 1872			270.92 (1,057.59)	
Share of German manufacturing 1888				-53.92 (277.69)
Share of German services 1888				-427.34 (500.43)
Share of German trade 1888				675.44 (508.23)
Share of German rents 1888				48.87 (128.91)
Population 1910s	0.0018 (0.0013)	0.0024** (0.0011)	0.0023* (0.0012)	0.0024** (0.0011)
% of foreign rural workers 1910s	76.25* (40.39)	70.43* (40.93)	72.09* (37.23)	79.50* (45.84)
% of foreign landowners 1910s	75.86 (100.87)	43.75 (109.10)	15.30 (79.05)	35.25 (127.07)
Share of coffee area 1910s	-70.10 (54.78)	-57.53 (61.78)	-49.14 (60.16)	-34.09 (62.50)
Municipal expenditures 1910s	0.0002** (7.67e-05)	0.0002** (9.12e-05)	0.0002** (0.0001)	0.0002** (9.52e-05)
State schools 1910s	38.65*** (1.58)	38.09*** (1.50)	38.05*** (1.76)	37.77*** (1.53)
Municipal characteristics 1910s	Yes	Yes	Yes	Yes
Geographic characteristics	Yes	Yes	Yes	Yes
Observations	47	48	47	42
Adjusted R ²	0.9945	0.9942	0.9938	0.9933
<i>Panel B: First-stage estimates (selected variables)</i>				
	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>
No. of colonies 1850s	0.1405*** (0.0266)	0.1446*** (0.0309)	0.1384*** (0.0195)	0.1571*** (0.0208)
State schools 1910s	-0.0029 0.0084	0.0001 0.0076	0.0010 0.0060	0.0039 0.0080
Share of German-speakers 1872	-3.67 6.90	-19.88 14.62	0.9074 5.52	-7.3028 16.16
Share of German workers 1872	6.19 5.30			
Share of German workers 1888		8.81 14.62		

Notes: As for tab. 5.

Table 7. *German-speaking immigrants, German schools, and on-the-job skills effects on enrolment in private schools (IV estimates, 1910s)*

<i>Panel A: Second-stage estimates</i>				
<i>Variables</i>	<i>Enrolment, private 1910s</i>	<i>Enrolment, private 1910s</i>	<i>Enrolment, private 1910s</i>	<i>Enrolment, private 1910s</i>
German schools _{1910s}	84.16** (40.65)	79.03* (45.26)	75.75** (33.37)	29.34 (41.53)
Share of German-speakers ₁₈₇₂	-1,072.81 (1,964.59)	-894.12 (4,508.38)	-1,753.11 (1,280.95)	-4,162.34 (3,521.59)
Share of German workers ₁₈₇₂	-1,637.38*** (366.06)			
Share of German workers ₁₈₈₈		-1,181.08 (1,607.57)		
Share of German manufacturing ₁₈₇₂			972.88*** (356.48)	
Share of German services ₁₈₇₂			-601.76* (317.42)	
Share of German trade ₁₈₇₂			-2,429.31*** (636.51)	
Share of German rents ₁₈₇₂			1,576.91 (2,251.28)	
Share of German manufacturing ₁₈₈₈				-345.88 (491.10)
Share of German services ₁₈₈₈				-1,185.12 (867.31)
Share of German trade ₁₈₈₈				1,239.20 (779.44)
Share of German rents ₁₈₈₈				-1,086.94*** (420.15)
Population _{1910s}	-0.0032 (0.0028)	-0.0027 (0.0030)	-0.0023 (0.0025)	-0.0038 (0.0027)
% of foreign rural workers _{1910s}	155.05 (133.80)	195.78 (127.43)	91.61 (139.20)	308.52*** (111.94)
% of foreign landowners _{1910s}	140.49 (334.47)	134.39 (331.93)	-8.44 (256.00)	696.40 (497.19)
Share of coffee area _{1910s}	-143.98 (121.95)	-85.94 (140.23)	-10.28 (113.23)	-36.29 (135.73)
Municipal expenditures _{1910s}	0.0011*** (0.0001)	0.0011*** (0.0002)	0.0012*** (0.0002)	0.0013*** (0.0002)
State schools _{1910s}	7.24** (3.42)	6.24* (3.43)	4.80 (3.14)	6.59** (2.90)
Municipal characteristics _{1910s}	Yes	Yes	Yes	Yes
Geographic characteristics	Yes	Yes	Yes	Yes
Adjusted R ²	0.8450	0.8238	0.8673	0.8288
<i>Panel B: First-stage estimates (selected variables)</i>				
	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>
No. of colonies ₁₈₅₀	0.1392*** (0.0271)	0.1459*** (0.0309)	0.1413*** (0.0197)	0.1496*** (0.0207)
State schools _{1910s}	0.0020 (0.0069)	0.0045 (0.0068)	0.0134* (0.0065)	0.0043 (0.0084)
Share of German-speakers ₁₈₇₂	-9.92 (10.33)	-27.89 (18.74)	-5.68 (10.26)	-24.98 (16.12)
Share of German workers ₁₈₇₂	6.73 (5.19)			
Share of German workers ₁₈₈₈		9.83 (9.13)		

Notes: As for tab. 5.

Table 8. *German-speaking immigrants, German schools, and on-the-job skills effects on enrolment in municipal schools (IV estimates, 1910s)*

<i>Panel A: Second-stage estimates</i>				
<i>Variables</i>	<i>Enrolment, municipal 1910s</i>	<i>Enrolment, municipal 1910s</i>	<i>Enrolment, municipal 1910s</i>	<i>Enrolment, municipal 1910s</i>
German schools 1910s	31.97 (19.51)	33.93* (19.82)	12.09 (21.84)	20.76 (21.80)
Share of German-speakers 1872	-1,490.29 (1,022.02)	-1,182.00 (2,464.48)	-1,402.74 (967.00)	-232.23 (3,731.88)
Share of German workers 1872	-348.22 (241.80)			
Share of German workers 1888		-461.76 (803.23)		
Share of German manufacturing 1872			436.91** (212.57)	
Share of German services 1872			-446.10 (274.57)	
Share of German trade 1872			-642.16* (342.81)	
Share of German rents 1872			1,823.02 (1,418.72)	
Share of German manufacturing 1888				-325.63 (251.10)
Share of German services 1888				-149.89 (753.27)
Share of German trade 1888				162.55 (676.14)
Share of German rents 1888				141.31 (265.31)
Population 1910s	0.0063*** (0.0015)	0.0060*** (0.0018)	0.0061*** (0.0017)	0.0059** (0.0023)
% of foreign rural workers 1910s	49.44 (87.42)	68.37 (78.82)	-11.33 (101.59)	94.41 (85.57)
% of foreign landowners 1910s	517.81*** (159.47)	514.13*** (169.21)	504.10*** (158.87)	492.93** (244.75)
Share of coffee area 1910s	-36.34 (62.97)	-18.11 (68.93)	10.48 (59.16)	4.74 (79.23)
Municipal expenditures 1910s	0.0002 (9.77e-05)	0.0001 (9.54e-05)	0.0003** (0.0001)	0.0002 (0.0001)
State schools 1910s	-2.11 (1.73)	-2.16 (1.87)	-3.11* (1.77)	-1.80 (2.04)
Municipal characteristics 1910s	Yes	Yes	Yes	Yes
Geographic characteristics	Yes	Yes	Yes	Yes
Adjusted R ²	0.7092	0.7021	0.7201	0.6212
<i>Panel B: First-stage estimates (selected variables)</i>				
	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>
No. of colonies 1850s	0.1463*** (0.0319)	0.1511*** (0.0320)	0.1489*** (0.0196)	0.1540*** (0.0207)
State schools 1910s	-0.0039 (0.0074)	-0.0007 (0.0074)	0.0072 (0.0059)	0.0018 (0.0083)
Share of German-speakers 1872	-6.51 (10.55)	-20.06 (18.59)	-0.2157 (8.60)	-22.39 (25.19)
Share of German workers 1872	6.30 (5.57)			
Share of German workers 1888		7.32 (8.85)		

Notes: As for tab. 5.

Table 9. *German-speaking immigrants, German schools, and on-the-job skills effects on completion in state schools (IV estimates, 1910s)*

<i>Panel A: Second-stage estimates</i>				
<i>Variables</i>	<i>Completion, state 1910s</i>	<i>Completion, state 1910s</i>	<i>Completion, state 1910s</i>	<i>Completion, state 1910s</i>
German schools 1910s	24.80 (25.73)	18.56 (25.91)	26.14 (32.77)	33.40* (19.09)
Share of German-speakers 1872	-2,774.29** (1,321.14)	-2,889.09 (1,861.66)	-3,888.81** (1,528.10)	-139.70 (2,378.31)
Share of German workers 1872	27.15 (461.44)			
Share of German workers 1888		395.49 (888.32)		
Share of German manufacturing 1872			405.06** (182.83)	
Share of German services 1872			-34.86 (247.20)	
Share of German trade 1872			421.86 (380.72)	
Share of German rents 1872			-2,935-17* (1,57112)	
Share of German manufacturing 1888				-437.12 (292.40)
Share of German services 1888				1,578.48* (849.37)
Share of German trade 1888				-100.61 (449.36)
Share of German rents 1888				782.91*** (199.53)
Population 1910s	-0.0002 (0.0019)	0.0003 (0.0020)	0.0010 (0.0023)	0.0020 (0.0022)
% of foreign rural workers 1910s	68.29 (79.56)	30.13 (74.43)	68.65 (94.57)	-172.13** (74.93)
% of foreign landowners 1910s	311.06 (222.93)	264.70 (216.15)	130.32 (233.09)	-62.83 (187.09)
Share of coffee area 1910s	-41.39 (71.19)	-43.81 (63.16)	23.06 (59.38)	-104.08 (72.21)
Municipal expenditures 1910s	-7.45e-05 (0.0001)	-5.74e-05 (0.0001)	-8.94e-05 (0.0002)	-0.0002 (0.0002)
State schools 1910s	1.09 (1.70)	1.07 (1.90)	-0.3488 (1.79)	-0.0245 (1.52)
Municipal characteristics 1910s	Yes	Yes	Yes	Yes
Geographic characteristics	Yes	Yes	Yes	Yes
Adjusted R ²	-0.2873	-0.2474	-0.2975	0.0021
<i>Panel B: First-stage estimates (selected variables)</i>				
	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>	<i>German schools 1910s</i>
No. of colonies 1850s	0.1398*** (0.0265)	0.1459*** (0.0314)	0.1403*** (0.0232)	0.1540*** (0.0218)
State schools 1910s	-0.0013 (0.0081)	0.0010 (0.0079)	0.0111 (0.0069)	0.0058 (0.0091)
Share of German-speakers 1872	-5.65 (8.47)	-25.27 (16.95)	-0.2357 (7.68)	-13.87 (18.40)
Share of German workers 1872	6.60 (5.75)			
Share of German workers 1888		10.08 (9.18)		

Notes: As for tab. 5.

Table 10. Path dependence and impact of German-speaking immigrants, German schools, and on-the-job skills on current enrolment and completion (OLS estimates, 2000s)

Variables	Total enrolment 2000s	Enrolment, state 2000s	Enrolment, private 2000s	Enrolment, municipal 2000s	Enrolment, private 2000s	Enrolment, municipal 2000s	Enrolment, municipal 2000s	Completion, state 2000s	Completion, state 2000s
Total enrolment ^{1910s}	-2.98*** (0.8988)	-6.57*** (2.38)	3.08** (1.33)	-5.91 (5.51)	-6.55*** (2.25)	3.81** (1.44)	-2.94* (1.56)	-2.67* (1.49)	
Enrolment, state ^{1910s}	-3.38*** (0.7079)								
Enrolment, private ^{1910s}									
Enrolment, municipal ^{1910s}									
Completion, state ^{1910s}									
German schools ^{1930s}	-996.18* (550.72)	-2,275.39* (1,251.27)	240.69 (195.38)	753.91 (935.58)	-2,347.48* (1,185.61)	-98.76 (218.98)	1,329.92 (1,014.24)	-237.32 (185.55)	-229.06 (168.94)
Share of German-speakers ¹⁸⁷²	-15,399.78 (29,950.35)	87,461.17 (91,067.22)	-8,065.90 (15,615.32)	-42,307.55 (71,291.89)	228,401.70 (231,763.10)	17,808.76 (28,722.68)	-98,568.73 (148,181.70)	14,419.05 (14,368.12)	58,656.02* (31,792.00)
Share of German workers ¹⁸⁷²	-1,697.26 (15,833.83)	-16,215.74 (36,919.11)	-10,636.26* (5,245.25)	22,760.61 (28,590.15)				-1,897.32 (4,390.9)	
Share of German workers ¹⁸⁸⁸									
Population ¹⁹⁹⁹⁻²⁰⁰⁴	0.2048** (0.0128)	0.2095*** (0.0105)	0.1503*** (0.0189)	0.0451*** (0.0119)	0.1521*** (0.0172)	0.0124*** (0.0021)	0.0475*** (0.0079)	0.0215*** (0.0029)	-15,723.45 (9,916.66)
Income ¹⁹⁹⁹⁻²⁰⁰⁴	-1.64*** (0.5912)	-1.83*** (0.4981)	0.6483 (1.10)	-2.45*** (0.8343)	0.3927 (1.05)	0.4816*** (0.1601)	-2.71*** (0.71)	0.0215*** (0.1529)	0.0215*** (0.1447)
Municipal expenditures ^{education²⁰⁰²⁻³}	-3.22e-05 (5.13e-05)	-3.59e-05 (4.10e-05)	-0.0003*** (7.69e-05)	-0.0002*** (6.76e-05)	-0.0003*** (6.76e-05)	7.92e-06 (1.07e-05)	0.0002*** (5.50e-05)	-3.71e-05*** (1.10e-05)	-3.52e-05*** (9.61e-06)
Economic structure ^{2000s}	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Observations	68	59	51	50	54	46	46	52	46
Adjusted R ²	0.9963	0.9972	0.9759	0.9514	0.9701	0.9770	0.9542	0.9505	0.9575

Notes: Robust standard errors if the hypothesis of homoscedasticity was rejected at the 10% level. ***p < 0.01, **p < 0.05, *p < 0.1. All models include an intercept, controls for municipal characteristics (average straight-line distance to the state capital, area, latitude, altitude, average rainfall, and average temperature), as well as economic structure (share of value added by agriculture, industry, services, and public administration). The term 'German' always refers to 'German-speakers', as defined in n. 8; the abbreviation is used only to facilitate the reading of the table.

Table 11. Path dependence and impact of German-speaking immigrants, German schools, and on-the-job skills on current stock of human capital: average years of education (OLS estimates, 2000s)

Variables	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s	Avg. years educ. 2000s
Total enrolment ^{1910s}	0.0001 (9.04e-05)	0.0001 (9.15e-05)							
Enrolment, state ^{1910s}		0.0002* (0.0001)							
Enrolment, private ^{1910s}			0.0001 (0.0003)	0.0002 (0.0003)					
Enrolment, municipal ^{1910s}					-0.0002 (0.0006)	-0.000161 (0.000635)			
Completion, state ^{1910s}							0.0013* (0.0007)	0.0009 (0.0008)	
German schools ^{1930s}	-0.1278 (0.0945)	-0.2507*** (0.0901)	-0.2373** (0.0887)	-0.1607 (0.1034)	-0.1360 (0.1004)	-0.2041* (0.1029)	-0.0777 (0.0957)	-0.1912* (0.0961)	
Share of German-speakers ¹⁸⁷²	3.45 (7.99)	-20.10 (13.72)	-21.03 (13.30)	0.5837 (8.77)	-2.12 (8.48)	-18.42 (15.03)	2.10 (7.97)	-14.79 (14.38)	
Share of German workers ¹⁸⁷²	0.9704 (2.50)	0.7807 (2.49)		2.33 (2.83)	2.56 (2.66)		-0.1521 (2.56)		
Share of German workers ¹⁸⁸⁸		10.99** (4.30)	11.03** (4.16)			8.22 (5.22)	9.08* (4.77)	7.90 (4.66)	
Population ¹⁹⁹⁹⁻²⁰⁰⁴	-7.76e-07 (8.09e-07)	-9.83e-07 (7.35e-07)	-1.07e-06 (7.25e-07)	-9.51e-07 (9.06e-07)	-7.98e-07 (8.23e-07)	-6.31e-07 (8.04e-07)	-8.19e-07 (8.04e-07)	-8.19e-07 (7.47e-07)	
Income ¹⁹⁹⁹⁻²⁰⁰⁴	-6.72e-07 (6.71e-05)	9.23e-05 (6.60e-05)	9.34e-05 (6.45e-05)	6.02e-05 (8.24e-05)	5.37e-05 (8.48e-05)	0.000104 (7.24e-05)	1.21e-05 (6.60e-05)	8.07e-05 (6.79e-05)	
Municipal expenditures education ²⁰⁰²⁻³	5.50e-09 (5.11e-09)	2.81e-10 (4.89e-09)	1.98e-10 (4.79e-09)	2.94e-09 (6.67e-09)	-2.67e-09 (6.53e-09)	-1.55e-09 (5.58e-09)	5.25e-09 (5.20e-09)	9.52e-10 (5.12e-09)	
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic structure ^{2000s}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68	59	59	51	50	46	56	50	
Adjusted R ²	0.5772	0.6596	0.6705	0.5348	0.5756	0.6244	0.5624	0.6316	

Notes: As for tab. 10.

Table 12. Path dependence and impact of German-speaking immigrants, German schools, and on-the-job skills on current stock of human capital: illiteracy rates (OLS estimates, 2000s)

Variables	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}	Illiteracy rate _{2000s}
Total enrolment ^{1910s}	-0.0003 (0.0002)	-0.0003 (0.0002)						
Enrolment, state ^{1910s}			-0.0006** (0.0003)					
Enrolment, private ^{1910s}				0.0003 (0.0006)				
Enrolment, municipal ^{1910s}					0.0010 (0.0015)			
Completion, state ^{1910s}						0.0008 (0.0016)		
German schools ^{1930s}	0.1790 (0.2239)	0.3389 (0.2160)	0.1311 (0.2242)	0.1661 (0.2089)	0.2153 (0.2340)	0.2500 (0.2978)	0.0949 (0.2078)	-0.0028 (0.0021)
Share of German-speakers ¹⁸⁷²	5.68 (12.48)	56.34** (24.69)	7.55 (11.96)	10.50 (18.75)	43.25 (29.53)	49.68* (27.58)	6.15 (14.82)	29.96 (22.78)
Share of German workers ¹⁸⁷²	-8.75* (4.68)		-7.86 (4.71)	-9.85* (5.45)			-4.89 (4.82)	
Share of German workers ¹⁸⁸⁸		-25.90*** (8.19)			-19.24* (10.59)	-20.17* (9.97)		-13.67 (8.32)
Population ¹⁹⁹⁹⁻²⁰⁰⁴	7.52e-08 (1.57e-06)	4.31e-07 (1.43e-06)	3.57e-07 (1.74e-06)	1.20e-06 (1.19e-06)	3.46e-07 (1.12e-06)	6.85e-07 (1.22e-06)	5.21e-07 (1.45e-06)	4.79e-07 (1.15e-06)
Income ¹⁹⁹⁹⁻²⁰⁰⁴	0.0002 (0.0002)	3.86e-05 (0.000194)	0.0002 (0.0002)	0.0002 (0.0002)	3.29e-05 (0.0002)	-4.13e-05 (0.000172)	0.0002 (0.0002)	8.07e-05 (0.000195)
Municipal expenditures education ²⁰⁰²⁻³	-1.98e-08 (1.23e-08)	-6.52e-09 (1.29e-08)	-2.04e-08 (1.25e-08)	-2.53e-08 (1.76e-08)	-1.00e-08 (1.61e-08)	-6.30e-11 (1.08e-08)	-2.41e-08* (1.30e-08)	-1.23e-08 (1.33e-08)
Municipal characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Economic structure ^{2000s}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	68	59	68	51	46	46	56	50
Adjusted R ²	0.6710	0.6899	0.6818	0.6330	0.6236	0.6722	0.6719	0.6981

Notes: As for tab. 10.

Table 13. Path dependence and impact of German-speaking immigrants, German schools, and on-the-job skills on current stock of human capital: educational component of municipal HDI (OLS estimates, 2000s)

Variables	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}	Education MHD1 _{2000s}
Total enrolment ^{1910s}	1.77e-06 (5.47e-06)	4.90e-06 (5.65e-06)							
Enrolment, state ^{1910s}		6.70e-06 (8.22e-06)	1.09e-05 (8.16e-06)						
Enrolment, private ^{1910s}			-1.09e-05 (1.73e-05)	-1.09e-06 (1.91e-05)					
Enrolment, municipal ^{1910s}									
Completion, state ^{1910s}									
German schools ^{1930s}	-0.0067 (0.0057)	-0.0143** (0.0056)	-0.0137** (0.0055)	-0.0123** (0.0058)	-0.0078 (0.0061)	-0.0139** (0.0062)	5.27e-06 (3.83e-05)	6.97e-05 (4.22e-05)	7.02e-05 (4.35e-05)
Share of German-speakers ¹⁸⁷²	0.4209 (0.4838)	-0.3831 (0.8469)	-0.3990 (0.8244)	0.2722 (0.4900)	0.0588 (0.9300)	-0.1216 (0.9069)		0.3055 (0.4511)	0.1754 (0.8210)
Share of German workers ¹⁸⁷²	0.0738 (0.1516)	0.0593 (0.1512)	0.0998 (0.1583)					-0.0022 (0.1450)	
Share of German workers ¹⁸⁸⁸		0.4666* (0.2655)	0.4579* (0.2578)	0.2723 (0.2974)			0.3441 (0.2875)		0.1975 (0.2664)
Population ¹⁹⁹⁹⁻²⁰⁰⁴	3.40e-08 (4.90e-08)	1.67e-08 (4.54e-08)	1.09e-08 (4.49e-08)	2.14e-08 (4.69e-08)	9.50e-09 (5.07e-08)	1.44e-08 (5.30e-08)	2.92e-08 (4.85e-08)	1.09e-08 (4.55e-08)	1.13e-08 (4.26e-08)
Income ¹⁹⁹⁹⁻²⁰⁰⁴	1.14e-06 (4.06e-06)	5.75e-06 (4.07e-06)	5.71e-06 (4.00e-06)	2.81e-06 (4.61e-06)	5.70e-06 (4.83e-06)	3.90e-06 (4.32e-06)	6.63e-06 (4.37e-06)	1.08e-06 (3.74e-06)	4.88e-06 (3.88e-06)
Municipal expenditures education ²⁰⁰²⁻³	-9.54e-11 (3.09e-10)	-3.31e-10 (3.02e-10)	-3.30e-10 (2.97e-10)	-3.73e-11 (3.73e-10)	-3.02e-10 (3.72e-10)	-1.93e-10 (3.53e-10)	-4.15e-10 (3.37e-10)	-1.29e-11 (2.94e-10)	-2.23e-10 (2.93e-10)
Municipal characteristics Economic structure ^{2000s}	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes	Yes Yes
Observations	68	59	59	46	50	46	46	56	50
Adjusted R ²	0.5915	0.6331	0.6419	0.5683	0.5690	0.5709	0.6003	0.6407	0.6648

Notes: As for tab. 10.

concern with the magnitude of these variables still remains: the smallest significant coefficient for historical enrolment in state schools implies that, for each child who matriculated in this type of school in the 1910s, current average years of schooling would be increased by only 0.00024 years. Evaluated at the mean enrolment in the 1910s, however, this coefficient corresponds to about 2.3 per cent of current average years of schooling.⁷⁸

As a final evaluation, we now turn to the variables in the set (*German-speaking presence_i*). The share of German-speakers in the population in the nineteenth century has no systematic effect on current educational performance, which is consistent with the results of the first and second periods.⁷⁹ In turn, whenever significant, German schools established before the 1930s always present a negative coefficient. For the measures of stocks of human capital, this negative impact is even systematically repeated when the controls for on-the-job skills are taken from the 1888 almanac. This robust pattern leads to the rejection of the hypothesis that German schools created before the 1930s had a direct positive effect on current educational performance. However, this does not imply a rejection of the hypothesis of the historical importance of the German schools in setting a positive path dependence for the accumulation of human capital. It should be borne in mind that for the 1910s German schools had an important and positive influence on enrolment in state and private schools. For the current period, in turn, we observed persistence for enrolment in private schools and convergence in state schools. Once the historical educational condition is controlled for in the current analysis, the negative impact of German schools seems to be just another facet of beta-convergence.

Turning to on-the-job skills, on the one hand we observe no systematic effect for the measures of current flows of human capital. There are cases of individual significance, such as the negative impact of the share of German-speakers in total activities in 1873. Nevertheless, not only the significance but even the signs depend very much on the specification and, in particular, on the control used for the historical level of education. On the other hand, the effects of on-the-job skills are clearer for the stocks of human capital. For instance, the share of German-speakers in the total workforce in 1888 always affects at least two baselines for average years of education, illiteracy, and the educational component of the MHDI. The total workforce share of German-speakers in 1873 is lower, but nevertheless robust for illiteracy. When categorized by sector, it is noteworthy that none of the specific skills from 1888 shows the systematic positive impact that it had for the total share of German-speakers in that year. At first, this seems to suggest that the general pool of skills is the main long-run determinant issuing from these immigrants. Nevertheless, for 1873, the presence of German-speakers in services is systematically associated with current higher measures of stocks of human capital.

Unlike the other variables in the set (*German-speaking presence_i*), the estimates for on-the-job skills are less congruous with previous periods. This suggests that other transmission channels could be at work here. For instance, historical on-the-job skills could have influenced the pace of technological adoption or changes in

⁷⁸ $[(\text{Mean total enrolment}_{1910s}) \times (\text{Coefficient})] / (\text{Mean years of education}_{2000s})$.

⁷⁹ The exception is a 10% significant impact on completion in state schools and a 5% significant impact for illiteracy rates. The coefficients, however, are excessively large and do not survive any other specification.

the sector composition of municipalities.⁸⁰ In the nineteenth century and at the beginning of the twentieth century, the educational level associated with these changes might have been matched by the skills of the immigrants, explaining the general nonsignificance of the on-the-job skill components for the previous analyses. Later on, however, changes in technology and sector composition may have required other traits that are captured in the final regression precisely by the on-the-job skills of the immigrants.

VI

This article has studied the accumulation of human capital in the state of São Paulo, Brazil, focusing on the influence of German-speaking immigrants from 1840 to 1920. It has examined whether these immigrants represented a positive shock for historical and current measures of human capital through their share of the population in the nineteenth century, the schools they founded, and their on-the-job skills.

The findings have shown that the share of German-speakers in a municipality in the nineteenth century had no impact on human capital formation, either historically or currently. However, the institutionalization of their higher levels of education, through the creation of schools, proved to be a major contribution to an increase in the levels of enrolment at the beginning of the twentieth century. In the case of human capital, the analysis presented here favours the institutional hypothesis over the hypothesis of the direct influence of immigrants via cultural traits.⁸¹ A further step would be to explain the origins of such educational institutions, which, in turn, depend on the cultural background of the immigrants and the socio-economic conditions of the recipient society.

In analysing this more institutional explanation for the accumulation of human capital in São Paulo, the importance of differentiating between specific types of school was highlighted. The path dependence and long-run effects for private, state, and municipal schools differed substantially. A strong positive persistence was found for current enrolment in private schools with respect to enrolment levels in the 1910s. On the other hand, state schools showed a strong process of beta-convergence in terms of enrolment levels at the beginning of the twentieth century.

With respect to the main variable of interest, German schools influenced enrolment levels both in private and in state schools in the 1910s. As a consequence, they also had a robust positive impact on total enrolment. This finding seems to provide evidence of spillover and contagion effects among immigrants and native Brazilians, thus supporting one of the classical hypotheses of the Brazilian historiography, namely that German-speaking immigrants experienced a smoother integration process in São Paulo than in the southern provinces of the country.⁸² The impact of German schools, however, dissipated over time, and the schools have no direct positive influence on current measures of human capital. At the same time, these educational institutions have an indirect effect on current educational performance via their influence on private and state schools in the 1910s. It is

⁸⁰ I control for the levels of sector composition, but not for changes over time.

⁸¹ Glaeser et al. 'Do institutions cause growth?'; Acemoglu et al., 'Institutions'.

⁸² Holanda, 'Prefácio'.

particularly noteworthy that historical enrolment in state schools is associated with current higher average years of education and lower levels of illiteracy.

Unlike the literature focused on Brazil, which favours the hypothesis of a direct long-run impact of immigrants on human capital, the results of this study point toward dissipation effects that survive only indirectly in the long run.⁸³ From a broader perspective, the results also diverge from those of studies that assess the direct impact of immigrants on long-run educational performance.⁸⁴ A potential explanation for these diverging results is that this study has focused on an ethnic minority which, in 1872, represented less than 1 per cent of the average population of the province—and only 4.39 per cent in the MCA with the maximum share of German-speakers.

Finally, the analysis of the on-the-job skills of German-speakers provided less conclusive results. While no robust effect was found for historical schooling, some direct impacts were identified on current levels of enrolment and measures of human capital stocks. This suggests that this component of human capital brought by the immigrants might have transmission channels other than the direct impact on formal education as assessed in this article. Those potential explanations include technological adoption and sector structural changes, and thus raise questions that merit further investigation.

Date submitted

14 January 2015

Revised version submitted

8 March 2017

Accepted

6 April 2017

DOI: 10.1111/ehr.12575

Footnote references

- Acemoglu, D., Gallego, F., and Robinson, J. A., 'Institutions, human capital and development', *Annual Review of Economics*, 6 (2014), pp. 875–912.
- Acemoglu, D., Johnson, S., and Robinson, J. A., 'The colonial origins of comparative development: an empirical investigation', *American Economic Review*, 91 (2001), pp. 1369–401.
- Acemoglu, D., Johnson, S., and Robinson, J. A., 'Reversal of fortune: geography and institutions in the making of the modern world income distribution', *Quarterly Journal of Economics*, 117 (2002), pp. 1231–94.
- Becker, S. O. and Woessmann, L., 'Was Weber wrong? A human capital theory of Protestant economic history', *Quarterly Journal of Economics*, 124 (2009), pp. 531–96.
- Becker, S. O. and Woessmann, L., 'The effect of Protestantism on education before the industrialization: evidence from 1816 Prussia', *Economic Letters*, 107 (2010), pp. 224–8.
- Bezerra, M. C. S., 'Educação étnica: a pluralidade das propostas educacionais de origem germânica no estado de São Paulo' (unpub. Ph.D. thesis, Universidade Estadual de Campinas, 2007).
- Carvalho Filho, I. and Colistete, R. P., 'Education performance: was it all determined 100 year ago? Evidence from São Paulo, Brazil', Munich Personal RePEc Archive working paper N. 24494 (2010), <https://renatocolistete.wordpress.com/textos/> (accessed on 20 Sept. 2017).
- Carvalho Filho, I. and Monasterio, L. M., 'Immigration and the origins of regional inequality: government-sponsored European migration to southern Brazil before World War I', *Regional Science and Urban Economics*, 42 (2012), pp. 794–807.
- Davatz, T. *Memórias de um colono no Brasil, 1850* (São Paulo, 1941).
- Dean, W., *Rio Claro: um sistema brasileiro de grande lavoura, 1820–1920* (Rio de Janeiro, 1977).
- Gennaioli, N., La Porta, R., Lopez-de-Silanes, F., and Shleifer, A., 'Human capital and regional development', *Quarterly Journal of Economics*, 128 (2013), pp. 105–64.

⁸³ The argument presented here is, however, more in line with that of Carvalho Filho and Colistete, 'Education performance', who study the relation between current educational performance and historical public investments, with the latter being influenced by immigrants.

⁸⁴ See especially Nunn et al., 'Migrants', p. 10, for the US.

- Glaeser, E. L., La Porta, R., Lopez-de-Silanes, F., and Shleifer, A., 'Do institutions cause growth?', *Journal of Economic Growth*, 9 (2004), pp. 271–303.
- Gouvêa, F. M., 'Os imigrantes alemães em Rio Claro: estratégias de sobrevivência e redes de sociabilidade nos séculos XIX e XX' (unpub. Master's dissertation, Universidade Estadual Paulista, 2011).
- Grininger, V., 'Imigração suíça em São Paulo: a história da colônia Helvetia' (unpub. Master's dissertation, Universidade Estadual de Campinas, 1991).
- Heflinger Jr., J. E., *Ibicaba: o berço da imigração europeia de cunho particular; Ibicaba: die Wiege der privat organisierten Europäischen Einwanderung* (Limeira, 2007).
- Heflinger Jr., J. E., *A revolta dos parceiros na Ibicaba; the rebellion of the sharecroppers in Ibicaba* (Limeira, 2009).
- Heinke, E., 'Lose Blätter aus der Geschichte der deutschen Kolonie von São Paulo, 1800–1920', in A. Uhle, ed., *Erstes Jahrbuch für die deutschsprechende Kolonie im Staate São Paulo 1905* (São Paulo, 1905).
- Holanda, S. B., 'Prefácio do tradutor', in T. Davatz, *Memórias de um colono no Brasil (1858)* (São Paulo, 1941).
- Karastojanov, A. M. S., 'Vir, viver e talvez morrer em Campinas: um estudo sobre a comunidade alemã residente na zona urbana durante o II Império' (unpub. Master's dissertation, Universidade Estadual de Campinas, 1998).
- Keller, J., *Bericht über die gegenwärtige Lage der Landschulen im Innern des Staates São Paulo. Vortrag gehalten am 6. Mai 1919 an der Lehrvereins Versammlung im Klubhaus der Germania, von J. Keller, Direktor der Deutschen Schule Villa Marianna* (São Paulo, 1919).
- Keller, J. and Linhart, H., *Entwurf für den Lehrplan für deutsche Kolonieschulen* (São Paulo, 1926).
- Kreutz, L., 'Escolas étnicas dos imigrantes alemães no Brasil', *Martius-Staden-Jahrbuch*, 52 (2005) pp. 91–106.
- Lambert-Siriani, S. C., *Uma São Paulo alemã: vida cotidiana dos imigrantes germânicos na região da capital (1827–1889)* (São Paulo, 2003).
- Lamounier, M. L., 'Formas de transição da escravidão ao trabalho livre: a lei de locação de serviços de 1879' (unpub. Master's dissertation, Universidade Estadual de Campinas, 1986).
- Luné, A. J. B. and Fonseca, P. D., *Almanak da província de São Paulo para 1873* (facsimile, São Paulo, 1973).
- Mariscal, E. and Sokoloff, K. L., 'Schooling, suffrage, and the persistence of inequality in the Americas, 1800–1945', in S. Haber, ed., *Political institutions and economic growth in Latin America, essays in policy, history, and political economy* (Stanford, Calif., 2000).
- Musacchio, A., Fritscher, A. C. M., and Viarengo, M., 'Colonial institutions, trade shocks, and the diffusion of elementary education in Brazil, 1889–1930', *Journal of Economic History*, 74 (2014), pp. 730–66.
- Naritomi, J., Soares, R. R., and Assunção, J. J., 'Institutional development and colonial heritage within Brazil', *Journal of Economic History*, 72 (2012), pp. 393–422.
- Nobre, S. A. S., 'Associação dos professores teuto-brasileiros do estado de São Paulo: uma reconstrução histórica da trajetória de um órgão associativo voltado à educação étnica no período de 1916 a 1938' (unpub. Master's dissertation, Universidade Estadual de Campinas, 2004).
- Nunn, N., 'The importance of history for economic development', *Annual Review of Economics*, 1 (2009), pp. 65–92.
- Nunn, N., Qian, N., and Sequeira, S., 'Migrants and the making of America: the short- and long-run effects of immigration during the age of mass migration', Harvard Univ. working paper (2017).
- Pande, R. and Udry, C., 'Institutions and development: a view from below', Yale Univ. Economic Growth Center working paper no. 928 (2005).
- Penteado, O. A., *Efemérides Rio-Clarenses* (Rio Claro, 1983).
- Perret-Gentil, C., *A colônia Senador Vergueiro* (Santos, 1851).
- Przeworski, A., 'The last instance: are institutions the primary cause of economic development?', *European Journal of Sociology*, 45 (2004), pp. 165–88.
- Ribeiro, M. J. F. de A., 'Memória, imigração e educação: fábrica de tecidos Carioba, uma vila industrial paulista no início do século XX' (unpub. Ph.D. thesis, Universidade Estadual de Campinas, 2005).
- Rocha, R., Ferraz, C., and Soares, R., 'Human capital persistence and development', *American Economic Journal: Applied Economics* (forthcoming).
- Seckler, J., *Almanach da província de São Paulo para 1888. Administrativo, commercial e industrial* (São Paulo, 1888).
- Silva, F. R., 'A educação alemã na colônia riograndense, 1922–1938 (Maracá/Cruzália—SP)' (unpub. Master's dissertation, Universidade Estadual Paulista, 2010).
- Sokoloff, K. L. and Engerman, S. L., 'History lessons: institutions, factor endowments, and paths of development in the New World', *Journal of Economic Perspectives*, 14, 3 (2000), pp. 217–32.
- Sommer, F., 'São Paulo und die Deutschen I–X', *Deutsche Zeitung* (São Paulo, 1953).
- Stock, J. H. and Yogo, M., 'Testing for weak instruments in linear IV regression', National Bureau of Economic Research technical working paper 284 (2002), <http://www.nber.org/papers/t0284.pdf> (accessed on 14 Sep. 2017).
- Stolcke, V. and Hall, M. M., 'The introduction of free labour on São Paulo coffee plantations', *Journal of Peasant Studies*, 10, 2–3 (1983), pp. 170–200.
- Stolz, Y., Baten, J., and Botelho, T., 'Growth effects of 19th century mass migrations: "Fome Zero" for Brazil?', *European Review of Economic History*, 17 (2013), pp. 95–121.

- Summerhill, W. R., 'Colonial institutions, slavery, inequality, and development: evidence from São Paulo, Brazil', Munich Personal RePEc Archive working paper no. 22162 (2010).
- Tschudi, J. J., *Viagem às províncias do Rio de Janeiro e S. Paulo* (São Paulo and Belo Horizonte, 1980).
- Uhle, A., ed., *Erstes Jahrbuch für die deutschsprechende Kolonie im Staate São Paulo 1905* (São Paulo, 1905).
- Vergueiro, J., *Memorial acerca da colonização e cultivo de café. Apresentado a S. Exc. o sr. ministro e secretário d'Estado dos negócios da agricultura* (Campinas, 1874).
- Viotti da Costa, E., *Da senzala à colônia* (São Paulo, 1998).
- Witter, J. S., *Ibicaba, uma experiência pioneira* (São Paulo, 1982).
- Witzel de Souza, B. G., 'Liberdade ou grilhões? Um estudo dos contratos de parceria à luz da imigração germânica em São Paulo, 1840–1870' (unpub. Bachelor's dissertation, Universidade de São Paulo, 2011).
- Witzel de Souza, B. G., 'Imigração alemã e mercado de trabalho na cafeicultura paulista: um estudo quantitativo dos contratos de parceria', *História Econômica & História de Empresas*, 15, 2 (2012), pp. 81–110.
- Witzel de Souza, B. G., 'The combined effect of institutions and human capital for economic development: A case study of German Immigration to São Paulo, Brazil (1840–1920)' (unpub. Master's dissertation, Georg-August-Universität Göttingen, 2014).

Official publications

- Brazil, Directoria Geral de Estatística, *Recenseamento Geral do Brazil de 1872* (Rio de Janeiro, 1872).
- São Paulo, Secretaria dos Negócios da Agricultura, Commercio e Obras Públicas, *Estatística Agrícola e Zootécnica do Estado de São Paulo, 1904–1905* (São Paulo, 1905).
- São Paulo, Repartição de Estatística e do Archivo de São Paulo, *Anuario Estatístico do Estado de São Paulo, 1904* (São Paulo, [1904] 1907).
- São Paulo, Repartição de Estatística e do Archivo de São Paulo, *Anuario Estatístico do Estado de São Paulo, 1905* (São Paulo, [1905] 1907).
- São Paulo, Repartição de Estatística e do Archivo de São Paulo, *Anuario Estatístico do Estado de São Paulo, 1906* (São Paulo, [1906] 1908).
- São Paulo, Repartição de Estatística e do Archivo de São Paulo, *Anuario Estatístico do Estado de São Paulo, 1907* (São Paulo, [1907] 1910).
- SEADE (Fundação Sistema Estadual de Análise de Dados), 'Informações dos Municípios Paulistas', www.imp.seade.gov.br/frontend (accessed on 20 Sept. 2017).

Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

- S1.** Self-selection of German-speaking immigrants: municipal sector composition and technology
- S2.** Number of observations, unbalanced missing values, and bootstrapping techniques
- S3.** Sub-regional analyses: 'Fronteira Oeste', 'Old-West', and 'Holloway's regions'
- S4.** Official settlement colonies and German schools in the 1910s