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The Value of Foreign Language Skills in the German Labor Market☆

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ABSTRACT

This article explores the relationship between foreign language skills and individuals' labor income in Germany, focusing on the English language. Using the 2012 and 2016 waves of the German Socio-Economic Panel's Innovation Sample (SOEP-IS), we find that native speakers of German with English language skills earn a wage premium of 13 percent, on average. Incremental improvements in the level of skills, e.g., from basic to independent user, increase wages by 11 percent, on average. We address endogeneity issues by using novel data that combine comprehensive information about individuals' characteristics with fine-grained self-assessments of language skills based on descriptors derived from the Common European Framework of Reference for Languages (CEFR). Any remaining sources of endogeneity in the level of language proficiency are addressed by an instrumental variable approach that exploits exogenous variation in individuals' exposure to foreign language acquisition in school. We also show that wage differentials cannot be explained by the value of foreign language skills as a general ability signal, but they are driven by the productive value of such skills. Finally, by examining language skills instead of the use of such skills in the workplace, we identify individual returns to foreign languages for the general population. As education policy is the main determinant of English language acquisition (not only in Germany), this information is highly relevant for policy-makers.

1. Introduction

In 2019, before the turmoil caused by the Covid-19 pandemic, the 27 member states of the European Union spent 3.4 percent of their GDP (i.e., 473 billion Euro) on primary and secondary education, and a significant share of these resources were invested in foreign language teaching. In Europe (including EFTA/EEA and candidate countries) compulsory foreign language teaching accounts for 5 to 10 percent of total teaching hours in primary education and for 10 to 20 percent in secondary education (Eurydice (2017): 117).[1] Grin (2003) estimates that Western European countries spend, on average, between 5 and 15 percent of their total education budget on second language teaching.

There are many reasons why European governments invest resources in foreign language education, including: promoting cooperation and mutual understanding with neighbouring countries, broadening the cultural horizons of pupils and students, reducing communication costs in trade and in productive activities, as well as facilitating the international mobility of labor (European Commission (2008); European Commission (2012b)). The Council of the European Union considers foreign language skills as one of the eight "key competences for lifelong learning" together with literacy, and numerical, scientific and engineering skills (among others) (Council of the European Union (2018)). From an individual's perspective language skills not only increase the set of goods and services that can be consumed, but they are also a specific kind of human capital that might improve one's labor market prospects.

Therefore, several empirical analyses have addressed the question of whether foreign language skills bring about higher incomes for individuals. This question is particularly complex because the returns to

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[1] By comparison, mathematics teaching (a key component of STEM skills) accounts for 17 percent of time in primary education and between 10 and 16 percent in secondary education (Eurydice (2019)).

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foreign language skills are subject to several context-specific factors, including education policy and the degree of openness of a country's economy. This article contributes to the literature by investigating the returns to foreign language skills induced by education policy in Germany (focusing on English), which is an interesting example of a highly export-oriented and internationally integrated economy backed by a strong public education system.

Our analysis is based on two waves of the German Socio-Economic Panel's Innovation Sample (SOEP-IS), a representative, longitudinal survey of private households in Germany, which contains novel and high-quality data on language skill levels at the individual level derived from the Common European Framework of Reference for Languages (CEFR). This considerably reduces the bias due to misclassification error stemming from self-evaluation of language skills on imprecise competence scales that many empirical studies on returns to language skills suffer from (see Section 5.2 below). The rich dataset not only allows us to control for various sources of individual heterogeneity, including cognitive skills and individuals' motivation, but also provides information about the modes of language acquisition that can be used to identify causal effects of English language skills based on an instrumental variable (IV) approach. Our identification strategy exploits exogenous variation in exposure to English language learning induced by official language policy. We propose two novel instruments for foreign language skills that are informed by the history of language education policy in Germany and by findings in bilingual education studies. The first instrument captures whether learning of English was mandatory when respondents were in school, while the second instrument refers to the age at which respondents started to learn the language during childhood. Our findings show that native German speakers of working age (25-64) who have English skills earn, on average, 13 percent higher wages than those individuals that do not speak English. Returns accrue not only to individuals with advanced skills, but also to individuals with basic and intermediate skills. IV estimates indicate an average return to each additional skill level (basic, intermediate, and advanced) of about 11 percent.[2]

The remainder of the article proceeds as follows: To contextualize our study, the next section explains why English language skills are an important asset in the German labor market and provides a brief presentation of the history of language education policy in Germany. Section 3 reviews the existing literature on the relationship between foreign language skills and labor market outcomes. Section 4 introduces our dataset and provides descriptive statistics. In Section 5, we discuss the methodological challenges and explain our empirical strategy. Section 6 presents estimation results, robustness checks and a brief heterogeneity analysis. Section 7 summarizes and concludes the article.

2. Foreign languages in Germany

2.1. The importance of foreign languages in the German economy

Germany has a highly international integrated, open economy. In 2019, the "degree of openness" of the German economy, defined by the sum of imports and exports in relation to GDP, was about 88 percent, making the country the most open economy among the G7 countries (BMWi (2020)). The country is the world's third largest exporter, and third largest importer. Europe is Germany's main trading region for the exchange of goods, representing 68 percent of the country's exports and 68 percent of its imports. Outside Europe, the most important trading partners of the country are China and the USA. Employment relies heavily on open markets and international trade, since approximately 28 percent of jobs in Germany are directly or indirectly linked to exports (in manufacturing this applies even to 56 percent of the jobs) (BMWi (2020)). Given this context, we expect foreign language skills to be rewarded in the German labor market. Even though German is the third most commonly spoken foreign language in the European Union,[3] German businesses and individuals cannot only rely on foreign trading partners' knowledge of German, in particular outside Europe. Therefore, it is not surprising that foreign language teaching plays an important role in the German public education system, and that the importance of language teaching in the curriculum has gradually increased over the last decades. Nowadays, all pupils learn at least one foreign language, usually English, and to a lesser extent French; a second foreign language is usually taught in secondary education, including English, French, Italian, Spanish, and Russian (Eurydice (2017)). According to official statistics for 2019, 58 percent of German students had learned English in primary school.[4] Over the last decades this proportion rose to 100 percent in lower secondary education, it stabilized at 96 percent in the general track of upper secondary education, and at 39 percent in the vocational track of upper secondary education. Teaching of other languages is less widespread in Germany. French, for example, is taught to 3 percent of pupils in primary education, 23 percent in lower secondary education, and 11 percent in upper secondary education. Spanish is also quite popular with about 12 percent of pupils learning it in upper secondary education, while the percentage of pupils learning Italian and Russian remains below 3 percent. Traditionally TV programs in Germany are dubbed, and subtitling is still uncommon (Almeida and Costa (2014), Safar et al. (2011)).[5] Education, therefore, is the primary (albeit not exclusive) channel through which English is acquired by the population, either as a school subject or as a medium of instruction following the CLIL mode - Content and Language Integrated Learning (Kötter (2016)). To support our empirical strategy, we provide some essential contextual information about the public education system, and the history of language education policy in (East and West) Germany.

2.2. A brief history of foreign language education in Germany

Historically, French and English have been the most frequently taught modern, foreign languages in Germany. French was the first modern foreign language taught in German high schools (typically *Gymnasium*) from the unification of the country in 1871 up to the 1930s. However, it became less popular in the 1920s for reasons connected with resentment against France after the end of the first world war (Reinfried (2016)). In 1938, the national-socialist government drastically limited French teaching, and made English the first mandatory foreign language (Reinfried 2016). Between the end of second world war in 1945 and 1949, the allies (i.e., USSR, USA, UK, and France) were responsible for language education policy and promoted Russian, English and French in their respective areas of occupation (Christ (2016)). With the formal establishment of the Federal Republic of Germany (FRG, aka West Germany) and the German Democratic Republic (GDR, aka East Germany), in 1949, language education policy became a domestic policy area again. A summary of the most important decisions in language education policy in GDR and FRG after 1949 is provided in Table 1.

[2] Given a limited number of observations in our sample, we do not find statistically significant earning differentials for other common foreign languages in Germany (i.e., French, Russian, Spanish, Italian and Dutch).

[3] German is spoken as a second language by 11 percent of EU residents after English (38 percent) and French (12 percent). Figures refer to 2012 for the EU with 27 members excluding Croatia and including the United Kingdom (European Commission (2012a)).

[4] See Foreign language learning statistics by the EU statistical agency Eurostat, Table code [educ_uoe_lang01].

[5] Things may have started to change in recent years due to the increasing diffusion of digital film broadcasters and smart TVs that allow viewers to choose their preferred language and use subtitles. However, this recent trend is unlikely to influence our analysis which is based on data from 2012 and 2016 and focusses on employed individuals whose language skills were developed predominantly up to the late 2000s.

Table 1
Important dates in the German history of foreign language education after 1949.

Year	German Democratic Republic (GDR)	Federal Republic of Germany (FRG)
1951	Russian mandatory starting from grade 5.	
1952	Russian mandatory starting from grade 3 in some schools.	
1955		Dusseldorf Agreement by KMK recommends introducing a first foreign language (generally English) in all study tracks of the secondary education.[a]
1957	Learning English or French possible from grade 7 (instead of grade 9).	
1964		Hamburg Agreement by KMK: A first language becomes compulsory in all types of secondary schools. English is the most frequently taught first foreign language.[b]
1969		Implementation of the Hamburg Agreement completed. At least one foreign language (predominantly English) is taught in all federal states in lower secondary education starting from grade 5.[c]
1990	Collapse of GDR.	Unified Federal Republic of Germany.
1992	FRG education policy extended to former GDR.	
2004	A first foreign language is integrated in primary schools' curricula (generally English), mostly starting at grade 3.	

Note: Table complied by the authors. It summarizes the most important language education policy changes in East Germany (GDR), West Germany (FRG), and in the reunified Germany from 1949 to the present time. Grade 3 is the third year of primary education, while grade 5 usually corresponds to the beginning of lower secondary education. Sources are mentioned in the main text.

[a] Some study tracks include a second foreign language (generally French).

[b] A second foreign language can be taught on an optional basis in Realschule, typically from grade 7. Two foreign languages are compulsory in the Gymnasium, the first from grade 5, the second from grade 7.

[c] Learning a second foreign language is possible (in some study tracks even mandatory) from grade 7.

In GDR public education was the responsibility of the central ministry of education. Between 1949 and 1959, the educational system in the GDR went through a process of reorganization which, for reasons of space, cannot be fully presented here (see Nikolai (2018): 67-98, Köhler (2008); Waterkamp (1987)), but between 1959 and 1989, the system remained substantially stable: Formal, mandatory education started when children were aged six, and continued for ten years (Nikolai (2018): 67-98). This general education track was known as *"Allgemeinbildende Polytechnische Oberschule" (POS)*. Further education typically continued for two or three more years (e.g., at *Erweiterte Oberschule (EOS)* which prepared students for higher education). Between 1949 and German reunification, Russian was predominant in schools. From 1951 Russian was mandatory from grade 5 in all schools (Nikolai (2018)). From 1952 on, Russian was actually taught from grade 3 onwards in some schools, while from 1957 onwards learning English or French was possible from grade 7 instead of grade 9 (de Cillia and Klippel (2016)). Learning a second foreign language in POS (i.e., English or French) was either optional or mandatory depending on whether the study track attended was preparatory for further education or not (Geissler 2011; Köhler (2008)). The popularity of English can be inferred from the fact that the percentage of pupils who studied English at grade 7 in POS rose from 21 percent in 1961 to 50 percent in 1971, and, finally, to 72 percent in 1989 (Köhler (2008): 33).

Contrary to the GDR, within the federal structure of West Germany (between 1949 and 1990) as well as later in unified Germany (language) education has been a policy area under the competence of the federal states or *Länder* (Christ (2016); Helbig and Nikolai (2015)). As a result, in West Germany there were ten different educational systems. After the reunification in 1990 this number increased to 16 because the former GDR corresponds to six federal states today (including Berlin). Each state has its own institutional structures, curricula, and guidelines. For the sake of brevity, we focus on the general commonalities between the various educational systems.

In general, compulsory schooling in West Germany began in the year in which children turn six. In most federal states primary school continued for four years (grades 1-4), typically followed by six years of lower secondary education (grades 5-10 for children aged 10-16), which has been divided into different school tracks with their respective leaving certificates and qualifications organized within specific school types. Traditionally these were *Hauptschule, Realschule*, and *Gymnasium*. Starting from the 1970s *Gesamtschulen* or "comprehensive schools" have developed bringing together *Hauptschule, Realschule* and *Gymnasium* (Helbig and Nikolai (2015)).[6] Lower secondary education was (and still is) followed by upper secondary education for teenagers aged 16-19 (grades 11-13), which includes the upper level of *Gymnasium* and vocational study tracks awarding *Abitur* and *Fachhochschulreife*, respectively.

An important institution within the (West) German education system is the Standing Conference of the Ministers of Education and Cultural Affairs (*Kultusministerkonferenz* KMK). KMK has played a crucial role in the coordination and development of education policy within the federal education system of West Germany (de Cillia and Klippel (2016); Quetz (2010)).[7] Its recommendations, however, cannot be understood as reforms. Rather, they have guided and inspired various reform processes at the level of the federal states. The KMK initiatives in 1955, 1964, and 2004 were particularly important for language policy. In the *Dusseldorf Agreement* of 1955, the federal states agreed on a common basic structure for the school system, and KMK recommended introducing a first foreign language (generally English) in all study tracks of the secondary education. Some study tracks included a second foreign language (generally French) (Eurydice (2001); de Cillia and Klippel (2016); Doff (2008)). A further harmonization of the school systems took place with the *Hamburg Agreement* of 1964 (amended in 1971, and still in force). With the Hamburg Agreement a first language became compulsory in all types of secondary schools (Eurydice (2001); Doff (2008)). English is the most frequently taught first foreign language. A second foreign language can be taught on an optional basis in Realschule, typically from grade 7; two foreign languages are compulsory in the Gymnasium, the first at grade 5 the second at grade 7, with a possible third optional language from grade 9 (Eurydice (2001)). The agreement also declares that French remains part of the language offer in all federal states, which explains why, in some federal states, English was not necessarily the first foreign language taught.[8] It took time for the states to fully implement these recommendations (Quetz (2010)), but starting from 1969 all federal states provided compulsory teaching of at least one foreign language (predominantly English) in lower secondary education starting from grade 5 (Helbig and Nikolai (2015)). After re-

[6] Hauptschule and Realschule have been abolished recently in most federal states (Eurydice (2021)).

[7] See also Helbig and Nikolai (2015) for a detailed presentation of the history of the education system in West Germany until 1990, and then in the unified country.

[8] This decision is connected to the Elysee Treaty of friendship between France and West Germany signed in 1963 (Minuth (2016)).

unification in 1990, the language policy guidelines of West Germany were extended to the new federal states, and came into force there in 1992 (Eurydice (2001)). As a consequence of globalization in general and the enlargement of the European Union in particular in the 2000s increasing attention at the political level was paid to foreign languages and multilingual education (de Cillia and Klippel (2016)). This process has accelerated since 2002, following the recommendations of the European Union to teach pupils two foreign languages from a very early age,[9] and led to an initiative of KMK to extend foreign language teaching to primary education (Quetz (2010)). As a result, from Autumn 2004 onwards a first foreign language has been gradually integrated in primary schools' curricula in Germany, mostly starting at grade 3 (Rymarczyk and Vogt (2016)), but in six federal states even at grade 1 (Sambanis (2016); Eurydice (2017)). Although the participants in our samples were not affected by the 2004 reform process,[10] some of them may have started to learn English (or French) in primary school as a result of *ad hoc* language policies and initiatives in certain states undertaken before 2004. Indeed, teaching English in primary schools, was already possible before 2004 (Bausch et al. (2016)), but in practice was mostly offered in pilot education projects or programmes available in special - e.g., bilingual - schools (Eurydice (2001), see also Table A.1 in the Appendix).

To summarize the development of German foreign language education policy, we can conclude that children who attended school in the former GDR before 1990 have certainly studied Russian as a first language, but could also learn English or French (mostly from grade 7) depending on their level of educational attainment and personal interest. In West Germany, the importance of foreign language learning was emphasized in official decisions beginning in the 1950s, and from 1969 onwards all students had to learn at least one foreign language (mostly English) over the course of their secondary education. As a result, most respondents in our two datasets have learnt at least some English. However, even among those with mandatory (English) language education in school (from 1969 onwards in West Germany and from 1992 onwards in East Germany) the intensity of language learning (measured in terms of the number of years of teaching) is characterized by significant heterogeneity. In fact, not necessarily all pupils within a certain federal state and school track started to learn English at the same grade. Besides areas near the border with France that taught French first, in certain academic high schools (*Gymnasium*), children may start to study Latin at grade 5,[11] and begin to learn English only later, typically at grade 7 (Christ (2016); Thaler (2017)).[12] Thus, the exposure to English lessons in school can, for example, be four (respectively, six) years for children starting at grade 7 (respectively, 5) and completing education at grade 10, and seven (respectively, nine) years for children starting to learn English at grade 7 (respectively, 5) and completing upper secondary education at grade 13. It is worth recalling that this simplified pattern is derived from the general recommendations made by KMK, but the speed and the intensity of policy implementation are determined by the federal states and by schools at the local level, and they have been subject to different constraints such as availability of teachers (Doff (2008)). For this reason, it is not possible to identify the exact number of years of formal English education for survey respondents.[13] Table A.1 in the Appendix illustrates this complex institutional framework by providing an overview of the language policies of all 16 federal states in the 1990s (after reunification) which were most relevant to the youngest cohorts in our samples.

While all these particularities do not allow us to evaluate the effect of a specific reform in Germany, the gradual introduction of language policy changes over time, both across and within federal states and school types, provides exogenous variation in individuals' exposure to foreign language education that we exploit in our identification strategy (see Section 6).

3. Related work

A review of the literature published in 2016 identified more than 150 papers on the relationship between language skills and labor market outcomes.[14] In the remainder of this paper, we focus on papers dealing with the returns to *foreign* language skills, and on those contributions that address the theoretical or methodological issues which are relevant to this article.

The empirical literature on language-based earning differentials can be divided into two groups. Contributions in the first group address the question of individuals' labor market outcomes resulting from knowledge of the official (*de facto* or *de jure*) language of the country or region where they reside. This typically refers to immigrants speaking the local dominant language as a second language, e.g., German in Germany or English in the United States.[15] In general, the results reveal that proficiency in the official language of the host country has a positive effect on migrants' labor income in a range of 5 to 35 percent with respect to someone without language skills. A partially similar situation is that of ethnic minorities made up of a mix between the autochthonous population and descendants of immigrants living in an officially monolingual country (e.g., Russian-speakers in Latvia and Estonia).[16] Proficiency in the official language of the state brings a wage premium for the members of the minority, although not in all economic sectors. A related set of studies examines the labor market outcomes related to the knowledge of a minority language that is official in a region where the majority language is spoken by virtually all members of the minority language community (e.g., English in Wales, and Spanish in Catalonia or in the autonomous community of the Basque Country).[17] In general, bilingualism in the local minority language is associated with a positive wage premium.

What distinguishes these contributions from the second group of papers dealing with foreign language skills is the sociolinguistic context. Immigrants and speakers of an autochthonous minority languages live in contexts characterized by daily contact between linguistic groups, which can be unproblematic or not (see Chiswick and Miller (2015) and Beacco et al. (2017) for a discussion). They may suffer from social exclusion or discrimination in the labor market, e.g., because of their ethnicity, limited language skills in the dominant language or even their accent (Chiswick and Miller (2018)). The situation is less complex if

[9] This is the so-called *mother tongue plus two* formula, see the Presidency Conclusions of the Barcelona European Council meeting of 15-16 March 2002.

[10] Even the youngest individuals in the 2016 sample - born in 1991 - had already completed primary education by then.

[11] In Germany, Latin is considered a foreign language.

[12] However, this kind of school has become less popular recently. In 2015/2016, the number of students studying Latin was approximatively 642,000 of which, however, only 15,370 (2.4 percent) started at grade 5 (Schibel (2017): 95). It is more common to start learning Latin at grade 7 or later.

[13] Moreover our sample does not provide information on the federal state of school attendance for the SOEP-IS 2016 participants.

[14] See Gazzola et al. (2016). Other general or sectorial literature reviews are provided in Ridala (2020); Adserá and Pytliková (2016); Chiswick and Miller (2015); Isphording (2015); and Chiswick and Miller (2007).

[15] This branch of the literature contains evidence for Spanish in Spain (Budría et al. (2019)), English in the United States (Bleakley and Chin (2004); Bleakley and Chin (2010); Isphording and Sinning (2012)) or in the United Kingdom (Leslie and Lindley (2001); Dustmann and Fabbri (2003); Miranda and Zhu (2013)), German in Germany (Dustmann and van Soest (2001); Dustmann and Van Soest (2002); Aldashev et al. (2009)), Hebrew in Israel (Chiswick and Repetto (2007)), Dutch in the Netherlands (Yao and van Ours (2015); Yao and van Ours (2019)), and standard Mandarin for internal migrants to urban areas in China (Gao and Smyth (2011)).

[16] See Toomet (2011); and Kroncke and Smith (1999).

[17] See Henley and Jones (2005) for Welsh in Wales, Borooah et al. (2009) for Irish in the Republic of Ireland and in Northern Ireland, and Cappellari and Di Paolo (2018) for Catalan.

we examine people's labor market outcomes which are associated with skills in languages that are not official (*de facto* or *de jure*) in the country or region where they reside. Typically, this is the case of both foreign languages and second languages, i.e., languages that are official at the national level but not at the regional level, following the linguistic territoriality principle (e.g., English in Quebec, or French in Flanders). In general, in these cases we deal with native speakers of the official language who add new skills to their linguistic repertoire. The problem of ethnic discrimination, therefore, is often irrelevant because speakers belong to the dominant majority. In addition, knowledge of another language should not detract from earnings as individuals can, in principle, simply hide this information from the labor market (Chiswick and Miller (2018)). For purposes of simplicity, we shall use the term "foreign languages" to include "second languages" for the rest of this article.[18]

3.1. Mechanisms behind returns to language skills

There are two alternative albeit not mutually exclusive theoretical explanations for foreign language-related earning differentials. The first interpretation refers to the standard theory of human capital. Foreign language skills are rewarded because they increase an individual's productivity. There are different factors that influence the language used in economic processes, that is, the languages spoken by customers in sales markets, the language of production factors (particularly the workforce but also technology), the language contents of goods and services produced, and the language of business owners and senior managers (Grin et al. (2010): 78). Foreign language skills can be used in these processes thereby contributing to the creation of added value.[19] Individuals' earnings differentials, therefore, reflect the underlying processes of added value creation (Grin et al. (2010)).

A competing explanation is the theory of signalling and the related theory of screening.[20] In this interpretation, foreign language skills are used to address a problem of information asymmetry between employers and employees. They are rewarded not because they increase an individual's productivity, but because they are interpreted by employers as an indicator or signal of an individual's aptitudes such as adaptability and openness to other cultures that are difficult and costly to evaluate in the hiring process. According to this theory, foreign language skills can be used to screen and rank-order job candidates because they reveal unobservable traits or innate abilities, which give them access to more attractive jobs with higher pay. Although most of the empirical contributions refer directly or indirectly to both theories, empirical evidence suggests that signaling alone is not likely to explain observed wage differentials (see e.g., Grin et al. (2010) and discussion below).

3.2. Existing empirical evidence

Depending on the available data, empirical papers dealing with returns to foreign language skills are comparable only to a certain extent. While some contributions deal with a knowledge of foreign languages in general, others focus on the use of such skills in the workplace. Further, the quality of data used varies considerably across studies (see Section 5), where data on the level of proficiency are not always available. Despite these limitations, some general trends can be identified.

In the Unites States evidence is mixed. Earning differentials associated with skills in languages other than English, if any exist, are modest (Saiz and Zoido (2005); Fry and Lowell (2003)), but results vary considerably depending on the language examined (Chiswick and Miller (2018)). Evidence from Canada, which is officially bilingual at the federal level, shows that knowledge of English and its frequent use in the workplace is rewarded in the officially French monolingual province of Quebec (Christofides and Swidinsky (2010)),[21] while in the Rest-of-Canada (RoC), where English is dominant, knowledge of French (but not its frequent use) is rewarded. In developing countries, there are positive wage premia associated with a knowledge of former colonial languages such as English and French.[22]

Results for European countries reveal some common observations. First, earning differentials associated with language skills are sizable, between 6 and 50 percent, depending on the country, the language considered, and a person's level of proficiency. Second, very good language skills are rewarded better than basic language knowledge. Third, English has an undisputed economic value in the European labor market, but it is not the only linguistic asset worth investing in; in some countries, skills in other languages may be rewarded more than skills in English, showing that returns to foreign language skills are shaped by supply and demand in the particular country under examination.

Some examples illustrate these general conclusions. Ginsburgh and Prieto (2011) explore the earning differentials associated with foreign language knowledge (without specifying the level of proficiency) and its use in the workplace for men in a cross-country study including Austria, Denmark, Finland, France, Germany, Greece, Italy, Portugal, and Spain.[23] They show that the returns to English skills are positive in all these countries, ranging between 11 percent in Austria and 39 percent in Spain. The returns to knowledge of French and German are positive in some southern European countries, and they are usually larger than those associated with English. This reflects the relative scarcity of skills in French and German compared with English skills in the countries where these two languages are used in business transactions. In the case of Germany, the authors estimate a 26 percent wage differential for individuals using English at the workplace. Another cross-country study by Williams (2011) comes to conclusions similar to those of Ginsburgh and Prieto (2011), showing high earning differentials for English in all countries, and sizable returns to French and German skills in some countries.[24]

Grin (1999) estimates language-based earning differentials in Switzerland, and shows that for men wage premia resulting from good and very good skills in English, French and German as second languages range between 12 and 29 percent - depending on the linguistic region of the country. The returns to skills in German are higher than in English in the French-speaking part of the country, while in the German-speaking part of the country wage premia for skills in English are higher than those for French (see also Cattaneo and Winkelmann (2005)). Liwiński (2019) shows that in Poland the wage premium for advanced proficiency in foreign languages ranges between 32 and 11 percent, and it is higher (in decreasing order) for Spanish, French, Italian, German and English; the author explains this difference by citing the relative scarcity of ability in these three Romance languages found in the Polish economy compared with the two Germanic languages (see also Adamchik et al. (2019)). For men in Turkey, Di Paolo and Tansel (2015) observe earning differentials ranging between 20 and 8 percent for a knowledge of Russian, English, French

[18] It is worth mentioning two papers that can be located at the intersection between the two groups of studies presented here. They deal with earning differentials associated with immigrants' foreign language skills. See Isphording (2013) for Spain and Lang and Siniver (2009) for Israel.

[19] A "language-augmented" theory of production clarifying how foreign language skills contribute to the production process and generate added value is presented in Grin et al. (2010).

[20] For a discussion of the relevance of this theory in the context of foreign languages, see Armstrong (2015), and Grin et al. (2010): 76-77).

[21] See also Nadeau (2010); Vaillancourt et al. (2007); Grenier and Nadeau (2016).

[22] See Angrist and Lavy (1997) for French in Morocco; as regards English, see Azam et al. (2013), and Chakraborty and Bakshi (2016) for India; Casale and Posel (2011), Levinsohn (2007), and Cornwell and Inder (2008) for South Africa; and Lui (2007) for Hong Kong.

[23] In a related study Ginsburgh and Prieto-Rodriguez (2013) compute returns for men and women separately.

[24] Williams' study unfortunately does not provide information on specific languages for Germany.

and German (in decreasing order). Earning differentials increase with the level of proficiency. Toomet (2011) shows that in Estonia and Latvia proficiency in English is associated with a positive earning differential for ethnic Russian men, and in Estonia also for ethnic Estonians.

The benefits accruing from the occupational use of foreign languages specifically for the German labor market have been analyzed by Stöhr (2015). He combines panel data from the German Socio-Economic Panel (SOEP) with information about language requirements at the occupational level collected by the Federal Institute for Vocational Education and Training (BIBB). Stöhr's results indicate returns to the use of fluent English skills of about 12 percent in the general population and 26 percent for immigrants, while other foreign languages bring about economic benefits only in specific occupations. Although the dataset used by the author is quite large, it does not contain information on language skills at the individual level, but relies on external data about language requirements at the occupational level. This means that one cannot completely capture individual heterogeneity in language skills, because two people working in the same job, by assumption, are supposed to have the same level of language skills. Thus, the wage differentials estimated by panel regressions account for individual fixed effects in general but refer to the typical language requirements associated with individuals' jobs instead of representing the returns to a person's actual foreign language skills. Moreover, wage differentials associated with language use only provide limited information on the returns emanating from foreign language skills, because individuals who do not use a language cannot be distinguished from individuals who do not know the language. This might result in a loss of interesting information. For example, if many people do not use their language skills and earn lower wages (e.g., due to inefficient job matching), then wage premia for language use might be higher than those from acquired language skills. While occupational language use is particularly relevant when explaining compensating wage differentials, policy makers might also be interested to know whether public language policy investments pay off at the individual level. To the best of our knowledge, existing studies on the effects of language skills in the German labor market focus on occupational language use. We aim at bridging this gap in the literature by identifying returns to language skills based on high-quality, individual-level data.

4. Data and descriptive statistics

Our analysis is based on innovative data that combine labor market outcomes, detailed information on respondents' language skills and a rich set of personal characteristics at the individual level. It offers new possibilities for estimating the range of returns to language skills in the German labor market, because it contains clear descriptors for the self-evaluation of language skills based on the Common European Framework of Reference for Languages (CEFR) of the Council of Europe, which is the standard tool to assess language skills in all European countries and beyond. This allows us to estimate not only the effect of foreign language skills on individuals' income in general, but also the relative effect of the three macro-levels of foreign language proficiency (basic, intermediate, and advanced).

Our data comes from two waves of the German Socio-Economic Panel's Innovation Sample (SOEP-IS), a representative longitudinal survey of private households in Germany (see Zweck and Glemser (2018)).[25] SOEP-IS contains questions on language skills in 2012 and 2016 where both surveys cover a subsample of the overall Innovation Sample of about 2,000 individuals. As the two samples do not overlap we cannot compare information about foreign languages from both waves longitudinally. However, the 2016 survey contains information about foreign language skills after school graduation that can be used to analyze long-term skills' development. Moreover, information about individuals' language acquisition in the 2016 sample provides a set of instruments to account for potential endogeneity bias. An overview of the data on foreign languages collected in both years is given in Table 2.

Table 2
Overview of information about language skills in SOEP-IS 2012 and 2016.

Variable	SOEP-IS 2012	SOEP-IS 2016
Language skills		
Mother tongue(s)	X	X
Foreign languages	X	X
Can-Do descriptors of language skills	5-item list	6-item list
Ordinal assessment of language skills	5-point scale	
Language skill level after finishing school		6-item list
Language use		
Language use at home	5-point scale	
Language use with friends	5-point scale	
Language use at the job	5-point scale	
Language acquisition and background		
Age when foreign language acquisition began		X
Reason for foreign language acquisition		X
Father's mother tongue		X
Mother's mother tongue		X
Father's foreign languages		X
Mother's foreign languages		X
Living abroad		X

Note: This table shows and compares the variables related to language skills contained in SOEP-IS 2012 and SOEP-IS 2016. X indicates that the variable is included.

While the 2012 wave covers language skills and language use, the 2016 survey contains questions about language skills and collects information about foreign language acquisition. There are slight differences in the precise survey design, but the operationalization of language skills is in accordance with the CEFR in both years. Respondents are asked to self-assess their language abilities based on "can-do" descriptors of their foreign language skills, that is, indicators describing specific activities that individuals are able to do in a second language. Although language competencies were assessed on a 5-point-level scale in 2012 and on a 6-point-level scale in 2016, the descriptions used in each wave can be directly related to the three macro-level CEFR categories (i.e., A, B and C).[26] Therefore, in the subsequent analysis we aggregate the 5- and 6-point-level scales to a 3-point-level scale representing skill levels A, B and C. This not only increases our observational period but also our sample size, because there is no overlap in both sample waves, i.e., the questions on language skills were answered by different people in 2012 and 2016. By using both panel waves in our analysis we can rely on a larger database and ensure that language skill effects are not driven by exceptional economic circumstances in a single survey year. To account for varying macroeconomic conditions we control for time fixed effects in all pooled sample regressions and conduct subsample estimations in Section 6.2.

4.1. Distribution of foreign language skills

As we are interested in individuals' wage differentials, in the remainder of the paper we restrict our sample to data available for the native speakers of German of working age (25-64). We deliberately focus on native German-speaking residents to avoid any kind of bias that might

[25] The German Socio-Economic Panel (SOEP) was established in 1984 at the DIW Berlin and had a sample size of about 30,000 individuals in almost 14,000 households by 2016 (see Kroh et al. (2018)). In 2011, the SOEP-IS subsample was taken off the regular SOEP to give researchers an opportunity to conduct surveys based on their own research questions.

[26] The framework defines three broad skill categories (A - Basic, B - Independent and C - Proficient) and subdivides each category into two levels (A1, A2, B1, B2, C1, C2). These correspond with the six levels of language skills in the 2016 wave. Table A.2 in the Appendix provides an overview on how the CEFR descriptors were operationalized and aggregated to the 3-point scale for SOEP-IS in 2012 and 2016.

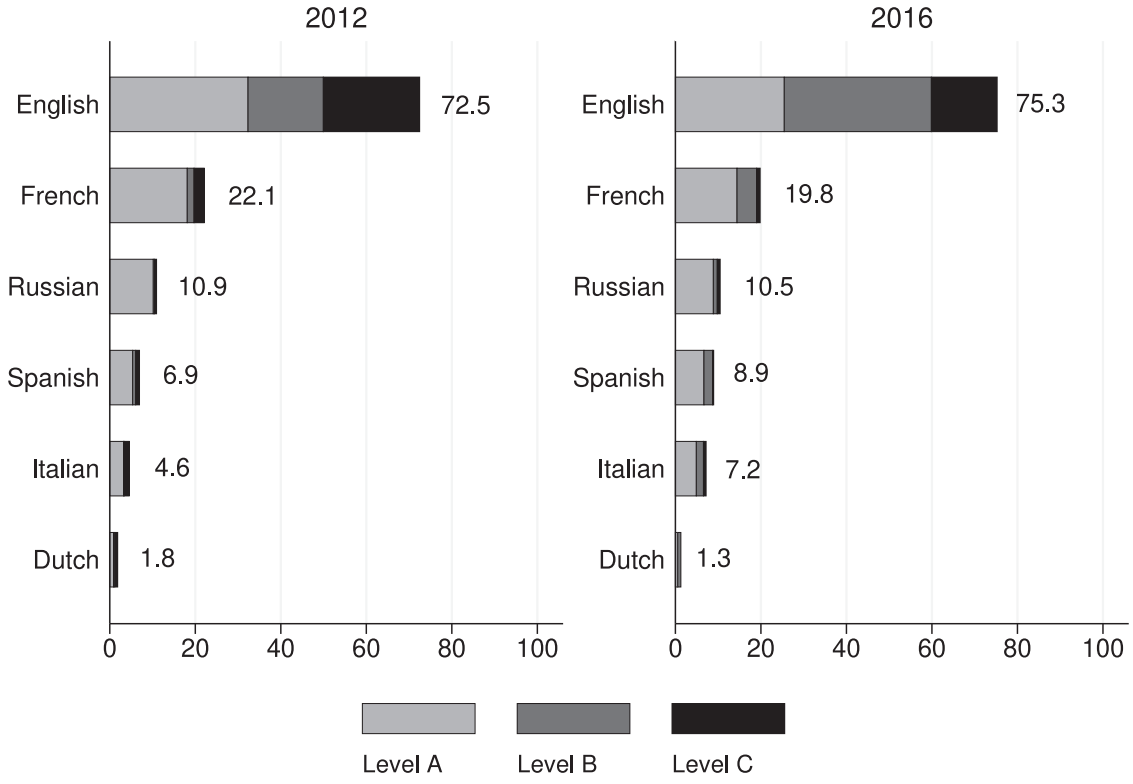

Fig. 1. Distribution of foreign language skill levels among native speakers of German in SOEP-IS 2012 and SOEP-IS 2016.
Note: This figure reports weighted shares of German native-speakers of working age (25 - 64) who declare an ability to speak one of the six most common foreign languages in Germany, by level of proficiency. The level of proficiency is defined according to the Common European Framework of Reference for Languages: A indicates "Basic user", B "Independent user", C "Proficient user". See Table A.2 in the Appendix for a mapping of language competencies into skill categories.

be due to a limited knowledge of the country's official language (see Section 3).[27] We also exclude individuals who are native English speakers, because they might receive wage premia for reasons other than pure language skills (e.g., access to professional networks abroad).

Analyzing individuals' foreign language skills in the 2012 and 2016 survey, we find that the most important foreign languages in Germany are English, French, Russian, Spanish, Italian and Dutch (see Fig. 1).[28] As in most European countries, and by virtue of language policy (see Section 2), English is by far the most popular foreign language with more than 70 percent of the working-age population knowing it. Moreover, our sample provides only little variation in skill levels for languages other than English (see Fig. 1). As the overall sample consists of less than 2,000 individuals, skill categories for some foreign languages are represented by very few individuals (e.g., advanced Dutch skills are observed for just seven people in both sample waves). The opportunities to identify significant labor market effects for these foreign languages in our data are, therefore, quite low. Consequently, in the remainder of the paper we focus on English as the primary foreign language of interest.[29]

Comparing English language skills reported in both sample waves (see Fig. A.1 in the appendix), we observe that, in 2012, the share of people reporting high and low levels of English proficiency is larger than in 2016. This is most probably a consequence of the different operationalization of the CEFR levels in the two samples' questionnaires.[30] To account for the potential consequences of these differences in skill level operationalization we control for the panel year in all our empirical specifications.

4.2. Characteristics of language skill groups

Besides information about language skills, the SOEP-IS data includes detailed information on respondents' characteristics, educational and socio-economic background as well as on labor market outcomes. Table A.3 in the Appendix provides an overview of the available data for both sample waves. Table 3 summarizes the observable characteristics of respondents by ability levels in English and shows that skill groups are characterized by different types of individuals.[31] Firstly, English ability is negatively correlated with age and labor market experience, i.e., people with high skill levels are, on average, younger than people with low or no English skills, and devoted more time to education.[32] Comparing ability levels by age group we find that improved English skills for younger generations can be observed on the extensive and intensive margin (see Fig. A.2 in the appendix). This is the result of policies promoting (earlier) foreign language learning in schools (see Section 2).

[27] The relationship between language skills and labor market outcomes for immigrants in Germany is analyzed e.g., by Aldashev et al. (2009), Dustmann and van Soest (2001), Dustmann and Van Soest (2002) and Stöhr (2015).

[28] German itself is a "foreign" language for about 10 percent of the resident population, but those individuals are not covered by our sample.

[29] Regression results for other languages did not yield any significant wage premia, but are available upon request.

[30] The 2012 survey contains one less intermediate skill category less which explains why more people report skill level A in 2012. At the same time, the Can-do descriptions for skill level C2 are more restrictive in the 2016 survey (see Appendix Table A.2) which explains why fewer people chose this category in 2016, but reported intermediate skills instead.

[31] Note that for indicator variables, mean values represent sample shares.

[32] Note that we approximate labor market experience with age - years of education - 6 because SOEP-IS does not contain complete labor market histories of individuals.

Table 3
Summary statistics for observable characteristics by language skill level (based on pooled sample of SOEP-IS 2012 and 2016).

Variable	No English		Level A		Level B		Level C	
	N	Mean	N	Mean	N	Mean	N	Mean
Individual Characteristics								
Survey year 2012	517	60.2	619	63.4	523	41.1	328	66.6
Age	517	50.9	619	46.8	523	43.9	328	41.2
Female	517	54.0	619	53.1	523	54.3	328	42.6
Married	517	57.5	619	58.2	523	53.8	328	51.2
Lived in East Germany before 1989	517	44.9	619	30.4	523	13.6	328	11.7
Has children	517	23.3	619	33.8	523	34.0	328	36.5
Labor market experience	516	34.0	619	28.6	523	24.4	328	19.9
Share of correct answers in vocabulary test	517	78.2	619	84.0	523	86.5	328	88.1
Share of correct answers in symbol-digit test	517	44.1	619	51.2	523	56.5	328	59.9
Importance of success in life (4-point scale)	517	2.8	619	2.8	523	2.8	328	2.9
Conscientiousness (7-point scale)	517	5.9	619	5.9	523	5.7	328	5.7
Information about Educational Attainment								
General secondary school (Hauptschule)	517	51.1	619	25.9	523	10.0	328	3.0
Intermediate school degree (Realschule & POS)	517	37.6	619	50.9	523	37.4	328	20.8
Vocational high school (Fachhochschulreife)	517	2.6	619	5.5	523	12.3	328	11.9
College entrance exam (Abitur & EOS)	517	2.1	619	15.3	523	36.3	328	61.2
Other degree	517	4.7	619	1.6	523	3.8	328	2.7
Dropout, no school certificate	517	1.8	619	0.8	523	0.2	328	0.0
Currently in school	517	0.1	619	0.0	523	0.0	328	0.3
Vocational degree	517	86.3	619	85.3	523	74.9	328	52.7
University degree	517	3.2	619	15.7	523	30.0	328	62.4
Information about other Foreign Language Skills								
Has basic skills in other languages	517	9.3	619	31.6	523	40.2	328	57.2
Has intermediate skills in other languages	517	2.1	619	2.5	523	9.3	328	22.5
Has advanced skills in other languages	517	1.8	619	2.0	523	2.4	328	15.9
Information about Labor Market Outcomes								
Full-time employment	517	41.4	619	53.8	523	55.9	328	65.0
Part-time employment	517	16.2	619	19.0	523	20.8	328	16.8
Marginal / irregular employment	517	7.6	619	5.5	523	5.9	328	5.1
Vocational training / sheltered work	517	0.8	619	0.0	523	1.0	328	0.5
Not employed	517	34.0	619	21.7	523	16.4	328	12.6
Gross hourly wage	311	14.4	441	17.8	410	21.2	254	26.8
Gross hourly wage (incl. imputed values)	329	14.4	479	18.2	433	21.1	281	28.1
Information about Occupations (ISCO-88 major groups)								
Armed forces	329	0.0	479	0.3	433	0.1	281	0.6
Legislators, senior officials and managers	329	5.0	479	4.2	433	5.2	281	9.6
Professionals	329	2.0	479	12.3	433	23.1	281	45.4
Technicians and associate professionals	329	19.3	479	28.3	433	37.0	281	21.0
Clerks	329	10.5	479	11.7	433	10.8	281	7.0
Service workers and shop and market sales workers	329	18.5	479	12.0	433	8.7	281	5.5
Skilled agricultural and fishery workers	329	3.4	479	0.6	433	2.0	281	0.0
Craft and related trades' workers	329	15.2	479	12.3	433	6.6	281	4.5
Plant and machine operators and assemblers	329	12.2	479	11.0	433	2.5	281	2.3
Elementary occupations	329	13.0	479	7.0	433	4.1	281	1.8
Occupation missing	329	0.9	479	0.2	433	0.0	281	2.4

Note: The table summarizes total number of observations and weighted mean values for individuals' observable characteristics by their level of English skills in a pooled sample of SOEP-IS 2012 and SOEP-IS 2016. Proficiency levels A, B, C refer to the Common European Framework of Reference for Languages (see Table A.2 in the Appendix). Mean values of indicator variables represent sample shares. Example: The first row in Column (1) indicates that 60.2 percent of individuals without English skills were observed in SOEP-IS 2012. ISCO-88 refers to the International Standard Classification of Occupations of 1988.

The second interesting observation is that only an underproportionally low share of individuals with Level C skills in English (43 percent) is female (see Table A.3 in the Appendix for comparison). This is surprising because the educational literature shows that - if gender-related skill differences in English language skills are found - women usually have higher ability levels than men (see e.g., Keller et al. (2020) and Hartig and Jude (2008)). However, these gender-differences do not necessarily imply that English skills of women are indeed worse than those of men, but it could also indicate a gender-related underreporting e.g., due to lower levels of self-confidence among female respondents. We will discuss the potential problem of misclassification further in the next section, and we control for gender effects in our regressions and investigate heterogenous returns to language skills for male and female subsamples in Section 6.2.

The underproportionally low shares of people who lived in East Germany before 1989 among the individuals with intermediate and advanced English skills (see Table A.3 in the Appendix for a comparision) can be explained by the differences in language policy before reunification (see Section 2). We account for the effects of these different regional backgrounds in all our regressions and conduct subsample estimations for East and West Germans in Section 6.2 as well. Finally, differences in educational attainment across English ability levels are to be expected because language skills are mainly transmitted via schooling (see Section 2).

5. Methodological issues and identification strategy

The methodological problems of estimating the returns to language skills are similar to problems associated with identifying the returns accrued from other kinds of human capital and education in general: Whenever the assumption of the conditional exogeneity of language skills is violated, parameter estimates cannot be interpreted as causal effects. Some studies exploit exogenous sources of variation in respondents' language skills resulting from specific school reforms.[33] These

[33] See Angrist and Lavy (1997) for Morocco; and Chakraborty and Bakshi (2016) for the Indian State of West Bengal; Cappellari and Di Paolo (2018) for

reforms typically affect either the language of instruction or the duration of foreign language teaching in the curriculum. However, most existing empirical studies cannot count on such natural experiments. To justify the use of OLS regression techniques in a non-experimental setting potential sources of endogeneity must be considered thoroughly. With respect to our setup this implies that: (1) The regression model does not neglect variables that are simultaneously correlated with language skills and wages, (2) there is no systematic measurement error in the language skill variable, and (3) individuals' labor market situation does not systematically influence their language knowledge. We address these identifying assumptions in turn.

5.1. Omitted variable bias

The first threat to causality is unobserved individual heterogeneity affecting both individuals' language skills and earnings, e.g., innate ability or motivation. If we omit such characteristics from the regression, we probably overestimate the effects of language skills (see Borjas (1994)). In the empirical literature there are different examples of regressors used as proxies to control for individuals' hidden ability or unobserved characteristics, i.e., high school grades (Azam et al. (2013)), father's education or parental education (Di Paolo and Tansel (2015)), positive attitudes towards biculturalism (Duncan and Mavisakalyan (2015)), as well as the results of college admission tests and the quality of the college attended by respondents (Saiz and Zoido (2005)).[34]

To account for as many sources of individual heterogeneity our regressions contain a rich set of control variables. First, we control for demographic characteristics like age, gender, marital and family status, labor market experience and whether a person lived in East or West Germany before 1989. Second, we account for individuals' socio-economic background by controlling for parental education as well as the parents' occupational class when respondents were 15 years old (both for mother and father).[35] To account for the differences in individual qualification and aspiration related to labor market outcomes and language learning our regression model includes control variables for formal education as well as proxy variables for cognitive skills and personal motivation.

Formal education is captured by indicator variables for educational attainment in school as well as for vocational and college education (see categories in Table 3 and Table A.3 in the Appendix). As a proxy for individuals' cognitive skills we use information from the Cognitive Achievement Potentials questionnaire that was part of the SOEP-IS panel survey in 2014 and 2018. It consists of a Multiple-choice Vocabulary Intelligence Test and a Symbol-Digit Test. The vocabulary test is designed to measure education- and experience-related cognitive pragmatics (Richter et al. (2017): 9). It is related to an individual's knowledge and asks respondents to identify a correct word among a list of five words. The test consists of 36 word formations where respondents can take as much time to solve the task as they want.[36] The first cognitive skill measure derived from this test corresponds to the share of correct answers which can take values between 0 and 1 - depending on how many of the 36 word formations were correctly identified. Details about the test are given in SOEP (2016).

The Symbol-Digit Test measures differences in cognitive performance, like "speed, accuracy, processing capacity, coordination, and inhabitation of basic cognitive processes" (Richter et al. (2017): 7). These information processing skills are mainly genetically determined. To differentiate these capacities across respondents, the Symbol-Digit Test asks survey participants to match symbols to certain numbers within a limited amount of time.[37] The share of correct answers within the maximum amount of time (90 seconds) relative to other survey participants in this matching test represents our second cognitive competency measure (also bounded between 0 and 1).[38]

Fig. 2 shows the distribution of individuals' performance in these tests. The distribution of correct answers in the vocabulary test is shifted to the right, but the distribution of correct answers to the Symbol-Digit Test comes close to a normal distribution. This indicates that obtaining a relative top score in the word test is easier than achieving a relatively high position in the time-restricted Symbol-Digit Test. Although these test results cannot capture all kinds of individual cognitive abilities, they impose some differentiation across individuals with respect to speed and the correctness of answers to a challenging cognitive task. This, in turn, can be considered as a proxy variable for innate ability influencing language learning and labor market outcomes at the same time.[39]

To account for individual differences in personal motivation and ambition we include controls for conscientiousness and success orientation. Conscientiousness is part of the Big 5 personality inventory and refers to personality traits like achievement striving and self-discipline (see Costa and McCrae (1992)). Individuals with high conscientiousness can be described as being productive and responsible and having a high aspiration level. The items that are used to measure conscientiousness in the SOEP-IS survey ask individuals to self-assess (1) if they are lazy, (2) how thorough they are in their work and (3) how efficient they work (Richter et al. (2017)).

Catalonia. Exogenous variation induced by school reforms is also exploited to study the effect of teaching in pupils' mother tongue (instead of ex-colonial languages) on human capital formation in Ethiopia (Ramachandran (2017)), or on the ability to learn English as a foreign language in South Africa (Taylor and von Fintel (2016)).

[34] Another approach to address heterogeneity along the earnings distribution is to run quantile regressions (Chiswick and Miller (2018); Isphording (2013) and Toomet (2011)). Ginsburgh and Prieto (2011) use the longitudinal information to instrument language use at the job with its lagged value and conduct IV quantile regressions to account for endogeneity and effect heterogeneity. Due to data limitations, however, this approach is not applicable in this article. An alternative approach to eliminate time invariant unobserved individual heterogeneity used in Stöhr (2015) and Williams (2011) is fixed effects panel regression. However, this technique is not applicable with the SOEP-IS data since we only observe language skills once per individual.

[35] We use this retrospective measure because many individuals' parents are already retired at the time of survey participation. For some parents for which retrospective information is not available, we can use parents' current occupational class as a proxy and for the remaining missing observations in the parental background variables we added a missing category.

[36] The introductory text to the Multiple-choice Vocabulary Intelligence Test in SOEP-IS was: *At the following pages you will see on each screen five word formations. In each row is always just one real German word which you should know. If you find it, please point on it; You have to touch the screen at the appropriate area. If you do not know any of the words at a page, please guess. Work at your own pace; you have as much time as you want. Should the participation in this test be impossible for important reasons (e.g. language problems), you can stop this test here.*

[37] The introductory text to the Symbol-Digit Test in SOEP-IS was: *Let us now turn to another subject. We have prepared a small test for you called the "Symbols and Numbers-Test". In this task, each number from 1 to 9 is associated with a specific symbol (see top bar). The following task is to enter the correct numbers for each character as soon as possible. You can practice this task first.*

[38] We are aware that research shows that bilingualism in some circumstances can have a positive effect on individuals' cognitive skills (Baker and Wright (2021) and Riehl (2022)). This effect, however, is usually pronounced for "balanced bilinguals", that is, persons (typically simultaneous bilingual children) born and raised in a bilingual and bicultural environment. Respondents in our sample, by contrast, are people who learn foreign languages in a formal mainstreaming educational context, and live in an environment that is largely monolingual.

[39] Unfortunately, these skill measures are not available to all individuals in our sample. Thus, controlling for this source of unobserved cognitive differences comes at the cost of a reduced sample size. To check that omitting observations without the cognitive skill measure does not affect our results we also ran our empirical analysis on an extended sample that includes imputed values for both cognitive skill measures. The results for the imputed data analysis are omitted here for brevity, but are available upon request.

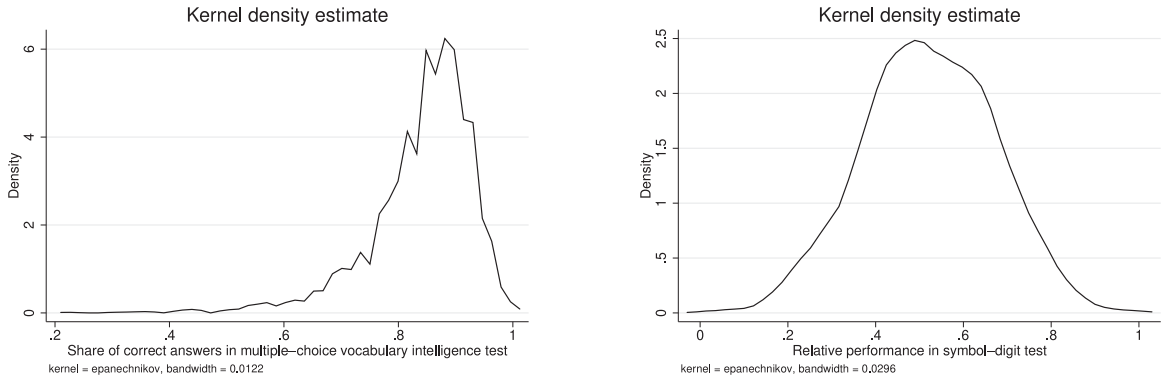

Fig. 2. Distribution of individuals' test results for Multiple-choice Vocabulary Intelligence Test and Symbol-Digit Test.
Note: The figure shows the distribution of the share of correct answers to the Multiple-choice Vocabulary Intelligence Test (left) and the distribution of individuals' correct answers within 90 seconds relative to the best performance (i.e., highest number of correct answers within 90 seconds) in the Symbol-Digit Test (right) in a pooled sample of observations from SOEP-IS 2012 and SOEP-IS 2016.

Our conscientiousness variable represents an average value of those items that were measured on a 7-point scale. Another important determinant of individuals' motivation, both to learn languages and to obtain high wages, is success orientation. In SOEP-IS this specific life goal is operationalized with four items: (1) Being able to afford to buy things for myself, (2) Being fulfilled, (3) Being successful in my career, and (4) Seeing the world and/or traveling extensively. Individuals evaluate the importance of each of these items on a 4-point scale. From these self-assessments we derive an average value of success orientation that we use as a proxy for individual ambition. Moreover, we want to rule out the possibility that our coefficient of interest only captures a general innate ability to learn second languages that merely serves as a signal on the labor market used by firms to screen job applicants. To distinguish the productive value of English language skills from a positive ability signal associated with knowing foreign languages in general, regressions also include three indicator variables that reflect whether individuals speak any other foreign language at a basic, intermediate or advanced level.[40] This approach is inspired by a study by Lang and Siniver (2009) on the returns to language skills in English among Russian-speaking immigrants in Israel. They argue that the ability to learn Hebrew and the ability to learn English are similarly correlated with the unobserved ability to learn other skills. Thus, the skill that, conditional on education, is most plausibly correlated with a knowledge of one second language is a knowledge of another second language. Therefore, the robustness of the results with respect to the inclusion of other language skill variables is a requirement to argue for a productive effect of English skills on the labor market rather than a pure signaling value.[41]

After controlling for all these sources of individual heterogeneity there is little room for unobserved characteristics that are correlated with language skills and economic outcomes at the same time. To check the sensitivity of our estimates with respect to unobserved heterogeneity, in Section 6.1 we apply the procedure proposed by Oster (2019).

5.2. Measurement error

The second source of bias is related to misclassification error stemming from the self-evaluation of language skills on imprecise scales of competence. Very often data on language skills contained in the census or large scale surveys are imprecise because the level of language skills is self-reported by respondents using vague descriptors such as "not well", "well" or "very well" (see examples in Fabo et al. (2017), Fry and Lowell (2003); Ginsburgh and Prieto (2011); Toomet (2011)), or ordinal values related to school grades such as 1 to 6 (Liwiński (2019)), and Likert-scale points (Wang et al. (2017)). In some cases, e.g., Saiz and Zoido (2005), the dataset contains only a dichotomous question such as "Do you have conversational knowledge of languages other than English?". Both Dustmann and van Soest (2001) and Bleakley and Chin (2004) find that the bias induced by measurement error is quantitatively more important than the bias due to unobserved heterogeneity. Dustmann and Van Soest (2002) address the problem of measurement error by using time-adjusted averages and lags of self-reported language proficiency as instruments for language skills. They conclude that estimates from plain OLS regressions are severely downward biased.

Misclassification error, however, is likely to be less severe when language skills are defined through better descriptors. Language skills refer to the specific concepts of productive skills (speaking and writing) and receptive skills (listening and reading). They need to be distinguished from communication skills in general, i.e., social interaction skills (Baker and Wright (2021). While one individual can have limited language proficiency but communicate effectively another one might have good linguistic skills but underdeveloped social interaction skills and might be unsuccessful in communicating with colleagues in the workplace. The ideal way to measure foreign language skills is through actual tests in the four core skills, but this is usually not feasible in a survey. The best approximation to tests, however, are self-evaluations based on clear "can-do" descriptors of specific activities that an individual is able to do in a foreign language (see Ross (1998) and Baker and Wright (2021)).[42] This approach is implemented in the CEFR. Using items derived from the CEFR for individuals' self-evaluation in the 2012 and the 2016 language survey reduces the potential for errors arising from misclassification (see Table A.2 in the Appendix). It cannot completely rule out the possibility that some individuals under- or overreport their true skills, but as long as this kind of measurement error is unsystematic, i.e., independent of other (unobserved) characteristics, it only causes an attenuation bias. However, the nature of the bias is less clear if the reason for misreporting is systematic, i.e., if measurement error is related to certain individual characteristics. As Dustmann and Van Soest (2002) point out, this time-persistent measurement error can be interpreted as a particular sort of individual's unobserved heterogeneity, e.g., due to overconfidence, low self-esteem etc.

[40] Note that these indicators are not mutually exclusive. If an individual has e.g., basic skills in Russian, intermediate skills in Italian and advanced skills in Spanish, all three indicators would take a value of 1 for this individual. Just as for the indicator of proficiency in English, these indicators are also built on three CEFR skill levels (A, B and C).

[41] Similar tests are carried out in Wang et al. (2017) and Di Paolo and Tansel (2015).

[42] "Can-do" descriptors of foreign language skills are available in Grin (1999) and in Eurostat's Adult Education Survey used by Di Paolo and Tansel (2015) and Gazzola and Mazzacani (2019).

Fig. 3. Average changes in individuals' self-reported English skills over time by wage deciles (based on SOEP-IS 2016).
Note: This figure depicts the mean values and 95 percent confidence intervals for the differences in respondents' skills in English between school graduation and 2016. This information is only available in SOEP-IS 2016 (see Table 2). The graph shows that there are no significant changes for 90 percent of the wage distribution, but for the top ten percent wage earners skills improve significantly over time.

As shown in Section 4.2 a relevant dimension for misclassification might be a gender-specific measurement error induced by different levels of self-confidence among men and women. We cannot test whether measured gender differences in language skills are due to actual ability gaps or result from individual misclassification, but a simple regression of an English language indicator on gender, age and educational attainment suggests that there is no systematic difference in the probability of being able to speak English for male and female respondents of similar age and qualifications. This is in line with the fact that English language acquisition is primarily influenced by schooling (see Section 2).[43] However, when considering English language skill categories according to the CEFR-levels the same regression setup reveals a significant difference for equally aged and qualified women of 0.11 points lower English skills, on average, compared with their male counterparts. This small example indicates that, as soon as a survey instrument offers room for interpretation, gender-related differences in self-reported English skills might result from female respondents reporting lower skills compared with their male counterparts. Obviously, this rationale not only applies to gender-related misclassification but might also affect individuals with specific character traits. To account for any remaining measurement error in the CEFR-based language skill measures, in Section 6.3 we instrument differences in language proficiency with exogenous variation in learning opportunities induced by language policy.

5.3. Simultaneity

The third methodological problem refers to the possibility that individuals with higher earnings invest more resources in foreign language acquisition. This might be either because they can afford private lessons and travel abroad or because they have more opportunities to practice their skills at work. In a study on the returns to Russian and Kazak in Kazakhstan, Aldashev and Danzer (2014) address the problem of simultaneity (or reverse causality) by using the number of years an individual has spent in urban areas dominated by ethnic Kazakhs as an instrument for language skills. Bleakley and Chin (2010) and Bleakley and Chin (2004) use an instrumental variable strategy based on US immigrants' age at arrival and country of origin to identify the returns to English skills and find that the instrumental variable estimate exceeds OLS.

While simultaneity is important in contexts where foreign languages are acquired on a voluntary basis during adulthood (see Saiz and Zoido (2005)), it is less relevant when foreign language skills are acquired predominantly during childhood as a result of mandatory schooling. Especially with respect to the question of *whether* someone speaks English, problems of simultaneity seem to be negligible in our setup, because English language acquisition in Germany is primarily driven by mandatory education (see Section 2). While 85 percent of all individuals declaring a knowledge of English in the 2016 SOEP-IS report that the reason why they studied this language was obligatory lessons in school, only 7.5 percent say they were interested in English as an optional subject, and 2 percent report that they started to learn English because of job requirements (multiple answers were possible). Moreover, Fig. A.3 in the Appendix shows that the vast majority of individuals started to learn English at school age. Therefore, English knowledge in general - and compared with other foreign languages - is unlikely to depend on the current earnings or employment status of an individual.

However, when considering the returns to certain skill *levels*, simultaneity might be an issue. To evaluate the scope of this problem in our data we analyze skill level development over time along the wage distribution.[44] First, we split our wage distribution into ten quantiles. Second, we compute average skill changes within these wage deciles based on the difference between current and past English skill levels as reported by survey respondents in 2016. Last, we test if the means in skill changes are significantly different from zero for each wage quantile. Although by doing this we cannot test the hypothesis of reverse causality, if we observe systematic skill improvement or deterioration over time, we should be cautious when interpreting the coefficients of English skill categories in an OLS setup. Fig. 3 depicts the mean values for language skill changes over time and the corresponding 95 percent confidence intervals. The graph shows that there are no systematic changes for 90 percent of the wage distribution. However, for the top ten percent wage earners there is a significant improvement in skills over time. In order to address the potential endogeneity induced by simultaneity in wages and language skill levels we run additional regressions on a sample where we exclude the top ten percent of the wage distribution as a robustness check in Section 6.3. Moreover, we propose an instrumental variable

[43] In SOEP-IS 2016 85 percent of all respondents who declare an ability to speak English report that the reason was obligatory English lessons in school.

[44] Fig. A.4 in the Appendix compares past and present skill levels for SOEP-IS 2016 respondents. As shown in Table 2, SOEP-IS 2016 contains data about the self-reported level of language skills both at the end of school education and in 2016.

Table 4
Results for OLS regressions of log hourly wages on an indicator for English language knowledge (based on pooled sample).

	(1)	(2)	(3)	(4)	(5)	(6)
	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate
English indicator	0.356***	0.160***	0.146***	0.125***	0.125***	0.0784**
	(0.0342)	(0.0332)	(0.0336)	(0.0345)	(0.0343)	(0.0325)
Demographics	No	Yes	Yes	Yes	Yes	Yes
Education	No	Yes	Yes	Yes	Yes	Yes
Time	No	Yes	Yes	Yes	Yes	Yes
Regional controls	No	Yes	Yes	Yes	Yes	Yes
Parents' educational attainment	No	No	Yes	Yes	Yes	Yes
Parents' occupational status	No	No	Yes	Yes	Yes	Yes
Cognitive potential	No	No	No	Yes	Yes	Yes
Success and conscientiousness	No	No	No	Yes	Yes	Yes
Other foreign languages	No	No	No	No	Yes	Yes
Occupations	No	No	No	No	No	Yes
Number of observations	1522	1522	1522	1522	1522	1514
R-squared	0.064	0.297	0.339	0.361	0.361	0.416
Adjusted R-squared	0.064	0.288	0.296	0.317	0.316	0.370

R-squared and Adjusted R-squared for multiply imputed data are computed by using Fisher's r to z transformation as suggested by Harel (2009). Robust standard errors in parentheses * p < 0:1, ** p < 0:05, *** p < 0:01.
Note: The table reports coefficients of an indicator for English language knowledge estimated in different OLS specifications. The "English indicator" refers to whether the respondent has at least some knowledge of English, without specifying the level of proficiency. The reference is an individual with no skills in English. Our preferred specification is presented in Column (5) and indicates that individuals with English knowledge earn, on average, 13 percent higher wages. Table A.4 in the Appendix reports detailed estimates of the coefficients for the regressions specified in columns (5) and (6).

approach that exploits exogenous variation in language instruction to address simultaneity in the returns to language proficiecy levels.

6. Empirical analysis

This section presents estimates for the returns to English language skills. Our estimation sample comprizes full-time, part-time and marginally employed individuals - besided unemployed individuals this only excludes individuals in sheltered work or vocational education.[45] Our outcome variable of interest is the log hourly wage rate. We derive this variable by dividing gross wages by the hours of work reported in SOEP-IS. For 106 individuals we do not observe actual wages, but have to rely on the multiply imputed data that is provided by DIW.[46] For eight individuals we cannot compute hourly wage rates because we can neither observe nor approximate work time. In 14 cases actual or imputed wages are equal to zero which is not in line with our definition of employed individuals. To limit the bias induced by these observations we omit them from our analysis.

Throughout this section English skills are represented by: (1) an indicator for English language knowledge (any level) and (2) variables capturing levels of English proficiency. The binary indicator (English/not) gives a general idea of the role of language skills in the economy, while breaking down skill levels into categories clarifies the importance of specific levels of competence. As explained in Section 5, given our data, the indicator for English language knowledge is not likely to be endogenous. Therefore, we first specify an OLS model and conduct several robustness analyses to justify that the coefficient of the fully specified model can be interpreted as a causal effect. To test the robustness of the positive returns to language skills across different demographic groups, we present estimates for stratified samples in Section 6.2. Finally, we focus on the returns to differences in language proficiency, and present two different instrumental variable specifications that take the potential remaining endogeneity in our CEFR-based language skill measure into account.

6.1. Returns to English language skills in general

Our regressions of log hourly wages on the indicator for English language knowledge are based on pooled cross-sectional data coming from the 2012 and 2016 SOEP-IS samples. In line with the relevant literature, the benchmark of our empirical analysis is a linear regression model of the following form:

$$Y_i = \alpha + \beta FL_i + \gamma X_i + \omega_{si} + \tau_i + \epsilon_i, \quad (1)$$

where Y_i denotes individual i's log hourly wage rate. In this subsection FL_i represents an indicator for English knowledge in general and β represents the corresponding parameter of interest. X_i contains a set of individual specific covariates[47] and regional controls characterising the local labor market in the district in which the individual lives (i.e., local unemployment rate, labor market tightness and local GDP per capita)[48]. ω_{si} denotes the schooling effects for different categories of educational attainment and ϵ_i captures an error term. When using pooled data for both sample waves we account for time-fixed effects by including an indicator for the year in which individuals participated in the survey denoted by τ_i. In some specifications we additionally control for occupational groups to acknowledge the heterogenous nature of wage premia for language skills with respect to different job characteristics.

Table 4 summarizes the estimated coefficients on the indicator for English language skills where control variables are sequentially added to the regression model. Column (1) presents the raw effect of language skills in a model without any other regressors. The coefficient indicates that people with English language skills earn, on average, 43 percent higher wages than those who do not speak English.[49] From Column (2) we can infer that more than half of this raw effect can be explained by differences in personal characteristics and educational background.

[45] We chose this broad group of labor market participants because the underlying treatment (English language education) also refers to a universal population of individuals and we are interested in the overall effect of language education policy on all parts of the population.

[46] See descriptive statistics in Table 3 and Table A.3 in the Appendix. Details on the imputation procedure are decribed in SOEP-IS Group (2018).

[47] These include age, experience and experience squared, gender, marital status, an indicator for having children, an indicator for living in East Germany before 1989, as well as parental education and occupational status as proxy variables for socio-economic background. Moreover, X_i contains cognitive skill indicators derived from the Vocabulary and Symbol-Digit Tests, measures of conscientiousness and success orientation to account for individuals' motivation and personal ambition as well as controls for skills in other foreign languages.

[48] This information at the district level (*Kreisebene*) was collected from the INKAR database and merged to SOEP-IS data at the household level by DIW.

[49] To obtain estimates of the exact percent change in the outcome variable for a one unit increase in the variable of interest (and for having English skills vs. not having English skills, respectively) we use the formula $\%\Delta y = e^{\hat{\beta}} - 1$.

Further controlling for parental background in Column (3) reduces the wage differential to 16 percent. When we additionally account for individuals' cognitive capacity and differences in personal motivation and ambition individuals with English skills obtain 13 percent higher wages, on average (see Column (4)).[50] The language skill effect remains stable when adding indicators for skills in any other foreign language to our model (see Column (5)). This indicates that the estimate is unlikely to capture unobserved differences in the ability to learn foreign languages in general that might serve as a signal to employers. In addition to the control variables mentioned above, in Column (6) we show the language skill coefficient from an additional regression where we control for occupational groups.[51] Including occupations as control variables reduces the size of the returns to English skills to 8 percent, because part of the respondents' variation in wages is (of course) explained by occupational differences. However, as already pointed out by Ginsburgh and Prieto-Rodriguez (2013) and Isphording (2013), using occupations as control variables likely underestimates causal language effects because some occupations use language skills more intensively than others and foreign language skills are prerequisites for certain (well-paid) jobs. In other words, individuals would not be able to do some jobs without having English skills. Therefore, occupations cannot be considered as independent variables and controlling for them might be misleading.[52] Although we clearly prefer specification number (5) containing only predetermined variables, we include occupational controls in some of our regressions to account for the heterogenous nature of wage differentials associated with foreign language skills in different occupational contexts.

To interpret this 13 percent wage differential as a causal effect of language skills we have to be sure that it is not subject to any remaining source of endogeneity. In Section 5 we discussed why simultaneity and measurement error are negligible with respect to the language indicator. Thus, any other sources of endogeneity could only be related to omitted variable bias. To investigate the sensitivity of our estimates with respect to unobserved heterogeneity, we apply the procedure suggested by Oster (2019).

$$\delta = \left(\frac{\widetilde{\beta} - \beta}{\mathring{\beta} - \widetilde{\beta}}\right)\left(\frac{\widetilde{R} - \mathring{R}}{R^{max} - \widetilde{R}}\right) \tag{2}$$

Based on Equation 2 we compute the statistic δ that reflects the relative importance of observable and unobservable characteristics for the observed effet to vanish. We plug in the values from Table 4 where $\mathring{\beta}$ and $\mathring{R}$ refer to coefficient and R^2 estimates in the uncontrolled regression (Column (1)) and $\widetilde{\beta}$ and $\widetilde{R}$ are taken from the fully specified model (Column (5)). In accordance with the rule of thumb derived by Oster (2019) we assume that R^{max} as the upper limit for R^2 is 1.3 times as high as $\widetilde{R}$. We obtain a value of 1.5 for δ which indicates that unobservable characteristics would have to be 1.5 times as important as observable characteristics for the causal effect to vanish ($\beta = 0$). Given the rich set of control variables that accounts for various sources of individual heterogeneity and the robustness of our coefficients, it seems unlikely that there remain unobserved variables having such a strong impact on our estimates.

6.2. Results for stratified subsamples

As we have seen in Section 4.2 - and in accordance with our findings on language education history in Section 2 - people with different foreign language skill levels are characterized by certain traits, e.g., they tend to be younger than those without any knowledge of English. From a policy perspective it is therefore interesting to know if the positive effects of English skills that we find in the overall sample are robust across different socio-demographic groups. Therefore, despite the small number of observations, we rerun our prefered model specification (see Column (5) in Table 4) on a number of stratified subsamples (see Table 5).

When we stratify our sample by gender (Column (1) and (2)), we find lower returns to language skills for women in the pooled sample compared with those for men. When splitting the female sample into those who lived in East Germany before 1989 and those who lived in West Germany, we observe that the estimated returns to English skills for all women are primarily driven by the West German subgroup (Column (6) and (8)). In contrast, the returns to English skills for East and West German men are almost identical (Column (5) and (7)), but not significant for the smaller sample of East German men. The returns for all individuals who lived in East and West Germany before reunification, respectively, are quantitatively similar (Column (3) and (4)), but within the East German subsample not significant. This might be due either to a limited amount of data or suggest that, among those who were exposed to the East German education system, English language skills are indeed of minor importance for wage determination. The fact that gender differences in the East German subsamples (Column (7) and (8)) are much more pronounced than those in the West German subsamples (Column (5) and (6)) indicates that the labor market outcomes of individuals who lived in East Germany before 1989 are also affected by other circumstances (e.g., the different internal migration behaviour of men and women after reunification (Fuchs-Schündeln and Schündeln (2009))).

The differences in estimates and their significance levels for men and women as well as for individuals who were exposed to East German language education might also explain why the returns to English skills are lower in the 2012 sample compared with the 2016 sample (Column (9) and (10)) and only significant at the 15 percent confidence level. From the descriptive statistics we see that both subsamples are not completely identical with respect to their observable characteristics. The 2012 sample not only contains fewer observations and fewer people who have English skills (see Fig. 1), but also more women, more individuals who are married and have kids and more people who lived in East Germany before 1989 (see Table A.3). Moreover, the economic situation in general, and the labor market situation in particular, were less favorable in 2012 as a consequence of both the Great Recession and the European debt crisis. The combined effect of economic circumstances, sampling differences as well as the limited amount of data and the variety of control variables, could explain why some subsample estimates are not significant at the ten percent level.

This also applies when we stratify our sample by age groups (Column (11) - (14)). While the returns to English skills are positive for all cohorts, they are only significant at the ten percent level for individuals who are older than 44. Besides the small sample effect, this probably also reflects changes in language education policy over the last decades (see Section 2). From Fig. A.2 we know that only a small share of individuals among younger cohorts have no English skills. Therefore, wage differentiation is much less likely to be driven by the fact that someone speaks English in general, but rather by the quality of their English skills. By contrast, within the older cohorts in which 30 to 40 percent of individuals do not have English skills, the returns to any level of English skills are much more likely to be realized.

We should not over-interpret estimates in Table 5, because they are only represented by a (very) limited amount of observations. However, the fact that we obtain positive and sizable estimates for almost all stratifications is an important check for the robustness of the estimated average return to English skills in the previous subsection. Nevertheless, stratified estimates also indicate that the degree to which returns to foreign language skills can be materialized is not identical for all groups of individuals. However, investigating the driving forces behind these

[50] To test the robustness of our estimates with respect to alternative proxy variables for individual ability we ran regressions on a reduced sample of respondents for whom we could access their last maths and German grades in school. When controlling for school grades instead of cognitive ability test results the returns to English skills are even slightly larger (see Table A.5 in the Appendix).

[51] Occupational groups are categorized according to the ISCO-88 classification (see Table 3 and Table A.3 in the Appendix). Note: For eight individuals occupational information is missing.

[52] See also Angrist and Pischke (2014) for a discussion of this issue.

Table 5
Results for OLS regressions of log hourly wages on an indicator for English language knowledge over stratified samples (based on pooled sample).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	Pooled Males	Pooled Females	Pooled West	Pooled East	Males West	Females West	Males East	Females East	2012 subsample	2016 subsample	Age 25-34	Age 35-44	Age 45-54	Age 55-64
English indicator	0.156***	0.0968*	0.0965**	0.0786	0.114**	0.109*	0.113	0.0292	0.0869	0.131***	0.185	0.104	0.112**	0.162**
	(0.0469)	(0.0512)	(0.0432)	(0.0621)	(0.0577)	(0.0654)	(0.108)	(0.113)	(0.0578)	(0.0430)	(0.115)	(0.0911)	(0.0546)	(0.0758)
Demographics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parents' educational attainment	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Parents' occupational status	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Cognitive potential	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Success and conscientiousness	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Other foreign languages	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	767	755	1165	357	605	560	162	195	655	867	300	307	526	389
R-squared	0.442	0.315	0.360	0.454	0.406	0.327	0.663	0.481	0.433	0.371	0.485	0.549	0.449	0.429
Adjusted R-squared	0.364	0.219	0.302	0.298	0.300	0.201	0.423	0.181	0.338	0.301	0.274	0.381	0.343	0.283

R-squared and Adjusted R-squared for multiply imputed data are computed by using Fisher's r to z transformation as suggested by Harel (2009). Robust standard errors in parentheses: * $p < 0:1$, ** $p < 0:05$, *** $p < 0:01$.
Note: The table reports coefficient estimates from OLS regressions of log hourly wages on an indicator for English language knowledge based on SOEP-IS 2016 and 2012 data. The set of regressors is the same as in Column (5) in Table 4. Each column refers to one of 14 stratified samples.

differences requires much more data and thus must remain subject to future research.

6.3. Returns to language proficiency levels

To extend our analysis to differences in language skill quality, in this section we specify the level of proficiency in English according to self-reported skill levels. The corresponding regression model is similar to Equation (1), but instead of a single language indicator we use two different measures for skill levels. In the first version, we include indicator variables for each ability level so that $FL_i = \sum_j^3 FL_{ji}$ where j represents the three distinct skill levels (i.e., the macro-level categories A, B, and C of the CEFR). In the second specification, we linearize the skill measure by representing FL_i in Equation (1) as an ordinal variable with $FL_i \in [0, 1, 2, 3]$, where 0 indicates a lack of skills and 3 represents Level C of the CEFR. Table 6 summarizes the estimated coefficients of the corresponding regression models. Columns (1) to (4) report β_j estimates for the three levels of language skills separately and Columns (5) to (8) report estimates for the ordinal skill variable.

The results show that the raw wage differentials in a model without any controls are 25 percent for people with basic English skills, 44 percent for intermediate skills and 81 percent for advanced skills - relative to people without English skills (see Column (1)). These estimates are significantly reduced in a model with the full set of regressors as described in Section 6.1. From Column (2) we infer that basic skills are associated with a 13 percent skill premium relative to the benchmark of having no English skills. For intermediate skills individuals earn, on average, 17 percent more than those who cannot speak English and, for advanced English skills, the wage premium is 25 percent. Each skill level coefficient estimate is significant at the 1 percent level. Again, if we do not restrict our set of regressors to predetermined variables, but also control for occupations, these coefficients reduce to 8, 10 and 16 percent, respectively (see Column (3)).

Column (5) presents the coefficient of the ordinal skill measure in an uncontrolled model (21 percent) and Column (6) depicts the estimate in a fully controlled model. Results indicate that, if we control for all available information on individual heterogeneity there remains a highly significant wage increase of 7 percent, on average, for each additional skill level. Including occupational fixed effects in the set of regressors the wage differential is still 5 percent per skill level increase (Column (7)).

We find positive earnings differentials for any level of skills, and in line with the empirical literature, Column (2) suggests the wage premium resulting from the knowledge of a foreign language increases with the level of proficiency (Liwiński (2019); Di Paolo and Tansel (2015) and Grin (1999)). While this is plausible in general, we have to make sure that skill level estimates are not biased by measurement error or reverse causality (see Section 5). Therefore, as a robustness check we ran two extra regressions (see Column (4) and (8) in Table 6) where we excluded the top ten percent wage earners from our sample (see the discussion about simultaneity in Section 5.3). For this reduced sample, coefficients on the individual skill levels are much more similar (see Column (4) vs. Column (2)) and an increase in language proficiency by one unit is only associated with an average increase in wages by 3 percent (Column (8)). Smaller estimates and no significant returns to the highest language proficiency could just be a consequence of omitting top wage earners who tend to have high English skills as well, but we take this potential threat to identification seriously, and propose an instrumental variable approach that is based on the exogenous variation in the exposure to English education in school. This information is derived from the SOEP-IS 2016 questionnaire where individuals are asked about the reasons for language acquisition and the age at which they started to learn the language (see Table 2). We use this information to develop two instrumental variables for English proficiency that refer to the context of language acquisition, and that are directly linked to education as the main determinant of foreign language skills in Germany.

The first instrument is an indicator variable for compulsory English education in school. We derive this information from individuals' answers to the question: "Why did you start to learn [English]?".[53] Since this question was only answered by individuals who declared they had English skills, we implicitly assume that people who report no ability to speak English did not have obligatory English lessons in school either.

[53] Survey respondents could select multiple answers from the following alternatives: Compulsory education in school; Interest for an optional subject in school; Requirement of my university; Requirement of my employer; Stay abroad; Dual or multilingual family; Hobby; Partner or acquaintance; Other reason, namely.

Table 6
Results for OLS regression of log hourly wages on English language skills (based on pooled sample).

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate
English level A	0.225***	0.119***	0.0798**	0.108***				
	(0.0382)	(0.0359)	(0.0339)	(0.0353)				
English level B	0.365***	0.156***	0.0969**	0.125***				
	(0.0379)	(0.0407)	(0.0387)	(0.0391)				
English level C	0.591***	0.223***	0.145***	0.0741				
	(0.0522)	(0.0572)	(0.0545)	(0.0544)				
Ordinal skill level measure					0.189***	0.0700***	0.0444***	0.0309*
					(0.0154)	(0.0176)	(0.0168)	(0.0166)
Demographics	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Education	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Time	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Regional controls	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Parents' educational attainment	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Parents' occupational status	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Cognitive potential	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Success and conscientiousness	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Other foreign languages	No	Yes	Yes	Yes	No	Yes	Yes	Yes
Occupations	No	No	Yes	No	No	No	Yes	No
Number of observations	1522	1522	1514	1371	1522	1522	1514	1371
R-squared	0.114	0.364	0.417	0.273	0.112	0.363	0.417	0.332
Adjusted R-squared	0.112	0.318	0.371	0.216	0.112	0.318	0.371	0.274

R-squared and Adjusted R-squared for multiply imputed data are computed by using Fisher's r to z transformation as suggested by Harel (2009). Robust standard errors in parentheses: * p < 0:1, ** p < 0:05, *** p < 0:01.

Note: The table summarizes the results of OLS regressions using different specifications of language proficiency. Columns (1) to (4) report coefficient estimates for three language skill indicators (one for each skill level) and Columns (5) to (8) present coefficient estimates of an ordinal skill measure, i.e., a single variable that takes values between 0 and 3 - depending on individuals' proficiency. Columns (1) and (5) present raw effects - without any controls. Columns (2) and (6) are based on the same set of regressors as Column (5) in Table 4. Columns (3) and (7) include indicators for occupational groups and Columns (4) and (8) summarize results for a sample where we exclude the top ten percent wage earners.

This assumption seems reasonable, because those who really had obligatory English lessons in school should at least have some skills, considering that English is usually taught for several years (see Section 2). This instrument exploits variation that is exogenous to individuals' choices, since in the German education system teaching of English is directly influenced by official education policies of the 16 States that make up the Federation (see Section 2). Thus, by adopting this IV, we come closer to a quasi-experimental setting.

The second instrument refers to the period of life when individuals started to learn English. Research on second language acquisition and bilingual education (e.g., Baker and Wright (2021) and Lambelet and Berthele (2014)) shows that, while there is no "critical period" for learning second languages, there are, nevertheless, advantageous periods in which to acquire language skills (i.e., early childhood and school days). People who learn a second language in childhood tend to achieve higher levels of proficiency than those who begin after childhood. This difference was found between younger and older learners, however, it refers to typical outcomes rather than potential (i.e., cognitive ability). Age differences, therefore, reflect differences in the situation and the opportunities of learning rather than in the capacity to learn. In formal classroom language learning situations, which are the predominant form of foreign language acquisition in Germany, the length of exposure (measured in terms of the number of years of second language instruction) is an important factor for learning outcomes. Students who start to learn a foreign language before the end of primary school or at the beginning of lower secondary education have the opportunity to continue studying it throughout secondary education, and to practice it later in informal contexts. Their potential exposure to language education, therefore, is longer and this improves language skills. As explained in Section 2, English has usually been the first foreign language taught in lower secondary education, and its teaching mostly continues until the end of secondary education. If English is (or was) not taught from grade 5 onwards, it is usually taught at least from grade 7 on. We set the learning age threshold at 12 (excluded) as it covers those students who did not enter grade 7 yet. We use this age as a milestone in the advantageous period for language learning that captures mostly students who started to learn English as the first foreign language. We derive a dichotomous variable that splits our sample into people who started to learn English before grade 7 ("Early learners"), and those who started later (in later years of lower secondary education, upper secondary education or in adult life). In accordance with findings in bilingual education research, we expect the first group of people to have, on average, better English skill levels compared with the second group because of their longer potential exposure to formal language learning opportunities.[54]

Table 7
Distribution of instruments over language learning determinants (based on SOEP-IS 2016).

	Obligatory learner	Early learner
General secondary school	0.49	0.32
Intermediate school	0.59	0.42
Vocational high school	0.90	0.75
College entrance exam	0.87	0.70
Age group 25 - 34	0.79	0.68
Age group 35 - 44	0.76	0.51
Age group 45 - 54	0.60	0.47
Age group 55 - 64	0.55	0.38
West Germany	0.77	0.61
East Germany	0.33	0.16

Note: The table reports the weighted shares of individuals who declared to have had obligatory English lessons in school (Column (1)) and the weighted shares of individuals who declared to have started to learn English before the age of 12 (Column (2)) by certain characteristics that affect individuals' exposure to language teaching (i.e., age cohort, educational attainment and residency in East or West Germany before reunification). See Table 3 and Table A.3 in the Appendix for details on educational categories.

[54] Note that our IV approach is related to Bleakley and Chin (2010; 2004) who use age at arrival in the United States as an instrument for immigrants' English skills. However, our instrument integrates updated findings in bilingual educa-

Table 8
First stage regressions for different instrumental variable specifications (based on SOEP-IS 2016).

	(1)	(2)	(3)	(4)
	Ordinal skill level measure	Ordinal skill level measure	Ordinal skill level measure	Ordinal skill level measure
Obligatory English learning	0.991***		0.858***	0.861***
	(0.0689)		(0.0757)	(0.0774)
Started learning before age of 12		0.619***	0.271***	0.274***
		(0.0668)	(0.0664)	(0.0687)
Demographics	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes
Parental education and occupation	Yes	Yes	Yes	Yes
Cognitive potential	Yes	Yes	Yes	Yes
Success and conscientiousness	Yes	Yes	Yes	Yes
Other foreign languages	Yes	Yes	Yes	Yes
Number of observations	867	867	867	781
Partial R-squared	0.272	0.129	0.292	0.311
F statistic	206.9	85.9	134.3	131.3
p-value for F statistic	0.000	0.000	0.000	0.000

Robust standard errors in parentheses: * p < 0:1, ** p < 0:05, *** p < 0:01.
Note: The table reports coefficients from the first stage regressions for different instrumental variable specifications based on data from SOEP-IS 2016. The variable of interest is an ordinal English proficiency measure that takes values between 0 and 3 (representing no, basic, intermediate and advanced skills, respectively). We propose two different instruments: The indicator "Obligatory English learning" refers to whether learning English was mandatory for the respondent during school years (see Column (1)). The indicator "Started learning before age of 12" (see Column (2)) reflects whether the respondent started to learn English before the age of 12 (excluded), and aims at identifing individuals who started to learn English before grade 7 (i.e., as the first foreign language, see Section 2). In Column (3) we specify the model with both instruments and in Column (4) we exclude the top ten percent wage earners from our sample.

Given our findings in Section 2 we know that both the probability to learn English in school obligatorily and the probability to start learning English early are strongly related to the main determinants of language education policy, i.e., individual's age, school track and place of residency before reunification. Table 7 shows the weighted shares of people in certain subgroups of the overall population for whom each of the two instruments is equal to one. It emphasizes that the distribution of both instruments is mainly driven by age as well as regional and educational background. People with higher educational attainment as well as younger people are much more likely to have learned English in school obligatorily and early.[55] Moreover, people who lived in East Germany before 1989 are much less likely to study English in school early or obligatorily.

To evaluate the relevance of the two instruments for English language skills Table 8 presents first stage regression results for the (potentially) endogenous ordinal skill measure.[56] Both indicators for obligatory English in school and an earlier start for language acquisition are highly correlated with self-reported English proficiency levels. Coefficients in Column (1) and (2) indicate that obligatory English learning in school increases observed skill levels, on average, by one point while early English learning is associated with 0.6 points higher skill levels, on average. In a model with both instruments each of the instruments is a significant predictor of language skills - independently of whether we consider the full sample or exclude the top ten percent of wage earners (see Column (3) and (4)). High values of the F-Statistics in all four specifications strengthen our confidence in the relevance of the proposed instruments.

The validity of our instruments relies on the assumptions that any unobserved individual characteristics that potentially influence obligatory English learning in the period of life in which English skill acquisition started either (1) is only affecting individual outcomes via the foreign language skills, or (2) is fully captured by the observable controls, or (3) is orthogonal to wages. As explained above both instruments are, in general, determined by language policy which is exogenous to individual (or parental) decision-making and thus orthogonal to an individual's wage potential. By controlling for age, East-West residency before reunification and school tracks we account for all major factors related to language policy that were identified in Section 2.[57] Theoretically, it might be that some families deliberately choose certain schools that offer specific second language education (e.g., earlier language learning). If these choices are related to the same individual characteristics that affect wages, the language skill effect we estimate might be biased. However, our set of control variables accounts for characteristics, which might drive such decisions by including educational attainment, different kinds of ability measures (also for other languages), individuals' motivation and (most importantly in this context) parental background. Therefore, even in cases where the exogeneity of public policy is undermined by the deliberate choices of families, our set of controls captures individual characteristics that influence obligatory English learning or learning ages and wages at the same time. A partial correlation analysis between both instruments and the set of predetermined variables reveals that those variables that reflect differences in language education policy (i.e., age, the place of residency before 1989 (West-East) and individuals' educational attainment) have the highest partial correlation both with respect to learning English obligatorily in school and starting to learn

tion research. Bleakley and Chin refer to the "critical period hypothesis", which suggests that younger children have a biological cognitive advantage for language learning between the age of 3 and 7 that gradually closes as they enter adolescence and adulthood. Research studies have, however, dismissed the validity of the critical period hypothesis (see also Chiswick and Miller (2008)). Modern research refer to differences in learning opportunities during advantageous periods instead of biological cognitive advantages of children.

[55] The relatively low share of obligatory and early learners in General secondary school (*Hauptschule*) can be related to the fact that teaching of English in this study track historically was introduced later than in *Gymnasium* and that the popularity of this study track decreased over time. Note also the first foreign language taught may not be English (see Section 2).

[56] Note that the sample size for the IV estimations is reduced, because information about the instruments was only collected in the 2016 SOEP-IS survey.

[57] In the SOEP-IS 2016 sample we cannot observe in which federal state individuals went to school. Recall, however, that exposure to English language education also varied within federal states (see Section 2). We use local labor market controls as a proxy for structural differences accross regions. Moreover, we tested an alternative specification where we also control for federal states of individuals' current residency as a proxy variable for past residency, but it did not change the overall effects. Results are available upon request.

Table 9
IV estimates for the returns to English language skills (based on SOEP-IS 2016).

	(1)	(2)	(3)	(4)
	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate	Log hourly wage rate
Ordinal skill level measure	0.108***	0.104*	0.107***	0.104***
	(0.0418)	(0.0598)	(0.0407)	(0.0393)
Demographics	Yes	Yes	Yes	Yes
Education	Yes	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes	Yes
Parental education and occupation	Yes	Yes	Yes	Yes
Cognitive potential	Yes	Yes	Yes	Yes
Success and conscientiousness	Yes	Yes	Yes	Yes
Other foreign languages	Yes	Yes	Yes	Yes
Number of observations	867	867	867	781
Number of excluded Instruments	1	1	2	2
Instrument: Obligatory English learning	X		X	X
Instrument: Started learning before 12		X	X	X

Robust standard errors in parentheses: * p < 0:1, ** p < 0:05, *** p < 0:01.
Note: The table reports coefficients from IV estimations of the effects of English foreign language skills on individuals' log hourly wage rate based on SOEP-IS 2016 data. In specification (1) the ordinal regressor "English Language proficiency level" is instrumented by an indicator variable for obligatory English learning in school. Column (2) reports results for instrumenting language proficiency with an indicator that equals one for those students that started to learn English before the age of 12 (excluded). In Column (3) both instruments are used and in Column (4) we restrict our sample to exclude the top ten percent wage earners. Estimated coefficients indicate average changes in log hourly wages in response to an incremental improvement over three skill levels (Basic, Independent, and Proficient).

English early (see Table A.6 in the Appendix). By contrast, partial correlations between parental background variables and both instruments are generally low.

Table 9 summarizes IV estimates for the average returns to incremental language skill increases where we control for the same set of regressors used in the OLS setup.[58] The ordinal language skill measure is instrumented with the indicator for obligatory learning in Column (1) and with the indicator for earlier learners in Column (2). Column (3) presents the estimate of an overidentified model where both instruments are used. The size of the estimated effect is the same for both instruments and the overidentified model, i.e., 11 percent higher wages for each additional skill level. The similarity of the results suggests that estimates are not sensitive to instrumental choice. Moreover, estimates are only slightly higher than the OLS benchmark in Table 6 (estimated at 7 percent, see Column (6)).[59] This is markedly different from what is usually found in the literature - where IV estimates in general are much larger than those obtained with OLS (see Chiswick and Miller (2015): 243). This is an important finding of this article, because the results suggest that the scope for misclassification error in the language skill measure is limited when self-evaluation is based on can-do descriptors that are derived from the CEFR. Moreover, when running an additional regression where we exclude the top ten percent wage earners (see discussion in 5) in Column (4) we find that the estimated effect remains stable. Thus, we conclude that an increase of one skill-level-point in the ordinal language proficiency measure causes wages to increase, on average, by 11 percent (see Column (3) in Table 9).

7. Summary and conclusions

This article discusses the relationship between foreign language skills and individuals' labor income in Germany. We focus on the English language because it is the most common and most frequently used foreign language in Germany. The novel data we use allows for an in-depth statistical analysis of the returns to foreign language skills both in general and with respect to different levels of language proficiency. The level of language skills is assessed through self-evaluations based on descriptors that were derived from the Common European Framework for Languages and characterize specific tasks individuals can perform in English. Compared with other studies, this significantly reduces the potential for measurement error in our data, which is a typical source of endogeneity in the empirical language economics literature. Moreover, using the rich dataset provided by the SOEP-IS, we are able to control for various sources of individual heterogeneity. To account for the remaining endogeneity in the relationship between self-reported language skill levels and labor market outcomes, we complement our OLS analysis with an instrumental variables approach. Several sensitivity checks show that the positive returns to English skills are robust to different model specifications and sample stratifications.

In contrast to other studies on the returns to foreign languages in Germany (Ginsburgh and Prieto-Rodriguez (2013); Stöhr (2015)), this article focusses on the value of language skills instead of their occupational use. This perspective emphazises the importance of language policy in contrast to occupational characteristics. Moreover, it can explain why our results differ from previous studies. While Ginsburgh and Prieto-Rodriguez (2013) find wage premia to knowledge and occupational use of English of 26 percent for men and 21 for women in Germany, our results indicate that individuals with English language skills obtain a wage premium of 13 percent, on average. The fact that our estimates are quantitatively smaller might be explained by the different concept of English skills and English use. While English skills merely refer to acquired human capital, English use is also characterized by occupational differences. Wage premia for language use might be higher than returns to language skills, because some individuals who have acquired high skills do not use them on the job and earn lower wages (e.g., due to inefficient job matching). Therefore, wage differentials associated with English use are not likely to capture all information if we are interested in the returns to (linguistic) human capital investments.

As regards the level of proficiency, our study also differs from the findings of Stöhr (2015) according to which there is a wage premium of 12 percent only for workers with an expert-level English skill if they choose occupations in which these are put to use. Our analysis suggests that there are also significant wage premia resulting from low and intermediate proficiency levels where each additional skill level is associated, on average, with a 11 percent wage increase. The difference between the OLS estimate (7 percent) and the IV estimate (11 percent) is much smaller than what is usually found in the literature. This is

[58] Including a time dummy in these regressions is obsolete, because the instrumental variable approach exploits information that is only contained in the 2016 sample.

[59] Note that the estimated parameter of the ordinal skill measure in the OLS model is 7 percent also when we run the regression only on the 2016 sample that we use for IV estimation here.

likely to be the result of a smaller risk of misclassification error in the assessment of language skills due to the use of better descriptors. The positive and significant rewards for basic skills in English should not be totally surprising. Grin et al. (2010) argue that the total cost to the firm looking for the ideal employee (with respect to language skills) includes three elements: (1) the recruitment effort cost (linked to the scarcity or oversupply of workers with the necessary level of foreign language skills), (2) the inefficiency cost linked to potential losses resulting from inadequate language skills, and (3) the salary cost which rises with the level of language proficiency. Therefore, firms are facing a trade-off in satisfying their occupational language requirements and their budget constraints. Depending on the relative magnitude of these three costs, Grin et al. (2010) show that it may be optimal for firms deliberately to target profiles with lower-than-needed foreign language skills.

Moreover, the robustness of our estimated returns to English skills when controlling for skills in other foreign languages suggests that the pure signalling value of language skills on the labor market is limited. This might be due to the fact that generating a credible language signal (e.g., via TOEFL-test scores) is costly to labor market participants. To avoid these costs firms might be more likely to screen employees' adaptability and openness to other cultures based on other references (e.g., semesters studied abroad). Disentangling the job-matching mechanisms that explain this observation, however, remains subject to future research.

Last but not least, our findings emphazise the importance of language education policy for the development of human capital. Our data suggests that language skills tend to be constant over the life-cycle of the majority of individuals. In other words, the stock of English skills in the German population is, to a large extent, determined by language policy through the public education system, while individuals' private investments in foreign language skills after graduation seem to play a minor role. As the limited number of observations on other foreign languages does not allow for an elaborate econometric analysis, it should not be concluded from this article that only English skills matter in the German labor market. In the 16 different German school systems other foreign languages are usually taught less often or less intensely than English for reasons that are not related to labor market prospects (e.g., geopolitical considerations, specific requests by families, trends in culture), which is reflected in the availability of data. Even though we do not find positive and statistically significant results for other foreign languages - contrary to studies carried out in other European countries (see Section 3) - concluding that only English language skills are associated with positive labor market outcomes could inspire misleading language policies. Instead, a broader dataset with more statistical observations for other foreign languages would be required to study these relationships in more detail.[60] Moreover, given the dynamics in the European integration process, foreign languages can also have a cultural and geopolitical value that is not necessarily reflected in variables such as individuals' income.

Appendix A

[60] An interesting question for future research is to explore the extent to which positive earning differentials associated with skills in English are due to its role as a lingua franca (which potentially can be fulfilled by other languages, too) as opposed to its value in communicating specifically with English-speaking countries.

Table A.1
Language education policy in German federal states in the 1990s.

State	Primary education (grades 1-4)	Lower secondary education (Grades 5-10)			Upper secondary education (Grades 11-13)
		Hauptschule	*Realschule*	*Gymnasium*	*Upper Gymnasium*
Baden-Württemberg	No mandatory foreign language.[61]	Mandatory English from grade 5.	English or French, from grade 5. Second foreign language optional from grade 7 (French or English).	Mandatory English or French from grade 5. Second foreign language mandatory from grade 7 (English, French, Latin, Russian).	Mandatory to continue studying one of the obligatory languages that were started at least until grade 9.
Bavaria (Bayern)	No mandatory foreign language.[62]	Mandatory English from grade 5.	Mandatory English from grade 5.	Mandatory first foreign language from grade 5 (English or Latin). Mandatory second foreign language from grade 7 (English, French or Latin).	Several languages available (English, French, Italian, Latin, Spanish, Russian).
Berlin	One foreign language (mostly English) mandatory from grade 5.[63]	English from grade 7 (rarely French, Russian, or Turkish as an alternative).	Mandatory English from grade 7 (rarely French, Russian, or Turkish as an alternative). Optional second foreign language possible.[64]	Mandatory English from grade 7 (alternatively: Ancient Greek, French, Latin, Russian, Spanish, or Turkish). Mandatory second foreign language (including English).	Two mandatory foreign languages (English is chosen in most cases, followed by French and Latin).
Brandenburg	One foreign language mandatory from grade 5 on (99% English).[65] Schools can offer early language courses on a voluntary basis from grade 3 on.[66]	Local study track is Gesamtschule. Optional second foreign language from grade 7. Optional third foreign language from grade 9.	Optional second foreign language from grade 7.	Mandatory second foreign language from grade 7. Optional third foreign language from grade 9.	Two mandatory foreign languages (English is chosen in most cases) - not necessarily the same languages that have been studied in lower secondary education.
Bremen	No mandatory foreign language.[67]	Common track "Orientierungsstufe" (grades 5-6). Mandatory foreign language, mostly English. Optional second foreign language.			Several languages available (English, French, Italian, Latin, Polish, Spanish, Russian, Ancient Greek).
		Mandatory English from grade 7.	Mandatory first foreign language (mostly English, sometimes French). Optional second foreign language from grade 7 (French or Spanish - English if first foreign language is French).[68]	Mandatory first foreign language from grade 7. Mandatory second foreign language from grade 7 (Latin, French, Spanish, Russian - English if first foreign language is French).	

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Table A.1 (*continued*)

State	Primary education (grades 1-4)	Lower secondary education (Grades 5-10)			Upper secondary education (Grades 11-13)
		Hauptschule	*Realschule*	*Gymnasium*	*Upper Gymnasium*
Hamburg	English education from grade 3.[69]	Mandatory English from grade 5.	Mandatory English from grade 5. Optional second language from grade 8 (usually French or Spanish, sometimes Italian or Russian).[70]	English or French or Latin mandatory from grade 5. Mandatory second language from grade 7 (mostly French, Spanish or Italian, sometimes Russian). Second foreign language must be English if the first is French or Latin.	Most pupils continue with English, French, and Latin (Italian, Spanish, Russian, Ancient Greek also available).
Hesse (Hessen)	A modern language offered from grade 3 (usually English or French).	A modern foreign language mandatory from grade 5.	A modern foreign language mandatory from grade 5. Optional second foreign language from grade 7 (English, French, or Latin).[71]	A modern foreign language or Latin mandatory from grade 5. Mandatory second foreign language from grade 7 (English, French, or Latin).	Teaching of English, French, Latin, Ancient Greek (basic or advanced) from grade 12.
Lower Saxony (Niedersachsen)	English, French or Dutch, recommended from grade 3.	Common track "Orientierungsstufe" (grades 5-6). Mandatory English from grade 5.			Two foreign languages are obligatory, at least one of which has been started in grade 5 or 7.
		Mandatory English from grade 7.	Mandatory English from grade 7. Optional second foreign language from grade 7 or 8 (Dutch, French).[72]	Mandatory English or French or Latin from grade 7. Mandatory second foreign language from grade 7 (English mandatory if first language Latin or French). Optional third foreign language from grade 9.	
Mecklenburg-Western Pomerania (Mecklenburg-Vorpommern)	First contact with English, French or Russian offered from grade 3.	Mandatory English from grade 5.	English from grade 5 (Russian possible). Second foreign language from grade 7 (French or Russian; English if first language Russian).[73]	English from grade 5 (Russian, French, Latin, Polish possible). Second foreign language from grade 7 (Russian, French, Latin, Polish, Swedish; English mandatory second language if the first language is not English).	Several languages available (English, Russian, French, Latin, Polish, Swedish, Ancient Greek, Spanish).
North Rhine-Westphalia (Nordrhein-Westfalen)	No mandatory foreign language.[74]	Mandatory English from grade 5.	Mandatory English from grade 5. Optional second foreign language from grade 7 (Dutch, French, Italian, Spanish). Optional third foreign language from grade 9.[75]	Mandatory first foreign language from grade 5. Mandatory second foreign language from grade 7 (French or Latin; English if first foreign language Latin or French). Optional third foreign language from grade 9.	Two or three foreign languages taught. Typically, pupils continue studying languages started in lower secondary education, but may add new one.
Rhineland-Palatinate (Rheinland-Pfalz)	No mandatory foreign language, but offer of English from grade 3 gradually expanded.[76]	Mandatory English from grade 5.[76]	Mandatory English from grade 5.[76] Second foreign language from grade 7 (English or French).	Mandatory first foreign language from grade 5 (English, French or Latin). Second mandatory foreign language from grade 7 (English, French, Latin, Russian). English mandatory second language if first foreign language Latin or French. Third language possible from grade 9.[77]	At least one foreign language which has already been studied in lower secondary level is obligatory.
Saarland	Mandatory French from grade 3 or 4.	Mandatory French from grade 5 (rarely English).	Mandatory French from grade 5 (rarely English). English mandatory second foreign language from grade 7.	Mandatory French from grade 5 (rarely English). English or Latin second mandatory foreign language. Optional third foreign language.[78]	Mandatory to continue studying two foreign languages from lower secondary education (English, French, Latin) in grade 11.
Saxony (Sachsen)	No mandatory foreign language.[79]	Unified school called 'Mittelschule'. Mandatory English or (rarely) French from grade 5.		Mandatory first foreign language from grade 5 (English, rarely French or Latin). Second mandatory foreign language from grade 7 (English, French, Latin, Russian, Spanish, and Czech). English mandatory second language if first foreign language Latin or French.	Mandatory to continue studying one of the obligatory languages that were started at least until grade 8.
Saxony-Anhalt (Sachsen-Anhalt)	No mandatory foreign language.[80]	Local study tracks are Sekundarschule and Gesamtschule. Mandatory English from grade 5. Second foreign language from grade 7 in Gesamtschule and some sub-tracks in Sekundarschule (French or Russian).		Mandatory first foreign language from grade 5 (usually English; alternatively French, Russian or Latin). Second mandatory foreign language from grade 7 (French, Latin or Russian; English if the first foreign language is Latin, Russian or French). Optional third foreign language.	Students can take advanced language courses in English, French, Russian or Latin if they continued to learn the language from grade 9 on. Optional third languages are: French, Russian, Spanish, Latin and Greek.

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Table A.1 (*continued*)

State	Primary education (grades 1-4)	Lower secondary education (Grades 5-10)			Upper secondary education (Grades 11-13)
		Hauptschule	*Realschule*	*Gymnasium*	*Upper Gymnasium*
Schleswig-Holstein	No mandatory foreign language.[81]	Mandatory English from grade 5.	Mandatory English from grade 5. Optional foreign language from grade 7 (Danish or French).[82]	Mandatory first foreign language from grade 5 (English, French or Latin). Mandatory second foreign language from grade 7 (English, French, Latin). Optional third foreign language from grade 9.	In grade 11 two foreign languages are mandatory, of which one must have been started at least from grade 7 onwards.
Thuringia (Thüringen)	No mandatory foreign language. Some schools offer English or French from grade 3.	Local tracks are Regelschule and Gesamtschule. First foreign language from grade 5 (English or Russian). Second foreign language from grade 7 (English, Russian or French).		First foreign language from grade 5 (English, Latin, Russian). Second foreign language from grade 7 (Latin, Russian). Optional third foreign language.	Information not available.

Source: Own representation based on findings from various chapters in Gogolin et al. (2001).

Note: *Hauptschule, Realschule* and *Gymnasium* have been the most common school tracks in Germany in the 1990s. While *Hauptschule* offers a basic general education, education at *Realschule* is more extensive and *Gymnasium* is intended to prepare students for higher education. Further details about the different school tracks in the German education system can be found in Eurydice (2021).

[61] Some schools in Stuttgart and Tübingen offer English from grade 3 or 4. Near the border with France, 400 schools teach French from grade 3.
[62] Since the school year 1994/95 in 180 primary schools (out of approximately 2,200) English, French or Italian were taught from grade 3.
[63] In Berlin primary education ends after grade 6.
[64] Gesamtschule has a similar program.
[65] In Brandenburg primary education ends after grade 6.
[66] In 1996/97 about 2000 children in grade 3 and 4 participated in such English courses.
[67] In the school year 1995/96 50% of schools propose an "early contact with foreign languages" from grade 3-4. Mostly English or French, some Spanish, Italian, or Turkish.
[68] Gesamtschule has a similar program.
[69] Mandatory English was introduced sequentially from 1995 to 1998.
[70] Gesamtschule has a similar program, but second language starts at grade 7.
[71] Gesamtschule similar to Realschule.
[72] Integrierte Gesamtschule has similar program.
[73] Gesamtschule has a similar program, but includes Latin.
[74] Pilot experiments "first contact with foreign languages" (any language) from grade 1.
[75] Gesamtschule has similar program, but includes Latin.
[76] French as an alternative in areas near the border with France.
[77] Gesamtschule has a similar program.
[78] Gesamtschule has a similar program.
[79] The Sorbian language (an indigenous Slavic minority language) is taught in the relevant region from grade 1. From grade 3 or 4 "first contact with foreign languages" is offered in Czech, English, French, Russian, Sorbian, or Polish.
[80] Some schools offer "first contact with foreign languages" from grade 3 (usually English, sometimes French).
[81] Some schools offer "first contact with foreign languages" from grade 3 - usually English, French, Italian, Danish, Turkish, Frisian (a local minority language).
[82] Gesamtschule has a similar program with Latin instead of Danish, plus third language possible from grade 9.

Table A.2
Language skill descriptors in the CEFR and in SOEP-IS 2012 and 2016.

Common European Framework of Reference for Languages (CEFR) "can-do" descriptors, Global scale.	Descriptor used in SOEP-IS 2012	Descriptor used in SOEP-IS 2016	**Variable '*Language skills*'**
A1: Breakthrough or beginner Can understand and use familiar everyday expressions and very basic phrases aimed at the satisfaction of needs of a concrete type. Can introduce him/herself and others and can ask and answer questions about personal details such as where he/she lives, people he/she knows and things he/she has. Can interact in a simple way provided the other person talks slowly and clearly and is prepared to help.	A1 I **can introduce myself and others** and **can ask people questions** about them.	A1 I can **understand everyday expressions and easy sentences, can introduce myself and other people**, and I **can ask easy questions**, e.g., about where people are living.	1
A2: Waystage or elementary Can understand sentences and frequently used expressions related to areas of most immediate relevance (e.g., very basic personal and family information, shopping, local geography, employment). Can communicate in simple and routine tasks requiring a simple and direct exchange of information on familiar and routine matters. Can describe in simple terms aspects of his/her background, immediate environment and matters in areas of immediate need.	A2:I can use a series of sentences to describe my education or **my profession** in **simple terms** to other people.	A2: I **can understand often used expressions**, like e.g., information about **work** or the local area. I also can communicate in **routine** situations.	
B1: Threshold or intermediate Can understand the main points of clear standard input on familiar matters regularly encountered in work, school, leisure, etc. Can deal with most situations likely to arise whilst travelling in an area where the language is spoken. Can produce simple connected text on topics which are familiar or of personal interest. Can describe experiences and events, dreams, hopes & ambitions and briefly give reasons and explanations for opinions and plans.	B: I can narrate a story, depict the plot of a book or a film and describe my reactions.	B1: I could understand main points **if clear standard** language is used in the context of **familiar** topics like **work, school, leisure time**, etc. I **can tell** a coherent story about my **experiences**.	2

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Table A.2 (*continued*)

Common European Framework of Reference for Languages (CEFR) "can-do" descriptors, Global scale.	Descriptor used in SOEP-IS 2012	Descriptor used in SOEP-IS 2016	**Variable '*Language skills*'**
B2: Vantage or upper intermediate Can understand the main ideas of complex text on both concrete and abstract topics, including technical discussions in his/her field of specialisation. Can interact with a degree of fluency and spontaneity that makes regular interaction with native speakers quite possible without strain for either party. Can produce clear, detailed text on a wide range of subjects and explain a viewpoint on a topical issue giving the advantages and disadvantages of various options.		B2: I can understand the main **content of complex articles**. Moreover, I can communicate **spontaneously** and have a conversation **without much effort**.	
C1: Effective operational proficiency or advanced Can understand a wide range of demanding, longer texts, and recognise implicit meaning. Can express him/herself fluently and spontaneously without much obvious searching for expressions. Can use language flexibly and effectively for social, academic and professional purposes. Can produce clear, well-structured, detailed text on complex subjects, showing controlled use of organisational patterns, connectors and cohesive devices	C1: I **can use the language in social and professional life** or in vocational training and **academic** studies effectively and **flexible**.	C1: I can **understand** long and **challenging** articles. Furthermore, I **can practice that language in social or occupational contexts without noticeable gaps in search for missing words**.	3
C2: Mastery or proficiency Can understand with ease virtually everything heard or read. Can summarise information from different spoken and written sources, reconstructing arguments and accounts in a coherent presentation. Can express him/herself spontaneously, very fluently and precisely, differentiating finer shades of meaning even in more complex situations.	C2: I can express myself **spontaneously, very fluently and precisely**, and **I'm able to reveal fine differences in meaning even in complex situations**.	C2: **I can understand virtually everything written and spoken** in that language without difficulties. I am also able **to express myself spontaneously, fluently and precisely. In complex contexts, I can make clear meaning nuances**.	

Note: The table reports the descriptors of language skills in the Common European framework of reference for languages (CEFR), and in the two waves of the SOEP-IS dataset. The commonalities between the CEFR's definitions and the descriptors used in the SOEP questionnaires are highlighted in bold. The values of the ordinal variable *"Language skills"* correspond to the A, B, C macro levels of the CEFR.

Table A.3
Summary statistics for 2012 and 2016 panel wave.

Variable	2012		2016	
	N	Mean	N	Mean
Individual Characteristics				
Age	878	46.1	1109	46.1
Female	878	52.7	1109	50.0
Married	878	58.0	1109	52.2
Lived in East Germany before 1989	878	28.1	1109	24.1
Has children	878	32.8	1109	29.9
Labor market experience	878	27.4	1108	27.2
Share of correct answers in vocabulary test	878	84.0	1109	83.8
Share of correct answers in symbol-digit test	878	51.9	1109	53.0
Importance of success in life (4-point scale)	878	2.8	1109	2.8
Conscientiousness (7-point scale)	878	5.8	1109	5.8
Information about Educational Attainment				
General Secondary School (Hauptschule)	878	25.8	1109	21.9
Intermediate School Degree (Realschule & POS)	878	38.7	1109	37.4
Vocational High School (Fachhochschulreife)	878	6.5	1109	9.3
College Entrance Exam (Abitur & EOS)	878	25.8	1109	26.2
Other degree	878	2.6	1109	4.0
Dropout, No school certificate	878	0.5	1109	1.1
Currently in school	878	0.1	1109	0.1
Vocational degree	878	77.6	1109	75.3
University degree	878	26.3	1109	23.4
Information about other Foreign Language Skills				
No English skills	878	27.5	1109	24.7
Basic English skills	878	32.3	1109	25.5
Intermediate English skills	878	17.6	1109	34.4
Advanced English skills	878	22.5	1109	15.4
Has basic skills in other languages	878	33.2	1109	32.3
Has intermediate skills in other languages	878	6.6	1109	9.9
Has advanced skills in other languages	878	6.2	1109	2.7
Information about Labor Market Outcomes				
Full-time employment	878	51.2	1109	56.0
Part-time employment	878	18.7	1109	17.8
Marginal / irregular employment	878	6.1	1109	6.0
Vocational training / sheltered work	878	0.4	1109	0.8
Not employed	878	23.6	1109	19.4
Gross hourly wage	595	19.0	821	20.7
Gross hourly wage (incl. imputed values)	655	20.1	867	20.6

(*continued on next page*)

Table A.3 (*continued*)

Variable	2012		2016	
	N	Mean	N	Mean
Information about Occupations (ISCO-88 major groups)				
Armed forces	655	0.3	867	0.1
Legislators, senior officials and managers	655	6.1	867	5.4
Professionals	655	20.0	867	20.2
Technicians and associate professionals	655	26.9	867	27.1
Clerks	655	9.4	867	11.2
Service workers and shop and market sales workers	655	11.0	867	11.3
Skilled agricultural and fishery workers	655	1.4	867	1.5
Craft and related trades' workers	655	9.0	867	10.7
Plant and machine operators and assemblers	655	7.9	867	6.2
Elementary occupations	655	6.5	867	6.3
Occupation missing	655	1.4	867	0.1

Note: The table summarizes total number of observations and weighted mean values for individuals' observable characteristics in SOEP-IS 2012 and SOEP-IS 2016. Mean values of indicator variables represent sample shares. Example: The second row in Column (1) indicates the share of women in SOEP-IS 2012 is 53 percent.

Table A.4
Detailed results for regressions of log hourly wages on English language skills (based on pooled sample).

	(1)	(2)
	Log hourly wage rate	Log hourly wage rate
English indicator	0.125***	0.0784**
Female	-0.259***	-0.242***
Age	0.0999***	0.0757***
Experience	-0.0710***	-0.0479**
Experience squared	-0.000448***	-0.000442***
Married	0.0800***	0.0803***
Has kids	0.0108	0.0136
Lived in East Germany before 1989	-0.148***	-0.132***
Indicator for survey wave 2016	0.0747***	0.0766***
Intermediate school degree	-0.0238	-0.0731
Leaving certificate from vocational high school	-0.188**	-0.231***
College entrance exam	-0.209*	-0.229**
Other degree	0.0722	0.0561
Dropout, no school certificate	0.400**	0.361**
Vocational degree	-0.0357	-0.0416
University degree	0.00507	-0.0766
Result of word test	0.407**	0.306*
Result of symbol-digit test	0.295***	0.225**
Importance of being successful	0.109***	0.0761***
Conscientiousness	0.0591***	0.0609***
Basic skills in other languages	-0.00212	-0.00468
Intermediate skills in other languages	0.0143	0.0119
Proficient skills in other languages	0.0219	0.0174
GDP per capita in local district	0.00184*	0.00202*
Local unemployment rate	-0.0122	-0.0123
Labor market tightness	-0.577	-0.436
Legislators, senior officials and managers		0.284**
Professionals		0.330***
Technicians and associate professionals		0.149
Clerks		0.0601
Service workers and shop and market sales workers		-0.174
Skilled agricultural and fishery workers		-0.225
Craft and related trades workers		0.0316
Plant and machine operators and assemblers		-0.0882
Elementary occupations		-0.242**
Number of observations	1522	1514
R-squared	0.361	0.416
Adjusted R-squared	0.316	0.370

R-squared and Adjusted R-squared for multiply imputed data are computed by using Fisher's r to z transformation as suggested by Harel (2009). * p < 0:1, ** p < 0:05, *** p < 0:01.
Note: The table reports a detailed list of coefficients for Columns (5) and (6) from Table 4.

Table A.5
Results for OLS regression of log hourly wages on English language knowledge with school grades as alternative controls (based on SOEP-IS 2012).

	(1)	(2)	(3)
	Maths	German	German and Maths
English indicator	0.170**	0.156**	0.156**
	(0.0720)	(0.0716)	(0.0717)
Demographics	Yes	Yes	Yes
Education	Yes	Yes	Yes
Regional controls	Yes	Yes	Yes
Parents' educational attainment	Yes	Yes	Yes
Parents' occupational status	Yes	Yes	Yes
Success and conscientiousness	Yes	Yes	Yes
Other foreign languages	Yes	Yes	Yes
Number of observations	448	448	448
R-squared	0.465	0.472	0.472
Adjusted R-squared	0.346	0.356	0.354

R-squared and Adjusted R-squared for multiply imputed data are computed by using Fisher's r to z transformation as suggested by Harel (2009). Robust standard errors in parentheses * p < 0:1, ** p < 0:05, *** p < 0:01.
Note: The table presents estimates from regressions where school grades are used as a proxy variable for cognitive skills instead of cognitive skill test results. Column (1) controls for last observed maths grade in school and Column (2) controls for last observed grade in German. Column (3) includes both grades as regressors. School grades are only available for a subsample of individuals from the 2012 SOEP-IS sample.

Table A.6
Partial correlations between instruments and predetermined variables (based on SOEP-IS 2016).

VARIABLES	(1) Obligatory learner	(2) Early learner
Age	-0.131***	-0.176***
	(2.41e-05)	(1.11e-08)
Female	0.0128	0.00872
	(0.681)	(0.779)
Lived in East-Germany before 1989	-0.391***	-0.369***
	(0)	(0)
General secondary school degree	0.105***	0.0268
	(0.000705)	(0.388)
Intermediate school degree	0.159***	0.0786**
	(2.50e-07)	(0.0112)
Vocational high school degree	0.179***	0.102***
	(5.76e-09)	(0.000963)
College entrance exam	0.192***	0.122***
	(3.92e-10)	(8.43e-05)
Other degree	0.0769**	0.0823***
	(0.0131)	(0.00790)
Mother: Education unknown	-0.0406	-0.00669
	(0.190)	(0.829)
Mother: General secondary school	-0.0352	0.0112
	(0.256)	(0.718)
Mother: Intermediate school degree	-0.0284	0.0113
	(0.360)	(0.715)
Mother: Technical school degree	-0.0167	0.0112
	(0.591)	(0.719)
Mother: Upper secondary school degree	-0.0346	-0.0108
	(0.265)	(0.728)
Mother: Other degree	-0.0441	0.0109
	(0.155)	(0.726)
Mother: No school degree	-0.0516*	0.00169
	(0.0962)	(0.957)
Father: Education unknown	-0.00556	0.0340
	(0.858)	(0.273)
Father: General secondary school	-0.00484	0.0296
	(0.876)	(0.339)
Father: Intermediate school degree	-0.00213	0.0339
	(0.945)	(0.275)
Father: Technical school degree	-0.00408	-0.0131
	(0.896)	(0.673)
Father: Upper secondary school degree	-0.00209	0.0284

(*continued on next page*)

Table A.6 (*continued*)

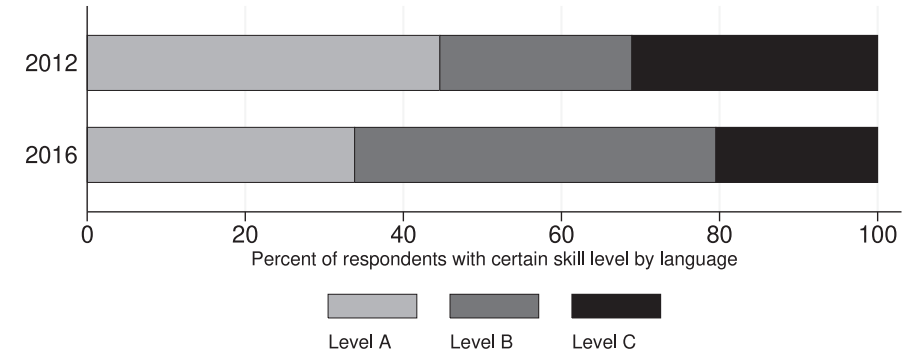
VARIABLES	(1) Obligatory learner	(2) Early learner
	(0.946)	(0.361)
Father: Other degree	-0.0122	0.0192
	(0.694)	(0.537)
Father: No school degree	-0.00831	0.0109
	(0.789)	(0.727)
Mother: Has died	-0.000957	0.0330
	(0.975)	(0.288)
Mother: Not employed	0.00256	0.0423
	(0.934)	(0.173)
Mother: Pensioner	-0.0321	0.0110
	(0.302)	(0.723)
Mother: Occupation missing	-0.00625	0.0372
	(0.840)	(0.231)
Mother: Untrained worker	0.00356	0.0399
	(0.909)	(0.199)
Mother: Semi-trained worker	-0.00118	0.0426
	(0.970)	(0.170)
Mother: Trained worker	-0.00319	0.0380
	(0.918)	(0.221)
Mother: Self-employed farmer no coworkers, since 2000	-0.00446	0.0365
	(0.886)	(0.240)
Mother: Self-employed farmer, with Coworker, n.A., since 2004	-0.000752	0.0339
	(0.981)	(0.275)
Mother: Freelance Professional, No coworkers, since 2000	-0.0295	0.0110
	(0.342)	(0.723)
Mother: Freelance Professional, with coworkers, n.A., since 2004	0.0135	0.0165
	(0.664)	(0.596)
Mother: Other self-employed no coworkers, since 1997	0.00113	0.0434
	(0.971)	(0.162)
Mother: Other self-employed with coworkers, n.A., since 2004	-0.00275	0.0414
	(0.929)	(0.183)
Mother: Help in family business	-0.00468	0.0228
	(0.880)	(0.462)
Mother: Untrained employee with simple tasks, since 1991	0.00379	0.0450
	(0.903)	(0.147)
Mother: Trained employee with simple tasks, since 1991	0.00127	0.0447
	(0.967)	(0.149)
Mother: Qualified professional	0.000811	0.0415
	(0.979)	(0.181)
Mother: High qualified professional	-0.00134	0.0410
	(0.966)	(0.186)
Mother: Managerial	0.0261	0.0352
	(0.400)	(0.256)
Mother: Low-level civil service	-0.0163	0.0292
	(0.600)	(0.346)
Mother: Middle-level civil service	-0.00571	0.0430
	(0.854)	(0.166)
Mother: High-level civil service	0.00159	0.0428
	(0.959)	(0.168)
Mother: Executive civil service	0.00804	0.0492
	(0.796)	(0.113)
Father: Has died	-0.0176	-0.00911
	(0.570)	(0.769)
Father: Not employed	0.00561	0.00863
	(0.857)	(0.781)
Father: Pensioner	0.0136	0.0120
	(0.661)	(0.698)
Father: Occupation missing	-0.0140	-0.00919
	(0.653)	(0.767)
Father: Untrained worker	-0.0120	-0.00775
	(0.699)	(0.803)
Father: Semi-trained worker	-0.0148	-0.0131
	(0.634)	(0.672)
Father: Trained worker	-0.00820	-0.00649
	(0.792)	(0.834)
Father: Foreman, team leader	-0.0348	-0.0248
	(0.262)	(0.424)

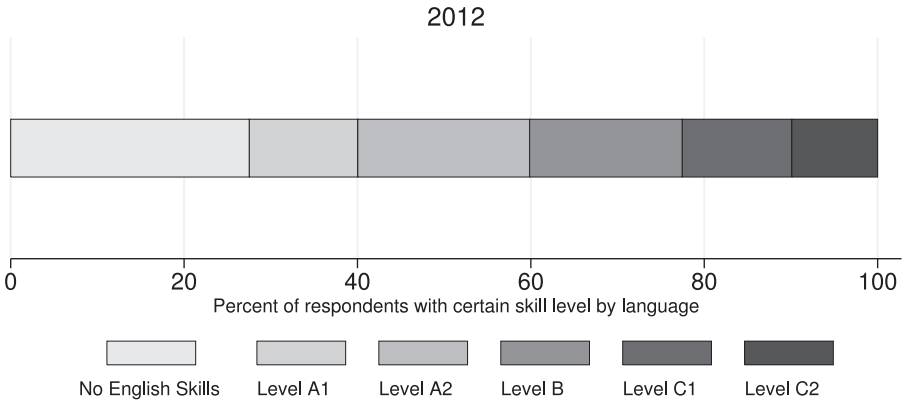
(*continued on next page*)

Table A.6 (*continued*)

VARIABLES	(1) Obligatory learner	(2) Early learner
Father: Foreman	-0.0114	-0.00704
	(0.713)	(0.821)
Father: Self-employed farmer no coworkers, since 2000	0.000156	0.00550
	(0.996)	(0.859)
Father: Self-employed farmer, with coworker, n.A., since 2004	-0.0101	0.0108
	(0.745)	(0.728)
Father: Freelance professional, no coworkers, since 2000	-0.00143	0.00423
	(0.963)	(0.892)
Father: Freelance professional, with coworkers, n.A., since 2004	-0.0175	-0.000142
	(0.573)	(0.996)
Father: Other Self-employed No coworkers, since 1997	-0.000532	0.00375
	(0.986)	(0.904)
Father: Other Self-employed with coworkers, n.A., since 2004	-0.00236	0.00322
	(0.939)	(0.917)
Father: Foreman	-0.0164	-0.0117
	(0.597)	(0.707)
Father: Untrained employee with simple tasks, since 1991	0.000208	-0.00790
	(0.995)	(0.799)
Father: Trained employee with simple tasks, since 1991	-0.00955	-0.00646
	(0.758)	(0.835)
Father: Qualified professional	-0.00427	0.00623
	(0.891)	(0.841)
Father: High qualified professional	-0.00595	0.00652
	(0.848)	(0.834)
Father: Managerial	-0.0229	0.00106
	(0.461)	(0.973)
Father: Low-level civil service	-0.00877	-0.0176
	(0.778)	(0.571)
Father: Middle-level civil service	0.000686	0.00947
	(0.982)	(0.760)
Father: High-level civil service	-0.00755	-0.00305
	(0.808)	(0.922)
Father: Executive civil service	-0.0167	-0.0207
	(0.592)	(0.504)
Observations	1,109	1,109
R-squared	0.391	0.393

P-values of partial correlations in parentheses *** p<0.01, ** p<0.05, * p<0.1.
Note: The table reports partial correlations and corresponding p-values for the two instrumental variables ”Obligatory Learner” and ”Early Learner” and a list of predetermined variables.





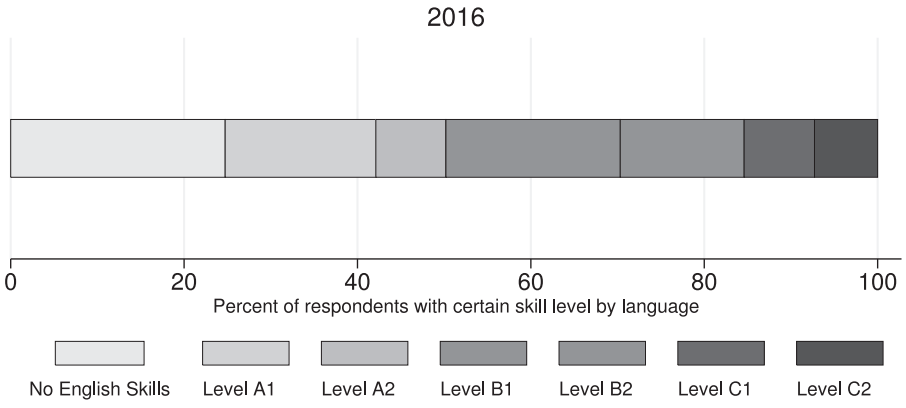


Fig. A1. Distribution of English foreign language skills in SOEP-IS 2012 and 2016.
Note: The figures show the weighted distribution of English language skills by survey year both for the aggregated macro skill levels (A, B and C) and the original CEFR-categories. In 2012 five language skill categories were used and in 2016 six skill categories were derived from the CEFR (see Table A.2).

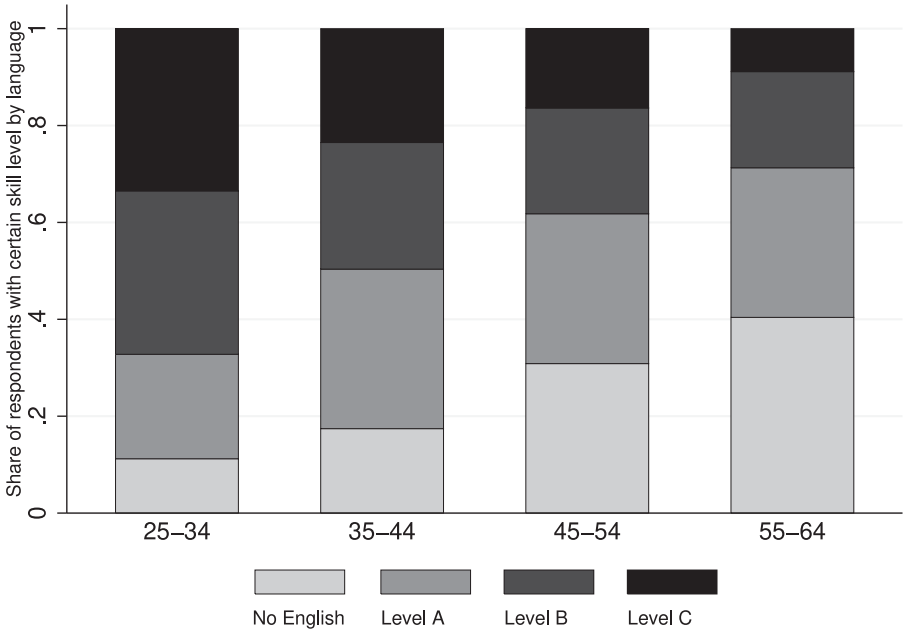


Fig. A2. Foreign English language skills by age group (based on pooled sample).
Note: The figure shows the weighted distribution of English language skills by age group. In accordance with the findings in Section 2, it illustrates that (high) English skill levels are much more common among younger individuals than among older cohorts.

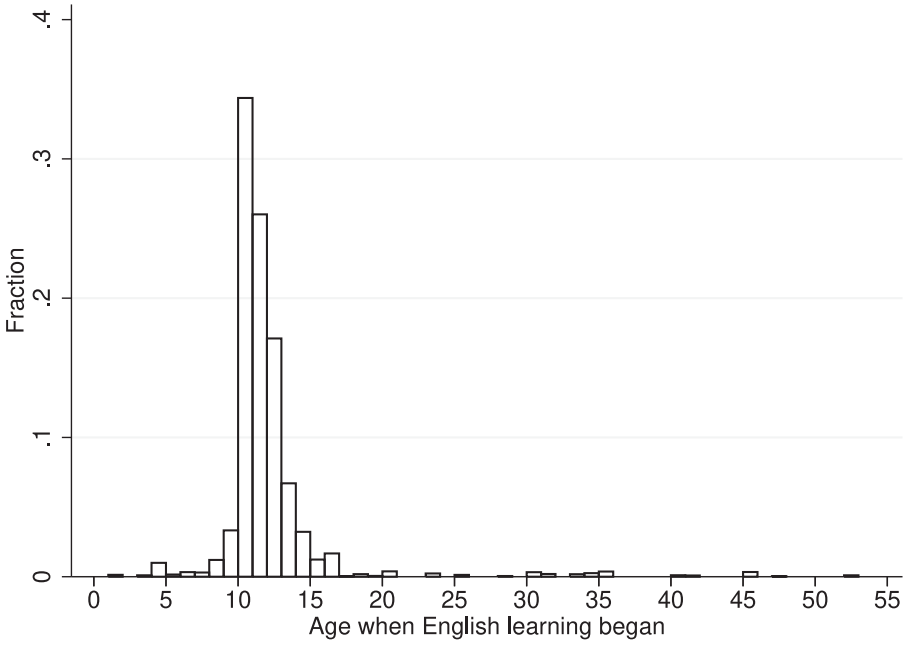


Fig. A3. Age when learning English as a foreign language started (based on SOEP-IS 2016).
Note: The figure illustrates the fraction of individuals with English skills who started learning at a specific age. It shows that English language learning is, to a large extent, determined by language policy through the public education system.

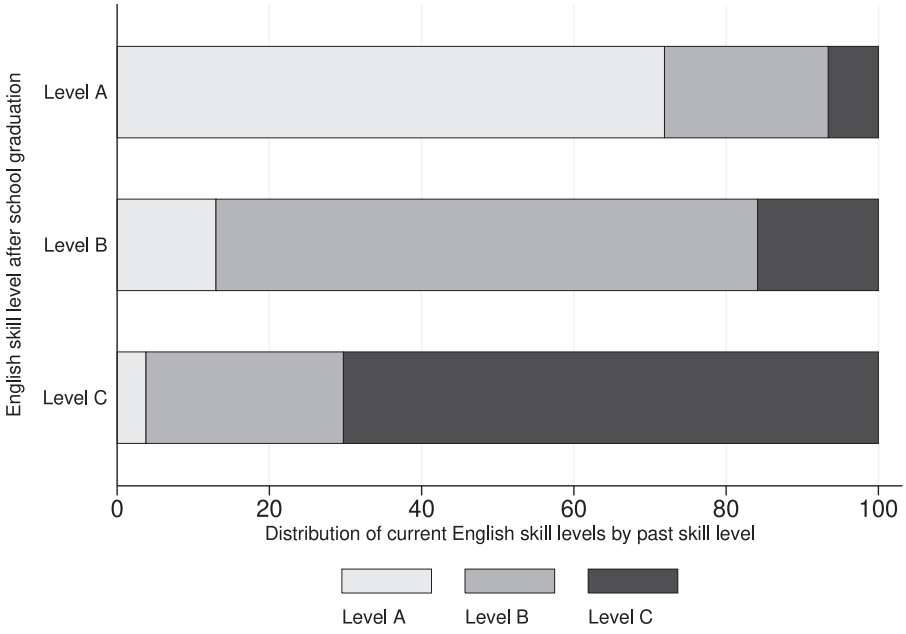


Fig. A4. Comparison of past and present English skill levels (based on SOEP-IS 2016).
Note: The figure compares the self-declared level of skills in English of respondents in 2016 and their self-declared retrospective skill level at the end of education. For example, more than 70 percent of those who report having Level A English skills at the end of school declare having the same skill level in 2016.

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