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The economic value to the UK of speaking other languages

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Preface

The objective of this study is first to assess the economic value of languages to the UK in general and then to evaluate the potential economic benefits to the UK of improving languages education in schools.

The report's findings directly contribute to the evidence base in international economics and language policy and should be of interest to policy and decision makers both in language policy in general and in languages education in particular.

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Executive summary

Background and rationale for this study

In a closely interconnected world, the ability to communicate in different languages has become increasingly important for the globally integrated business community. The United Kingdom (UK) has a comparative advantage due to the global nature of English as a lingua franca. However, there are risks associated with relying heavily on one language given the increasing geopolitical and economic importance of countries where English is not the official (or the main first) language such as China.

The UK has experienced a sharp decline overall in the uptake of languages since 2004, as evidenced by the falling number of entries for GCSE and A Level examinations. At a time when the UK government seeks to reset its global economic relationships as part of its vision of 'Global Britain', such a decline could have negative effects on the UK's ability to compete internationally.

Whilst a series of reports has set out the case for increased funding for languages in schools, there is a gap in the evidence relating to the potential economic benefits of enhanced foreign-language skills to the UK. A 2014 study (Foreman-Peck & Wang 2014) estimated that the UK is losing out on trade to the value of 3.5 per cent of the UK's GDP every year because of the lack of a common official language with all its trading partners that do not have English as an official language. The current report revisits this 2014 study and aims to provide an updated economic estimate for some of the UK's untapped language potential. Compared to the 2014 study the contribution of our research is threefold: (1) it revisits the existing literature on the economic effects of languages; (2) it applies a gravity model of trade to assess the relative importance of spoken languages for bilateral trade, including at the more disaggregated sectorial level; and (3) taking the parameter estimates for the trade effects derived from the applied empirical gravity model, as well as estimates from the existing literature on the human-capital effects of languages, it estimates the wider economic benefits for the UK in investing and extending languages education in schools using an applied computable general equilibrium model. This modelling framework is akin to the one used by the UK government to assess the economic impacts of free-trade agreements.

The role of languages in international trade and on human and cultural capital – what is known from the literature?

Existing evidence suggests that languages play a significant role in international trade and that not sharing a common language acts as a non-tariff trade barrier. In other words, having a common language can, all else being equal, reduce trade barriers and foster trade, akin to free-trade agreements and other preferential trade-cooperation agreements.

Empirical evidence suggests that learning additional languages enhances human capital, with multilingual individuals potentially earning higher wages and having better labour-market outcomes than their monolingual peers. One US study (Saiz & Zoido 2005) estimated that speaking an additional language increased college graduates' earnings by an average of around 2 per cent compared to individuals who did not speak another language, even when adjusted for many other factors that determine income such as gender, college degree subject, and so on.

While empirical studies suggest there is a wage premium for using a second language at work in European countries (including English-speaking Ireland), findings for the UK show that in many cases there is no direct wage return for speaking an additional language beyond English. Possible explanations for the mixed UK evidence include an undervaluation of language skills by employers, an unwillingness on the part of businesses to invest in language skills, and a mismatch between the level of proficiency in speaking a second language among the UK population and that required to be effective in business. Moreover, instead of building the human capital required, UK businesses have relied on hiring people from abroad with the necessary language skills.

Quantifying language effects on trade by sectors

This study applies an established econometric model – the so-called 'gravity model of trade', used to examine the determinants of bilateral trade flows between countries – to analyse the association between the ability to communicate in a spoken language and bilateral trade flows. The analysis is conducted at the sector level using international bilateral trade figures between a large number of countries and covers both merchandise and service trades. The key findings of the empirical gravity analysis are as follows.

First, sharing spoken languages can reduce trade barriers. Based on the application of a structural gravity model of trade, this study finds an increase in bilateral trade in mining & energy and services when a proportion of the population of two countries are able to communicate with each other through a shared spoken language, all else being equal. Specifically, a 1 per cent increase in the probability that two people from two countries meet at random and are able to communicate with each other increases bilateral trade in mining & energy by 2.4 per cent and trade in services by 0.6 per cent. It is important to highlight that, while the trade effect associated with an increase in the ability to communicate is larger in magnitude for mining & energy than for services in percentage terms, if a country has larger overall trade volumes for services like the UK, then in absolute terms the change in trade volumes created by a reduction in language-related trade barriers may well be larger for services than for mining & energy.

Second, the analysis conducted a number of sensitivity tests, including a sensitivity analysis comparing the relative importance of English versus other languages with regard to bilateral trade flows. We find that while English plays a very important role in determining business relations worldwide, it is not the sole driver of trade flows in sectors such as mining & energy and services, and that other languages matter equally, if not more, in reducing trade barriers.

Third, UK exports are predicted to increase if there is an increase in the number of languages shared with its trading partners. Our study estimates that a full eradication of language barriers with Arabic-, Chinese-, French- and Spanish-speaking countries could increase UK exports annually by about £19bn.

Quantifying the economic benefits of languages education for the UK economy

Within the macroeconomic modelling framework, the UK's economic performance is examined under different scenarios. In a baseline 'no change' scenario the UK economy is projected under current levels of languages-education provision in schools. Then, in a series of hypothetical scenarios, we assess how UK economic activity would evolve between now and 2050 if more UK pupils at Key Stage 3 (KS3) and Key Stage 4 (KS4) were able to speak an additional modern language to a level where it could be applied in a business setting. We consider the effects of languages on trade and human capital and assess the potential association with changes in UK GDP and consumer welfare. GDP is the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time (e.g. within a year). As a broad measure of overall domestic production, it functions as a metric of a given country's economic health. Consumer welfare concerns the question as to whether households within a country are better or worse off after an economic shock or policy change. For instance, households in a country could be better off if they can either buy their current basket of goods and services for cheaper prices or alternatively receive a higher income with which to buy more goods and services at given prices.

In the hypothetical scenarios, the emphasis is on improving language skills in four modern languages for UK pupils aged between 11 and 16 at KS3 and KS4, i.e. during the first five years of secondary education. There are many potential ways in which languages education can be fostered in the UK. Our scenario attempts broadly to mimic the Mandarin Excellence Programme (MEP), introduced in 2016, which aims to enable participating pupils in KS3/KS4 to attain at least a B1 level in Mandarin according to the Common European Framework of Reference for Languages (CEFR), with early evaluation reports suggesting that the programme has been successful.

For four different languages, Arabic, Mandarin, French and Spanish, we assess the potential economic effects of an increase by either 10 or 25 percentage points in the KS3/KS4 pupil population being able to use the language effectively later in a business setting. The modelling takes into account a number of sources of uncertainty by introducing sensitivity ranges around the main results of the scenario analyses following a Monte Carlo approach, and together with mid-point estimates (M) for all results, the lower (L) and upper (H) bound thresholds of a 99 per cent confidence interval are reported. The study provides the economic findings at the aggregate

level for the UK and then compares the estimated benefits with the potential costs to determine benefit-to-cost ratios.

Table S.1 reports the findings for a modelled increase of 10 percentage points in the number of KS3/KS4 pupils learning a language to a level that allows them later to operate effectively in a business setting. Findings are given for trade effects alone, and for a combination of trade effects and the potential effects associated with the increase in human capital.

Table S.1: Scenario: economic benefits over a 30-year horizon measured in GDP and welfare following a 10 percentage point increase in uptake of a language at KS3/KS4

	Arabic		Mandarin		French		Spanish	
Panel A: Cumulative GDP by 2050								
	£, million	%, GDP 2019	£, million	%, GDP 2019	£, million	%, GDP 2019	£, million	%, GDP 2019
I. Trade effect only								
M	928.2	0.0379	716.6	0.0292	672.5	0.0274	631.2	0.0257
L	918.6	0.0375	706.7	0.0288	664.5	0.0271	623.2	0.0254
H	944.4	0.0385	733.0	0.0299	685.7	0.0280	644.4	0.0263
II. Trade and human capital effects								
M	12,206.1	0.4978	11,978.2	0.4885	9,546.5	0.3893	9,468.6	0.3861
L	11,767.5	0.4799	11,517.7	0.4697	9,152.3	0.3732	9,142.1	0.3728
H	12,612.6	0.5144	12,354.1	0.5038	9,858.3	0.4020	9,762.4	0.3981
Panel B: Cumulative consumer welfare gain by 2050								
I. Trade effect only								
M	1,210.0	0.0493	1,843.1	0.0752	1,154.9	0.0471	947.0	0.0386
L	1,196.7	0.0488	1,817.1	0.0741	1,140.4	0.0465	934.8	0.0381
H	1,232.2	0.0503	1,885.5	0.0769	1,178.8	0.0481	967.3	0.0394
II. Trade and human capital effects								
M	12,239.1	0.4991	12,856.3	0.5243	9,833.2	0.4010	9,589.5	0.3911
L	11,806.3	0.4815	12,389.8	0.5053	9,441.1	0.3850	9,265.8	0.3779
H	12,643.0	0.5156	13,250.4	0.5404	10,149.0	0.4139	9,884.1	0.4031

Notes: M refers to the midpoint estimate based on the Monte Carlo simulation parameter inputs. L refers to the lower bound threshold of 99% confidence interval and H refers to the higher bound threshold of the 99% confidence interval. All values are reported in 2019 £.

A 10 percentage point increase in UK pupils in KS3/KS4 learning Arabic and able to apply the language effectively in a business setting is associated with an increase in UK GDP cumulatively over 30 years between £919mn and £944mn through a reduction in non-tariff trade barriers

related to languages alone. This corresponds to about 0.04 per cent of the UK's GDP in 2019. For a 10 percentage point increase in the UK KS3/KS4 pupil population learning Mandarin and able to use the language effectively in a business setting later, we estimate a cumulative GDP increase between £707mn and £733mn. For French we estimate a cumulative GDP increase between £665mn and £686mn, and for Spanish between £623mn and £644mn.

The equivalent consumer welfare effects are somewhat higher since the reduction in trade costs associated with reducing language barriers in the model increases the availability of imported goods at lower prices for households. For example, for Arabic we estimate a cumulative increase in UK welfare by 2050 between £1,197mn and £1,232mn by reducing non-tariff barriers only. The cumulative welfare gain for learning Mandarin is estimated between £1,817mn and £1,886mn, for learning French between £1,140mn and £1,179mn, and for learning Spanish between £935mn and £967mn.

If we add potential human-capital effects associated with learning languages to the scenario analysis, the estimated cumulative increase in the UK's GDP by 2050 for Arabic is estimated between £11,768mn and £12,613mn, for Mandarin between £11,518mn and £12,354mn, for French between £9,152mn and £9,858mn, and for Spanish between £9,142mn and £9,762mn. For Arabic and Mandarin this corresponds to about 0.5 per cent of the UK's GDP in 2019 and for French and Spanish to about 0.4 per cent. As before, the equivalent welfare effects are higher across all scenarios than the estimated GDP effects.

In order to understand the magnitude of the estimated effects, they have to be set against the cost of achieving them. While there is no direct publicly available data on the cost of providing education in one of the four languages considered, based on the information that is publicly available about the MEP and discussions with MEP stakeholders, a central cost estimate per student per year for Mandarin of at least £480 is applied. It is likely that programmes for French and Spanish, which are already well embedded in schools, would cost less to run, whereas Arabic is likely to be at least as costly as the MEP because it is starting from an even lower base in UK schools than Mandarin. We apply a range of cost estimates for each of the four languages under consideration.

The key finding from the cost-benefit analysis is that investing in languages education will most likely return more than the investment cost, even under conservative assumptions. Benefit-to-cost ratios of at least 2:1 for promoting Arabic, French, Mandarin or Spanish education are estimated, meaning that spending £1 could return approximately £2.

Discussion and conclusion

The analysis presented in this report demonstrates that investing in languages education could recoup its cost even under relatively conservative assumptions.

It is important to note that our economic analysis only considers trade and human-capital effects associated with improving languages education provision in the UK, and that other potential

effects, which are difficult to monetise or for which there is insufficient quantitative evidence for modelling work, have not been taken into account. There are nevertheless a number of studies and reports which demonstrate the importance of languages in various settings. These include (among others) literacy and skills; community and social cohesion and integration; international development and soft power; defence, diplomacy and national security; developing cognitive flexibility; and health and well-being. If these effects were taken into account and monetised in our modelling, they would inevitably increase the estimated economic benefits.

This study focuses on improving both the quantity and quality of language provision in the UK. The increase in achievement and motivation associated with the MEP is likely to foster students who wish to continue with languages beyond GCSE, at A Level and as either part or all of their university degree.

The findings of the report suggest that there are identifiable returns for investing in languages education, not just in the economic terms on which this report has focused, but also in producing the workers with the language skills needed for the UK to compete in an increasingly globalised world.

Table of contents

List of tables

Abbreviations

A Level	Advanced Level
AVE	Ad Valorem Equivalent
BCR	Benefit-to-Cost Ratio
CGE	Computable General Equilibrium
CI	Confidence Interval
CNL	Common Native Language
CSL	Common Spoken Language
DfE	Department for Education
EBacc	English Baccalaureate
EU	European Union
GCSE	General Certificate of Secondary Education
GDP	Gross Domestic Product
GTAP	Global Trade Analysis Project
KS	Key Stage
NTB	Non-Tariff Barrier
MEP	Mandarin Excellence Programme
OECD	Organisation for Economic Co-operation and Development
RoW	Rest of the World
SAM	Social Accounting Matrix
SMEs	Small and Medium-Sized Enterprises
STEM	Science, Technology, Engineering and Mathematics
UK	United Kingdom
US	United States
WTO	World Trade Organisation

Acknowledgements

1 Introduction

Languages are a central part of our identities and the way we view the world. They impact the lives of individuals regardless of their gender, ethnicity or geographical location. They shape the way we communicate orally and in writing, and how we form relationships with others in different communities and contexts across the globe. At a basic level, international travel, whether for business or leisure, means adapting to new linguistic and cultural situations. The ability to communicate in different languages has become increasingly important in the globally integrated business community and being able to communicate with new clients or business partners is often central to forging lasting and stable international relationships built on mutual trust. In an increasingly globalised world, language learning should thus form a key element in the education of children and young people to give them the necessary skills for their future careers.

The United Kingdom (UK) has a comparative advantage due to the global nature of English as a lingua franca. However, there are risks associated with relying heavily on one language given the increasing geopolitical and economic importance of countries where English is not the official (or the main first) language such as in China. Unfortunately, the UK has experienced a sharp decline overall in the uptake of languages since 2004, as evidenced by the falling number of entries for GCSE and A Level examinations in languages.[1] At a time when the UK government seeks to reset its global economic relationships as part of its vision of 'Global Britain',[2] such a decline is likely to have negative effects on the UK's ability to compete internationally, with recent research suggesting that language capabilities are positively linked with the export success of UK small and medium-sized enterprises (SMEs), which make up the majority of the UK business population.[3]

Indeed, evidence suggests that multilingualism can be beneficial for national economies, whereby countries that actively nurture different languages among their populations are rewarded with better trade relations and a more innovative workforce (Hardach 2018). Switzerland, for example,

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1 In 2004 the requirement for a language to be taken at GCSE was removed (see Tinsley & Doležal 2018 and Henderson & Carruthers 2021 on falling entries). See Chapter 2 for an explanation of the different system of qualifications used in Scotland.

2 HM Government (2018): 'Global Britain: delivering on our international ambition'; see: https://www.gov.uk/government/collections/global-britain-delivering-on-our-international-ambition (last accessed 15 January 2022).

3 https://www.aston.ac.uk/latest-news/new-research-links-languages-exporting-success-uk-smes (last accessed 15 January 2022).

attributes up to 10 per cent of its gross domestic product (GDP) to its multilingual heritage (Bradley 2008).[4] Furthermore, languages can help build trade relations between countries. For instance, a study of SMEs in Europe found that those which invested more in the language capabilities of their workforce were able to export more goods (Bel Habib 2011).[5] There is also evidence of an increased labour-market demand for multilingual workers. Research from the United States (US) (New American Economy 2017), for example, shows a rising demand for multilingual workers, with job advertisements seeking bilingual employees more than doubling between 2010 and 2015, and employers increasingly looking for workers who can speak Chinese, Spanish or Arabic. In an earlier study, it was estimated that the UK's lack of language skills is associated with significant loss of economic, social and cultural opportunities; the associated cost of the UK's linguistic underperformance related to lost trade and investment was estimated at 3.5 per cent of the UK's GDP every year (Foreman-Peck & Wang 2014). If no steps are taken, the UK could see a rising deficit in terms of education and training, identity and social cohesion, prosperity and well-being, and international relations, diplomacy, security and defence (Ayres-Bennett & Cambridge Public Policy SRI 2015). However, one should note that any language policy being implemented in an Anglophone region must take the centrality of English as its point of departure (Bamgbose 2020).

1.1. Research objectives

The aim of this report is to assess the potential economic benefits of languages to the UK. The goal is to revisit the study by Foreman-Peck and Wang (2014) and provide an updated economic estimate for some of the UK's untapped language potential. The research conducted for the purpose of this report consists of three steps.

First, the analysis revisits the existing literature related to the economic effects of languages. The relative importance of languages as an economic factor has recently gained increased attention in the economics literature and this study summarises the literature.

The second part of the analysis provides new estimates for the relative importance of spoken languages in international trade. Like Foreman-Peck and Wang (2014), we apply a gravity model of trade to assess the associations between languages and bilateral trade. However, we assess the language effect at the more disaggregated sectorial level, including agriculture, mining & energy, manufacturing and services trade.

The third step in the analysis uses parameter estimates for the trade effects derived from an applied empirical trade model, as well as estimates from the literature on the human-capital effect of languages. We apply these to a UK-wide macroeconomic model to assess the wider economic benefits to the UK resulting from enhanced quality and quantity of languages education in schools, leading to a greater number of UK pupils being able to communicate effectively in different languages.

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4   Switzerland has three official national languages, French, German and Italian; a fourth language, Romansh, is a statutory provincial language in the Grisons Canton.

5   E.g. German companies which invested heavily in multilingual staff added more export countries to their market than those that did not.

1.2. Structure of this report

Chapter 2 describes the current situation in UK languages education. Chapter 3 reports the findings of the literature review related to the economic importance of languages. Chapter 4 reports the estimates of the gravity model of trade. Chapter 5 reports the findings related to the economic effects of languages to the UK. Chapter 6 discusses the findings and concludes.

2 Background: languages education in the UK

The UK has a comparative economic advantage due to the global nature of English as a lingua franca. However, there is evidence that English alone is not enough, and that the UK may not be fulfilling its linguistic potential as a result of a decline in foreign-languages education in schools over the past two decades (British Academy 2019). Despite the English language being an obvious asset to the UK, there are risks in relying on it too heavily (Norton 2018). Brexit and the emphasis on Global Britain[6] have also highlighted the need for languages education as the rising global importance of non-English speaking countries such as China reduces the relative importance of English more than ever before (McQuillan 2021). Indeed, some of the world's fastest growing economies are not Anglophone, and the centre of gravity may be moving away from English (Kelly 2019). Hence, the role of the English language can only be complementary to that of other languages in a multilingual and multicultural context (Bamgbose 2020; Ricento 2012).

There are significant differences in the statutory provision for languages across the UK (Ayres-Bennett & Carruthers 2019). In England, languages are a statutory part of the school curriculum at Key Stages 2 and 3 (KS2 and KS3) and the National Curriculum in England therefore requires all local authority-maintained schools to teach languages to pupils aged 7 to 14. However, since 2004 the provision of languages has not been mandatory after the age of 14, and there have been reports that schools at times lack the capacity to deliver and provide high-quality languages education to pupils (Collen 2020). Furthermore, academies and free schools, which make up the majority of secondary schools in England, are not obliged to teach the National Curriculum, although in practice many follow it, at least in part. In Northern Ireland, the teaching of languages is not compulsory in primary schools (children aged 5–11). There is a selective system at secondary level with around 57 per cent of children attending secondary (non-grammar) schools and 43 per cent attending grammar schools[7]; significantly, the uptake of languages is much lower in non-grammar schools.

Scotland has adopted the Council of Europe's aim of having all children speak their first language ('mother tongue') plus two other languages (Scottish Government 2012). There

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6 https://www.gov.uk/government/collections/global-britain-delivering-on-our-international-ambition (last accessed 15 January 2022).

7 https://www.education-ni.gov.uk/publications/school-enrolments-northern-ireland-summary-data (last accessed 15 January 2022).

is statutory provision for the first additional language from P1 through to S3 (children aged 5-14), with the recommended addition of a second language from P5 (age 8). The assessment system is also different in Scotland, with pupils taking National 5, Higher and Advanced Higher qualifications.[8] Under the Global Futures plan (Welsh Government 2015), Wales has promoted a three-language formula, with English and Welsh as two of the languages alongside a modern foreign language. The learning of Welsh has been compulsory for children aged 5–16 (although they are not required to be entered for a public examination); a modern foreign language has been compulsory, as in England, at KS2 and KS3. Beginning in Year 7 in secondary schools in September 2022, a new curriculum for Wales will be rolled out: what are henceforth termed international languages will be taught alongside Welsh and English within a single Area of Learning and Experience – Languages, Literacy and Communication.[9] There is an expectation that primary schools will introduce an international language from Year 5 which will be taught in years 7–9, as is currently the case. However, these languages will not be core subjects, unlike English and Welsh (ages 5–16). New 'made in Wales' GCSEs are in preparation by the examination board WJEC.

Concerns have been expressed about both the quantity and quality of languages provision in the UK. In terms of quantity, the OECD 2018 Pisa results show that the UK is well below average in the number of hours students spend on language learning.[10] As regards quality, the 2015 Ofsted report, *Key Stage 3: the Wasted Years?* (Ofsted 2015), found significant weaknesses in the teaching of modern foreign languages, and that languages education failed to challenge and engage pupils.[11] According to the Higher Education Policy Institute, while an average 89 per cent of people aged between 16 and 30 in the European Union (EU) consider themselves able to read and write in more than one language – with 90 per cent in Germany and 79 per cent in France for instance – the comparable figure in the UK is only 32 per cent (Bowler 2020).

The number of students studying a language at secondary school decreased in England by 27 per cent between 2002 and 2011 (Tinsley & Doležal 2018). There is also no evidence that the government's ambition for 75 per cent of Year 10 pupils (beginning KS4) to study EBacc subjects by 2022 (for examination in 2024) will be achieved,[12] with levels in 2019 at less than 50 per

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8   Because of the different assessment system in Scotland, the recommendations in this report do not translate easily into that system and we therefore focus particularly on England, Northern Ireland and Wales, where GCSE and A Levels are taken. Note also that where we refer in this report to KS3 and KS4 this should be taken to include the Scottish equivalents; under the new curriculum KS3 and KS4 will also disappear in Wales.

9   For further details, see https://gov.wales/education-changing; https://hwb.gov.wales/curriculum-for-wales/languages-literacy-and-communication (both last accessed 15 January 2022).

10   https://www.oecd-ilibrary.org/sites/639ec0b7-en/index.html?itemId=/content/component/639ec0b7-en (last accessed 15 January 2022). Note that throughout this report the terms 'pupil' and 'student' are used interchangeably to refer to those studying in primary or secondary education.

11   The YouGov Children's Omnibus study (2018) revealed that languages are currently one of the less enjoyed school subjects, with boys enjoying languages less than girls (18 vs 28 per cent); https://yougov.co.uk/topics/education/articles-reports/2018/09/04/which-school-subjects-do-boys-and-girls-enjoy-more (last accessed 15 January 2022).

12   https://www.gov.uk/government/publications/english-baccalaureate-ebacc/english-baccalaureate-ebacc (last accessed 15 January 2022). The EBacc is a set of subjects at GCSE which are designed to keep young people's options open for further study and future careers: English language and literature, mathematics, the sciences, geography or history, and a language.

cent, and with the language GCSE requirement frequently being the missing element. A growing number of pupils are being disapplied from languages at KS3 (ages 11–14) in both state and independent schools in order to receive extra support in literacy instead (Collen 2020). There is also evidence that the Covid-19 pandemic could be exacerbating existing gaps in languages education in parts of England. For instance, language teaching was suspended in January 2021 due to Covid at one in five of the primary schools responding to the 2021 Language Trends survey, and two in five pupils in KS3 at state secondary schools responding to the survey did not engage with language learning during the first national lockdown (Collen 2021).

It should be noted that this decline in language learning may also impact other core skills. For instance, research shows the value of language learning for literacy, including in the first language (Forbes & Fisher 2020; Murphy et al. 2015), as well as in contributing to the mental agility and problem-solving skills valued by employers (Vega-Mendoza et al. 2015). There is also a social mobility or 'levelling up' dimension to this issue, since those schools reducing access to language learning tend to have a higher proportion of pupils eligible for free school meals and are more likely to be located in the north of England rather than the midlands or the south, and to be judged as requiring improvement by Ofsted (Tinsley and Doležal 2018).

There are also changing trends with respect to which languages are most frequently taught and examined in the UK (Churchwood 2019). In terms of GCSE entries in languages (Henderson & Carruthers 2021), French, for which numbers have historically been the highest, has been in sharp decline over the past 15 years, and it seems likely that, under current trends, it will very soon be overtaken by Spanish in England and Northern Ireland. The numbers for Irish in Northern Ireland are relatively stable, whilst those for Welsh in Wales have risen dramatically. Numbers for German are significantly lower than those for French and Spanish, as are those for other languages such as Mandarin and Arabic. At A Level, the decline in French entries is marked with entries in Spanish in England and Northern Ireland already on a par with them. Most striking is the fall in German entries in England and Wales, and in all three jurisdictions A level entries in German represent only about 1 per cent of total pupil entries (Henderson & Carruthers 2021).

An important initiative in England to combat some of these issues is the Mandarin Excellence Programme (MEP), delivered to participating schools by the University College London (UCL) IOE Confucius Institute for Schools on behalf of the Department for Education (DfE) in partnership with the British Council. Established in 2016,[13] the programme is based on an intensive study of Mandarin Chinese. The background to the MEP is the status of Mandarin Chinese as one of the world's most widely spoken languages, which taken alongside China's growing economic and political importance makes Mandarin Chinese a very important language for the future. The MEP starts in Year 7 (KS3), with financial support to schools continuing until Year 11 (KS4). In addition, KS5 pathway options are also being tracked as part of the long-term aims of the MEP. Participating students study eight hours of Mandarin Chinese every week including a minimum

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13   See https://ci.ioe.ac.uk/mandarin-excellence-programme/ for further information (last accessed 15 January 2022). There are, of course, other initiatives which could potentially be significant for languages including the Skills and post-16 Education Bill currently going through Parliament. The bill embeds employers at the heart of the skills system, making it a legal requirement for employers and colleges to collaborate on the development of skills plans; see https://www.gov.uk/government/news/new-legislation-to-help-transform-opportunities-for-all (last accessed 15 January 2022).

of four hours of classroom lessons on Chinese language and culture supplemented by four hours of guided self-study (Nicoletti & Culligan 2021).[14] Alongside financial support, the programme offers practical and pedagogical support including teaching materials, online resources and opportunities for teaching practice.

With an initial investment of £10m, the original aim of the programme was to have 5,000 students on track to fluency in Mandarin by 2020. As of September 2021, there are almost 7,000 students enrolled on the programme and the interim evaluation report suggests it is achieving its intended objectives (Nicoletti & Culligan 2021).[15] The case studies in the evaluation report also record how the MEP supports its mission of broadening students' horizons and boosting their motivation and aspirations. The lessons are made as fun, fast-paced and engaging as possible to sustain pupil motivation and to combat the perception that 'languages are hard'. The programme has the advantages of having been fully costed by the DfE and integrated into the English public examination system, with the first cohort on track to achieve strong GCSE results. Whilst the evaluation report cites challenges regarding timetabling the extra hours within the curriculum, these challenges are described as an inconvenience, rather than an insurmountable hurdle. Schools have demonstrated the programme to be logistically feasible, with the extra face-to-face hours variously timetabled at lunchtimes or after school, in personal development or tutor time, or replacing subjects such as music or art and design. As a result, the programme does not impact negatively on the learning of other EBacc subjects.

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14   There are also two periods of intensive study, a two-week period in China and a week in Nottingham, with the former being seen as particularly valuable.

15   The programme was renewed for another three to four years in 2021. At the same time, the government announced a new £4m Latin Excellence Programme, modelled on the MEP, to boost GCSE Latin entries: https://www.gov.uk/government/news/thousands-more-students-to-learn-ancient-and-modern-languages (last accessed 15 January 2022). Teaching is due to start in September 2022 and to run for four years.

3 The emerging field of the economics of language

Given the increasing mobility and interconnectivity of our globalised world, the ability to communicate in different languages and to be able to study, work and do business with commercial partners in different parts of the world is increasingly important. As a result, learning a language can be regarded as an investment in a person's human capital (see Chapter 3.2.1). This applies not only to migrants who move to another country to live and work, but also to non-migrants who often need to learn another language if their work involves communicating with people who speak different languages. The ability to communicate with others is not only a valuable skill for the labour market but also provides individuals with cultural agility, enabling them to be productive in environments where collaborators or competitors are international, speak different languages and have different cultures.

The concept of the 'economics of language' refers to the economic analysis of the determinants and consequences of language skills at the individual, societal and international levels (Ginsburgh & Weber 2020). In the field of economic analysis, language can be characterised as a resource that individuals seek to obtain, facing a trade-off between related costs to obtain the resource and benefits accruing from possessing it. Languages are an important tool for communication, and the economic well-being of a society can be enhanced if its members can communicate with each other (Bloom & Grenier 1991; Grenier & Zhang 2015). From a business point of view, for example, most activities related to producing goods and services involve some sort of teamwork and require understanding of shared written and verbal instructions. Consumption, another economic activity, is also enabled when buyers and sellers can understand each other regarding the prices of goods and their functionality.

Languages are therefore a contributor to human capital in society and can be fostered, like all other skills, leading to more productive outcomes. In purely economic terms, people learn a language because they expect a return on their investment, perhaps by expanding their ability to communicate and so becoming more productive – and thereby possibly earning higher wages (Grenier & Vaillancourt 1983). When deciding which languages to learn, people tend to choose a language which provides an adequate return since investing in languages is associated with

opportunity costs,[16] requiring time and resources that could be devoted to other activities. Multilingualism, defined as the ability to speak at least two languages, increases a person's human capital, and can influence people's way of thinking and behaving. Languages can also contribute to the cultural development of individuals, communities, and societies. The relative advantage of using a language depends on the number of people who speak it. The more people who speak a particular language, the larger the potential 'market size' for that language, and hence the potential returns for learning it. However, it is important to highlight that if language were to be considered purely as a tool for communication, economic theory would predict a convergence to one single language, as it would reduce inefficiencies and transaction cost in economic interactions across language borders. However, despite the growth of English as a leading business language over recent decades, there are still over 7,000 different languages in the world – albeit some are threatened or endangered – thanks to the strong link between language, culture, and identity.[17] On a more global scale, language proficiency, as well as linguistic distance and similarities, may have a (direct or indirect) impact on areas such as transnational labour mobility, trade, education, the social inclusion of ethnic minorities and migrants, and companies' international competitiveness.

In this chapter we provide a non-systematic overview of the existing literature on the relative importance of languages in economic terms and on wider aspects of society. The goal of the literature review was to review some of the latest evidence related to how languages can affect economic behaviour.[18] Specifically, we focus on three main socioeconomic outcomes directly associated with language skills: international trade, human capital and cultural capital.

3.1. The importance of languages in international trade

Among the many potential economic and cultural incentives for learning languages, one of the main reasons historically was the need to trade with other civilisations. Trade routes developed throughout ancient history due to the fact that some commodities, such as spices, were only available in specific locations. Hence, traders were obliged to travel through various cities and ports on different continents, and the ability to communicate and negotiate in different languages was essential to reduce transaction costs (Ginsburgh & Weber 2020). One of the best-known ancient trade routes is the Silk Road, which linked the ancient civilisations of China and the Roman Empire. In addition to fostering trade by providing wealth to participating merchants and satisfying the consumer demand for different goods, the Silk Road also became a vital route for the exchange and spread of knowledge, culture, technology, religion, languages and the arts, with many trading centres along the route (UNESCO n.d.; Department of Ancient Near Eastern Art, The Metropolitan Museum of Art 2000). Trade opportunities were thus enhanced by the ability

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16   Note that returns and costs can be measured in many ways, not just in financial or monetary terms. For instance, individuals may choose to learn a language so they can better communicate with friends in other countries or to access its literature and culture, not just to improve personal career opportunities.

17   Ethnologue: https://www.ethnologue.com/guides/how-many-languages (last accessed 15 January 2022).

18   Relevant literature was identified in JSTOR, EBSCO and Google/Scholar using a combination of different search terms including 'languages', 'economics', 'human capital' and 'skills', and through additional references cited in the studies reviewed. However, it is important to emphasise that the literature review did not follow the requirements for a systematic review.

of individuals to communicate with each other, and trade routes became the communication highways of the ancient world. In today's globalised world, international trade is far less hindered by differences in factors such as time zones, although differences in culture and language may still create barriers preventing the full realisation of the potential benefits of international trade and migration. The need to learn about different cultures and languages has therefore become more important in economic and social terms than ever (Adserà & Pytliková 2015; Ginsburgh et al. 2017).

In the last two decades, numerous economists and other social scientists have focused on the relationship between languages and trade, and there is a growing consensus that knowledge of more than one language is an important determinant of international trade (Egger & Lassmann 2015; Egger & Toubal 2016; Fidrmuc & Fidrmuc 2009; Fidrmuc & Fidrmuc 2016; Melitz 2008). According to the existing literature, there are three different ways in which trade patterns can be influenced by languages: (1) through a common official language; (2) through a common native language; or (3) through any common spoken language, whether native or not. In the economic literature these three categories are differentiated in the following way: the official language usually denotes the presence of geopolitical ties, such as a shared colonial history; the native language refers to the idea that people living in a particular area, region or country share the same mother tongue; and a common spoken language is a language that allows two individuals with different native languages to communicate (Egger & Lassmann 2012; Gazzola 2016; Melitz & Toubal 2014). Studies focusing on common official languages consistently conclude that sharing an official language increases the volume of bilateral trade between two countries (Fidrmuc & Fidrmuc 2009; Melitz & Toubal 2014); for instance, Egger and Lassmann (2012) show that on average a common official language increases bilateral trade flows directly by 44 per cent. The ability to communicate in a particular language can have an effect on trade flows between two countries, irrespective of whether it holds official-language status in either or both countries (Fidrmuc & Fidrmuc 2016; Gazzola 2016; Melitz & Toubal 2014). Common spoken languages have been proven to have a stronger effect on trade than either a common native language or a common official one (Egger & Lassmann 2015; Melitz & Toubal 2014).

Since international trade and GDP are intrinsically related, a few economic studies have also estimated the contribution of language skills to national economies in terms of GDP. For instance, knowledge of languages and a multilingual heritage was estimated as contributing one-tenth of the Swiss GDP (Bradley 2008) and around 3 per cent of the provincial GDP for the Canadian province of Quebec (Gazzola 2016). Conversely, the UK was estimated to be losing out on the equivalent of 3.5 per cent of its GDP every year on account of the lack of strong language skills among its population (Foreman-Peck and Wang 2014).

It is important to highlight that much empirical work regarding the association between language and trade has been conducted at the aggregated country level. However, more firm level analysis is emerging showing the relative importance of language skills at the more disaggregated micro-level. For instance, studies show that SMEs in European countries which invested more in the language skills of their workforce were able to export more goods and to have a broader market in terms of export countries (Bel Habib 2011). The same is true for the UK, with a recent study showing that SMEs making use of language capabilities among their workforce are 30 per cent more likely to export than those which do not (Tibrewal 2021). Overall, the economic benefits

deriving from the acquisition and learning of additional languages go beyond their impact on trade. Indeed, different areas of the economy such as labour markets, science and education are also likely to be positively impacted (Fidrmuc & Fidrmuc 2016).

3.2. Labour-market effects of language-related human capital

3.2.1. How language relates to educational performance and knowledge

Human capital is generally defined as the 'knowledge, skills, and health that people invest in and accumulate throughout their lives, enabling them to realize their potential as productive members of society' and can be developed by investing in people through education, health care and jobs, among other things (World Bank 2021). Language is a component of human capital, given that language knowledge is economically functional and generates economic benefits for individuals. These benefits are correlated to labour-market outcomes such as higher earnings and greater employability for multilingual compared to monolingual people. Wage and employment outcomes for individuals with language skills may be positively impacted by a number of factors related to the fact that language competency is associated with other desirable attributes such as enhanced communication skills, cultural awareness and the broader work experience gained by language graduates who spend a period abroad (Morris et al. 2014). Indeed, employers seem increasingly to look for individuals who are able to serve a broader clientele and collaborate with colleagues internationally across linguistically diverse groups (Colón 2019). The demand by firms for multilingual workers in the US, for example, has more than doubled over the last decade and is expected to rise further, especially for Spanish, Mandarin Chinese and Arabic speakers (New American Economy 2017). In the UK it is notable that foreign-language skills were the cause of the greatest dissatisfaction amongst employers, with almost two-thirds of employers not satisfied with the foreign-language skills of school and college leavers, and more than half not satisfied with the language skills of university graduates (Morris et al. 2014).

3.2.2. Multilingualism and labour-market outcomes

Most existing research which has aimed to establish a causal link between languages and labour-market outcomes has focused on the ability of immigrants to learn the language of their host country for the purposes of assimilation and/or job-enhancement (Gazzola 2016).[19] Economically, the decision to migrate voluntarily to another country is based on the difference between an individual's (monetary and non-monetary) benefits and costs. The latter may include not only the monetary costs of moving country but also of learning a new language and adjusting to a new culture, while benefits may include the prospect of finding a job and/or higher wages (Ginsburgh & Weber 2020). Language proficiency in the principal language of the destination country among immigrants has been estimated to yield an increase in earnings ranging from 5 to 35 per cent depending on several factors such as the source and destination countries, the languages involved and the measure of proficiency used (Chiswick & Miller 2015).

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19   A non-exhaustive list of the literature on this topic can be found in Gazzola et al. (2015).

Beyond research on immigrants, existing studies find evidence that multilingualism has a positive impact on a country's overall population, not just on the migrant population within that country.[20] According to US evidence, studying foreign languages at high school is associated with higher wages and wage growth over the life cycle. For instance, Altonji (1995) shows that two years of language study at high school is on average linked with about a 4 per cent higher wage. Saiz and Zoido (2005) find that US college graduates who can speak a second language (e.g. other than English) earn on average 2 to 3 per cent more than college graduates with no knowledge of a second language, all else being equal. In Saiz and Zoido (2005) this language effect is adjusted for a range of factors, including a person's parental education, degree subject, college attainment and a number of personal characteristics, all of which could influence whether an individual might earn a higher wage in the absence of knowledge of a second language in addition to English. In the Canadian context (Christofides & Swidinsky 2010), it has been demonstrated that bilingual men earned 3.6 per cent more than those speaking only English, with bilingual women earning 6.6 per cent more than their monolingual peers.

In the European context, a handful of studies also observe the positive impact of multilingualism on a person's labour-market outcomes. Focusing on several EU countries, Ginsburgh and Prieto-Rodriguez (2011) examine the financial benefits of mastering a second language for native, non-immigrant workers and reached the conclusion that the proficient[21] use of second languages in the workplace has a positive effect on earnings, with effects varying between countries and across the wage distribution. Despite English being the main lingua franca worldwide,[22] the authors highlight the idea that it competes with other Romance languages in Southern European countries, such as French in Spain (Ginsburgh & Prieto-Rodriguez 2011; Isphording 2015). Similarly, Williams (2011) finds that the use of a second language in the workplace is associated with positive earning differentials ranging from 3 to 5 per cent in different Western European countries. Using large-scale Eurobarometer survey data,[23] Donado (2014) demonstrates that knowing a second language increases the probability of being a higher earner by about 5.8 per cent and decreases the risk of being unemployed by about 3.2 per cent across 30 European countries. While speaking English (in non-English speaking countries) and German (in non-German speaking countries) seems to have a larger impact on average on employment outcomes, speaking French, Spanish and Italian appears to have positive impacts on employment outcomes for the non-migrant population in many European countries. The differentials due to multilingualism have also been studied in the context of the Turkish (Di Paolo & Tansel 2015), Polish (Liwiński 2019) and German (Stöhr 2015) labour markets. Knowledge

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20   Note that 'native population' here refers to the non-migrant population of a country.

21   Language proficiency is not a straightforward concept since there are different ways of measuring it depending on data availability, as well as on authors' preferences and assumptions. See Chiswick (2008), Chiswick & Miller (2015), Dustmann & Fabbri (2003), Khourshed & Meango (2020) and Zorlu & Hartog (2018) for further analyses based on language proficiency.

22   In earlier times, Latin and then French were the main lingua francas in Western Europe, but during the 20th century as a result of the global spread of the British Empire and the commercial dominance of the United States, English assumed this role; see http://www.historyworld.net/wrldhis/plaintexthistories.asp?historyid=099#ixzz7CgC4k8LD (last accessed 15 January 2022).

23   https://www.gesis.org/en/eurobarometer-data-service/search-data-access/data-access (last accessed 15 January 2022).

of one or more additional languages was found to bring positive earning differentials in all three cases.[24] Confirming previous research findings, Wang et al. (2017), using the European Community Household Panel (running from 1994 to 2008 across 15 European countries), found that using a foreign language at work increased a person's wage by about 2 per cent. While the study did not observe different wage premiums between speaking English (in non-English speaking countries), EU official and non-official languages, its findings suggest that workers are better paid in proportion to the degree of linguistic difference between the foreign language and the local language. That is to say, the returns for speaking Spanish in France are lower than the returns for speaking Mandarin or Arabic, given that Spanish and French are closer to each other linguistically.[25]

International evidence suggests that being multilingual has a positive impact on labour-market outcomes; by contrast, UK-specific evidence is scarce and mixed. Williams (2011), for instance, finds statistically significant positive wage returns from using a second language at work in 14 Western European countries (including Ireland) except for the UK. In countries such as Austria, Belgium, Germany, the Netherlands, Italy and Spain the wage return from using a second language at work is between 7 and 12 per cent, all else being equal, with even higher returns found in countries including Denmark, Ireland, Greece, Portugal and Finland. It is important to highlight that some of the highest wage returns were for those speaking English in countries where English is not the official language, but significant returns have also been reported for speaking French, Spanish, German and Italian. Williams (2011) finds an average 5 per cent wage premium for speaking a second language in the UK, although there is uncertainty around the result.[26] For the UK, Donado (2014) observed a positive effect on the probability of being a higher earner and a reduction in the probability of being unemployed among workers who reported using a second language at work compared to workers who did not.

Other UK-focused studies have analysed the wage returns of different types of qualifications, for instance comparing language degrees with other degrees such as those that focus mainly on mathematics. Dolton and Vignoles (2002), for example, investigate labour-market outcomes between different A Level subject choices among the male population using the longitudinal 1958 National Child Development Study (covering about 17,000 people born in either England, Wales or Scotland in 1958); they find positive returns for studying mathematics, but not for science, English or languages. An analysis of the British Cohort Study (Morris et al. 2014) looks at whether individuals who studied languages at school and at university experience better labour-market outcomes compared to other degrees. The findings indicate that when comparing individuals who studied at least one language at A Level compared to those who did not, there is a positive association with wages, suggesting that those who studied languages earn about 12.5 per

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24   Languages considered were English, French, Spanish, Arabic, German, Italian and Russian, among others.

25   The finding is explained through a possible labour-supply mechanism for foreign-language skills. Given the geographical proximity of European countries to one another and the fact that learning a closely related language is easier than one which is typologically very different, a native-born European worker is more likely to be able to speak a second European language compared to more linguistically distant languages such as Arabic and Mandarin.

26   Notably, the estimated returns for speaking French, German or Spanish were 11 per cent, 2 per cent and 16 per cent respectively, although these figures are not statistically different from zero using the UK sample population of the European Community Household Panel.

cent more. However, once gender, social class and academic ability are controlled for, the wage premiums are reduced to 7 per cent. Furthermore, there is no evidence that individuals with language degrees experience better labour outcomes compared to their peers with degrees in other fields. For example, recent evidence (Britton et al. 2020) suggests that the earnings of those with degrees in mathematics and medicine are currently amongst the highest, whilst degrees in languages are associated with lower incomes, all else being equal.

As discussed by Morris el al. (2014), there are a number of possible explanations for the mixed UK evidence on the labour-market returns from second-language skills. First, there could be a degree of complacency among UK employers about the relevance of multilingualism, given that English is frequently the lingua franca of business. Second, UK companies may not recognise the importance of language skills for improving their export prospects. While the evidence suggests that export-oriented firms do value language skills and recognise them as an important tool for improving trade relations, UK companies may nevertheless undervalue the true economic value of languages. Third, UK employers may not be willing to invest in languages education, despite their potential need for these skills. There may also be a mismatch between the level of proficiency in speaking a second language among the UK population and the level needed to succeed in a global business environment. Hence, UK employers may prefer to hire speakers of foreign languages from abroad who may compete with UK natives in the labour market, putting potential downward pressure on second-language skills among UK workers. While it is impossible to determine fully the factors behind the mixed UK evidence, it is important to highlight that the studies comparing different types of degree subjects (e.g. Dolton & Vignoles 2002) may not be the most relevant for determining the financial return from languages as these are compared against skills that may have an inherently higher labour-market value, such as mathematics. However, this does not imply that language skills have no value. A more relevant study is that by Saiz and Zoido (2005), which examines the economic return from language skills for those studying the same degree subject and finds a positive wage premium associated with multilingualism. Furthermore, most studies in this area have been based on data before 2000 and therefore do not consider the recent effects of globalisation on wages, specifically the notable economic and geopolitical rise of China over the last two decades.

3.3. Language as a determinant of cultural capital

The relation between language and culture has been a matter of interest for more than a century. In the first half of the nineteenth century, Humboldt (1988 [1836]) articulated the idea that languages are a means to express the 'inner life' of their speakers rather than just a means of communication (Ginsburgh & Weber 2020). In the twentieth century a number of scholars (e.g. Boas 1940; Mandelbaum 1949; Whorf 1956) have reiterated the central idea of the interdependence of language and culture. Sapir (1921) and Whorf (1956) further argued that language may influence one's way of thinking and behaving, including decision making, leading to the theory known as the 'Sapir–Whorf (SW) hypothesis' or the 'Theory of Linguistic Relativity'. This theory is based on the idea that, since societies may not share cultural categories, words and grammatical structures shape one's reality, so that words from one language may not translate directly into another (Thomson 1997). Leavitt (2010, 143) argues that one of the main contributions of linguistic relativism is that it 'distinguished clearly between what is *possible* to

think, which is in principle unlimited for speakers of any language, and what people *habitually* think, which may be strongly influenced by their language'. Indeed, according to Kramsch (1998, 12), 'despite the general translatability from one language to another, there will always be an incommensurable residue of untranslatable culture associated with the linguistic structures of any given language'. Language is rooted in culture, and culture is reflected and passed on by language from one generation to the next (Emmitt et al. 2006). In other words, some patterns in language may provide an insight into a specific culture (Boroditsky 2010). A few examples include the perception of colours (Casaponsa & Athanasopoulos 2018; He et al. 2019); the representation of time (Bylund & Athanasopoulos 2017; Ginsburgh & Weber 2020; Krieken et al. 2019; Mavisakalyan & Weber 2018); and the gender of nouns (Jakiela & Ozier 2018; Mavisakalyan & Weber 2018; Shoham & Lee 2018).

In short, the particular grammatical and lexical characteristics of a language may directly influence individual mindsets and thus human behaviours, beyond their impact via cultural transmission (Galor et al. 2020; Ginsburgh & Weber 2020). Whilst there may not be a consensus as to how exactly language and culture are related, or indeed about the channels of influence (Gelman & Roberts 2017), there is broad agreement that languages play a key role in the transmission of human culture. Those who are proficient in another language therefore do not just bring linguistic skills to business but also the intercultural agility that can enable people to work across different cultures and countries.[27]

3.4. Summary

The key findings of this chapter can be summarised as follows:

- Languages play a significant role in international trade. The existing evidence suggests that sharing a common language is associated with higher bilateral trade between countries. That is, sharing a common language can, all else being equal, reduce trade barriers. Most existing research has used a simple binary indicator variable to determine whether countries share a common official language; however, a shared official language may not adequately determine to what extent individuals from different countries can communicate with each other since they typically share languages beyond just official languages.

- Language skills tend to increase a person's human capital. There is empirical evidence that learning additional languages beyond a person's native language enhances human capital, with multilingual individuals potentially earning higher wages and having better labour-market outcomes than their monolingual peers. That is, speaking other languages may increase demand for people with the right skills in specific industries which deal heavily with trading partners in different countries across the globe. For instance, a US study estimates that speaking an additional language increases the earnings of college graduates on average by about 2 per cent compared to individuals who do not speak another language, even adjusted

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27   This suggests that while AI translation tools, which are improving all the time, can fulfil some of the needs of business, they will not be able to replace the intercultural competence of well-trained linguists.

for many other factors which determine income, such as a person's gender, college degree subject, etc.

- UK evidence on the association between language skills and labour-market outcomes is mixed. While empirical studies suggest that there is a wage premium in European countries for using a second language at work (including in English-speaking Ireland), findings for the UK in many cases show no direct wage return for speaking an additional language beyond English. While there are many different possible reasons for the mixed UK evidence, most empirical evidence for the UK compares the labour-market returns for different degrees and finds an inherently higher labour-market return for mathematics than for language skills. However, that does not imply that language skills have no value. A more relevant study is that by Saiz and Zoido (2005), which examines the economic return from language skills for those studying the same degree subject and finds a positive wage premium associated with multilingualism.

- Multilingual speakers are more likely to work across different cultures and countries. Business benefits not just from the linguistic skills but also from the greater intercultural agility associated with language learning.

4 Quantifying language effects on trade by sectors

In this chapter we provide new parameter estimates for the effects of spoken languages on international trade flows. When countries trade goods and services with each other there are many well-known trade costs that affect bilateral trade such as tariffs (taxes that are charged on the imports of goods from other countries) (Kane 2020). Most tariffs are set as a percentage of the value of the good being imported. The relative importance of tariffs has decreased over recent decades as many countries have engaged in bilateral or multilateral cooperation agreements to reduce trade barriers with the aim of fostering trade. However, to continue protecting some of their goods and services from import competition, countries have imposed non-tariff barriers (NTBs). These NTBs include quotas, specific product regulations or rules of origin (Institute for Government 2017). In a wider sense, however, there are several other trade barriers which also represent non-tariff measures including cultural and language barriers, which reduce trade between countries. In essence, a language barrier can act like a quasi-tax by 'taxing' trade between two trading partners either by lowering trade, partially to the benefit of other trading partners who may speak the same language (trade diversion) or by reducing trade overall (trade destruction) (Foreman-Peck & Wang 2014).

The goal of the empirical analysis presented in this chapter is to estimate the effects of spoken languages on trade across different sectors. The empirical analysis in this study differs from existing studies in two ways. First, in many existing studies that have examined the association between languages and trade (including Foreman-Peck & Wang 2014) the usual common language measure used is a binary indicator on whether countries share a common official language or not. However, a simple binary measure of common official language is not able to reflect adequately the diverse linguistic influences on trade, including the ability to communicate with trading partners through any common spoken language, rather than just sharing a common official language which may not be spoken by a large fraction of a country's population (Melitz & Toubal 2014).[28] Second, most empirical analyses so far have been only on aggregated merchandise trade (e.g. goods and agriculture), whereas in fact the effects of languages could vary across different sectors, especially when we consider service sectors featuring numerous person-to-person interactions requiring direct lines of communication. This study examines the sector-specific effects of languages on bilateral trade.

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28   For instance, Denmark's official language is Danish, but a relatively large proportion of the Danish population is able to communicate well in English.

To bridge these gaps in the existing literature we use a well-established regression-based framework, the so-called 'gravity model of trade', in which we calculate the correlation between shared spoken languages and bilateral sector-specific trade flows between any given pair of countries, after controlling for other factors that may influence spoken languages, trade or both.

To that end, we combine two data sources: first, a dataset that provides information about linguistic skills within countries and how they relate to the ability of the populations to communicate with each other (Melitz & Toubal 2014); and second, a database that includes bilateral trade flows between virtually any given pair of countries disaggregated by sectors, including services (Borchert et al. 2021).[29]

The chapter begins by outlining the theory and the empirical approach behind the gravity model of trade, then describes the data used and provides the empirical findings for the association between the prevalence of spoken languages between countries and how this may affect bilateral trade across different sectors.

4.1. Methodology: a gravity model of bilateral trade

The relationship between languages and bilateral trade has been explored extensively in the empirical literature, as discussed in Chapter 3. Most of the existing evidence is based on the examination of aggregated bilateral goods trade (e.g. manufacturing) using a gravity model of trade. The gravity model is one of the workhorse models in international trade and has been applied in numerous studies to explain determinants of bilateral trade flows over recent decades. The model is of particular interest for policy research, as it allows the trade impacts of various trade-related policies – such as direct tariffs, free-trade agreements and 'behind-the-border' regulatory barriers to trade – to be taken into account. An appealing feature of the gravity model is that it follows straightforward intuition, is empirically implementable, and is built on a microeconomic theoretical structure. The model was originally conceived as a simple analogy between Newton's Law of Gravitation and the factors that influence bilateral trade flows, proposing that the flow of trade between two countries is proportional to the economic size of the trading partners and inversely related to their distance from each other (Baier & Standaert 2020). Many studies have demonstrated an empirical relationship between these factors but, despite its empirical success, for many years the gravity model lacked a sound theoretical underpinning. However, over recent years a clear theoretical foundation for the gravity model has been developed, showing that gravity-like empirical specifications emerge from a variety of different theoretical structural assumptions regarding technology, market structure, consumer preferences and their relation to trade (Arkolakis et al. 2012).

4.1.1. The baseline structural gravity model

While an empirically estimated gravity model of trade has been applied in the literature for more than three decades, a more structural form of the model's theoretical foundation was established

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by Anderson and van Wincoop (2003). The underlying idea of the structural gravity model is that consumers have a 'love of variety', i.e. consumer utility increases both from consuming more of a given product variety and from consuming a wider bundle of different varieties (Dixit & Stiglitz 1977). On the supply side, each firm produces a single unique product variety under increasing returns to scale,[30] creating an equilibrium at which many firms in a country set prices above marginal cost. Furthermore, a producer in each country can sell goods domestically or in any other country. As a simplifying assumption, selling goods only domestically does not lead to transportation costs, whereas selling goods abroad does. Consumers purchase product varieties from all countries, whereby prices of imported varieties are adjusted upward due to the transportation costs.

In equilibrium, firms engage in international trade while producing goods both for the domestic and foreign markets. Consumers meanwhile purchase products manufactured both domestically and abroad. The model aggregates exports across all firms within an economy, which enables the establishment of a function for the total aggregated value of a country's exports, which is the main dependent variable of the gravity model.[31] The simplifying idea behind the structural model (Anderson & van Wincoop 2003) is that total production is equal to a country's GDP. This allows for a macroeconomic accounting leading to the structural gravity system as follows:

$$X_{ij} = \frac{Y_i E_j}{Y} \left(\frac{\tau_{ij}}{K_i P_j} \right)^{1-\sigma} \qquad (1)$$

$$K_i^{1-\sigma} = \sum_{j=1}^{C} \left\{ \frac{\tau_{ij}}{P_j} \right\}^{1-\sigma} \frac{E_j}{Y} \qquad (2)$$

$$P_j^{1-\sigma} = \sum_{i=1}^{C} \left\{ \frac{\tau_{ij}}{K_i} \right\}^{1-\sigma} \frac{Y_i}{Y} \qquad (3)$$

Where X_{ij} represents exports from country i to country j, Y_i is the GDP of country i, E_j is the total expenditure of country j (which is usually proxied by the country's GDP), Y is the world's total GDP, σ represents elasticity of substitution between product varieties, and τ_{ij} are trade costs which accrue from trading products or services with countries abroad. K_i represents outward multilateral resistance, which captures the fact that exports from country i to country j depend on trade costs across all possible export markets. P_j represents inward multilateral resistance capturing the dependence of imports from country j to country i on trade costs across all possible suppliers. The multilateral resistance terms capture the fact that changes in trade costs on one bilateral flow can affect trade costs along all other flows due to relative price effects.

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30   In economics, 'returns to scale' describe what happens to output as the scale of production increases, when all input levels including physical capital usage are variable. An increasing returns to scale occurs when the output increases by a larger proportion than the increase in inputs during the production process.

31   Note that the model can either be aggregated at the sector level or the country level.

Note that trade flows between countries are determined not only by the size of the barriers to trade between countries *i* and *j* but also by multilateral trade resistance, i.e. the barriers which each of *i* and *j* face in their trade with all their trading partners (including internal trade). For instance, trade between the UK and Spain depends on how costly it is for each country to trade with the other relative to the costs involved for each of them in trading with other countries. Therefore, a reduction in a bilateral trade barrier between the UK and a third country such as Belgium would reduce the UK's multilateral trade resistance. Even though the bilateral trade barrier between the UK and Spain is not affected, the fall in the UK's multilateral trade resistance induced by the decline in the bilateral trade barrier with Belgium would lead to a diversion of UK trade away from Spain and towards Belgium.

Due to a lack of direct measures of trade costs, τ_{ij} is usually specified empirically as a function of observable variables which are seen as directly correlated to trade costs. In the literature τ_{ij} is often written as follows:

$$\tau_{ij} = \delta_1 \log distance_{ij} + \delta_2 \, contig_{ij} + \delta_3 \, L_{ij} + \delta_4 \, colony_{ij} \qquad (4)$$

Where *distance* is the geographical distance between countries *i* and *j, contig* is an indicator variable equal to one if countries share a common land border, *L* is a variable considering whether country pairs share a language, and *colony* is an indicator variable equal to one if countries *i* and *j* were in a colonial relationship. However, other proxy variables of trade costs can be used.

4.1.2. A modified gravity model of bilateral trade: language as a variable

To examine empirically the relationship between spoken language and bilateral trade in goods and services we apply a gravity model incorporating different language measures as follows:

$$trade_{ijst} = \alpha + \beta_s \tau_{ijst} + Z_{ist} + Z_{jst} + \mu_{iis} + \varepsilon_{ijst} \qquad (5)$$

In this equation, the variables are defined as follows:

- $trade_{ijst}$: denotes trade flows by sector *s* to country *i* from country *j* at time *t*.

- τ_{ijst} : denotes a vector of bilateral variables which define the (sectorial) trade cost between two countries. This includes, for instance, geographical distance and the prevalence of shared languages alongside other shared cultural ties (e.g. colonial relationship) or other characteristics determining trade cost between countries such as their legal systems, and whether they have any preferential trade agreements that cover their trade.

- Z_{ist}, Z_{jst} : denote time-varying sectorial effects specific to country i and country j, including, for instance, changes in productivity across sectors, or other factors which may affect economic performance over time.[32]

- μ_{iis} : denotes country-specific fixed effects taking the value of 1 for intra-national trade in sector s and 0 otherwise.

To apply the empirical model in equation (5) we combine three different data sources at the bilateral-country level. First, we use the International Trade and Production Database for Estimation (ITPD-E) by Borchert et al. (2021) to obtain information on bilateral trade flows and domestic production by sectors.[33] Second, we employ a dataset which provides a measure of common languages spoken between two countries. Third, we utilise a dynamic gravity dataset which includes time-variant bilateral information on the distance between countries, their colonial relationships, and the prevalence of preferential trade agreements, among other things. We describe all three data sources in more detail in what follows.

Bilateral trade data: ITPD-E

We use data on bilateral trade and domestic production in agriculture, goods, and services from the ITPD-E database. The ITPD-E is constructed using reported administrative data and features unprecedented coverage of industries and countries with consistent international and domestic trade data.

The ITPD-E is constructed from four main sources: agriculture, mining & energy, manufacturing and services trade. For agriculture, the data stems from the Food and Agriculture Organization of the United Nations Statistics Division (FAOSTAT). Manufacturing and mining & energy trade data stems from the UN Commodity Trade Statistics Database (COMTRADE). Service trade is obtained using information from the WTO-UNCTAD-ITC Annual Trade in Services Database and the United Nations Trade in Services Database (UN TSD). For most sectors, data also includes domestic production values for all years except for mining & energy and manufacturing, where domestic production values are missing for 2015 and 2016. All flows reported in the ITPD-E are balanced across the exporter, importer, industry and time dimension by filling all missing observations with zeros. With regard to time coverage, the ITPD-E includes 17 years of trade between 2000 and 2016. It includes 170 sectors in total, of which 26 concern agriculture, 7 relate to mining & energy, 120 are manufacturing and 17 are services. The number of countries in the ITPD-E is 243.

Language and other gravity-proxy variables for trade costs

Language variables

Regarding common languages, we draw on data collected through the language dataset provided by Melitz and Toubal (2014). This dataset includes different common language indicators (such

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32   For instance, if the economy of one country is growing, all else being equal, one would expect that it would also increase demand for goods from all other new or existing foreign trading partners, either as intermediate or final goods or services. The inclusion of these importer and exporter effects takes into account the multilateral resistance terms discussed in section 4.1.1.

33   https://www.usitc.gov/data/gravity/itpde.htm (last accessed 15 January 2022).

as whether countries share a common official language) as well as indicators on common spoken languages (native and non-native) shared between two countries. In the dataset, Melitz and Toubal (2014) required all languages to be spoken by at least 4 per cent of the population in two different countries for them to be included, and native and non-native spoken languages are collected from the same original data source and year where possible. In general, data was collected over the period from 2000 to 2008. For the purpose of this analysis, our main language indicators are the variables CSL (common spoken language) and CNL (common native language). Both indicators are defined on a unit interval that reflects whether two countries share either any common spoken language or a common native language. That is, both measure the likelihood that two random people meeting between the countries can speak with each other in any common spoken or common native language and the higher the measure the more two countries share a common spoken language.

To construct CSL, Melitz and Toubal (2014) first compute the population share of each common spoken language for each country. Next, they construct this indicator as the proportion of each country's population that speaks languages common to both countries. The language sample covers 42 common spoken languages. The CNL measure is constructed in the same way, except that for a country-pair it reflects the proportion of people in a country who share the same natively spoken language(s) of the other country. Thus, CNL reflects the probability that two people chosen at random from a country-pair have the same native language. Because a common spoken language need not be native, there will be more CSLs than there are CNLs across country-pairs. In other words, for two randomly chosen people from two different countries, the probability that they have the same native language will be no larger than the probability that they can speak the same language. As such, for each country-pair the CSL measure would be at least as large as the CNL. The distinction between CNL and CSL is of importance. For instance, differences in CNL across countries are unlikely to be easily changed through policy. CNL is regarded as a potential carrier of values and norms that could influence the behaviour of economic agents. Conversely, CSL corresponds to the choice of individuals to acquire language skills and hence can be influenced by policy through, for instance, investment in languages education. Therefore, for the purpose of the analysis presented in this report, CSL is the relevant measure. In essence, beyond the level of shared native languages (CNL) spoken between countries, CSL measures the extent to which additional spoken languages (for example, acquired languages beyond the existence of native languages in the joint populations) are relevant across two countries for the promotion of trade. Melitz and Toubal (2014) interpret the effects of CSL on trade as the direct ability to communicate with each other, whereas they interpret CNL conditional on CSL as the effect on trade that stems from trust and/or ethnic ties between two countries that share a native language.

For parts of the economic analysis, we focus on the trading relationship between the UK and five country groups which have been broadly categorised according to the official languages

spoken there.[34] Where applicable we report data for Arabic, Chinese, French and Spanish; all other countries are placed in rest of the world (RoW).[35] The country classification based on language is reported in Table 4.1.

Table 4.1: Countries grouped according to their official languages (Arabic, Chinese, French, Spanish)

Language group	Countries
Arabic	Algeria, Bahrain, Chad, Comoros, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Mauritania, Morocco, Oman, Qatar, Saudi Arabia, Sudan, Syria, Tunisia, United Arab Emirates, Yemen
Chinese[36]	China, Hong Kong, Singapore, Taiwan
French[37]	Belgium, Benin, Burkina Faso, Burundi, Cameroon, Canada, Central African Republic, Democratic Republic of the Congo, Djibouti, France, Gabon, Guinea, Haiti, Ivory Coast (Côte d'Ivoire), Lebanon, Luxembourg, Madagascar, Mali, Mauritius, New Caledonia, Niger, Republic of the Congo, Rwanda, Saint Pierre and Miquelon, São Tomé and Principe, Senegal, Seychelles, Switzerland, Togo, Vanuatu
Spanish[38]	Andorra, Argentina, Bolivia, Chile, Colombia, Costa Rica, Cuba, Dominican Republic, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, Spain, Uruguay, Venezuela

Source: Melitz & Toubal (2014), modified

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34   It is important to note that in their analysis Melitz and Toubal (2014), on which this table is based, restricted themselves to a maximum of two official languages; where there were more, they kept what they considered to be the two most important in world trade. In the case of Chad, Comoros, Djibouti and Andorra – which have two of these four languages as an official language – we have assigned the country to one of the language categories based broadly on speaker numbers. Whilst this is somewhat arbitrary from a linguistic point of view, we do this so as not to double count trade with two different language regions. It is also important to highlight that trade between the UK and these four countries is extremely small in overall terms.

35   According to Ethnologue, these four languages, alongside English, Hindi and Bengali, feature in the top seven most spoken languages in the world, with Mandarin and Spanish having more native speakers worldwide than English: https://www.ethnologue.com/guides/ethnologue200 (last accessed 15 January 2022).

36   As Melitz and Toubal (2014) note, there are a number of thorny issues with the data they use from a linguistic point of view. They treat Chinese as a single language following Ethnologue's designation of it as a macrolanguage, although Mandarin and Cantonese, for instance, are not mutually intelligible. It is also important to note that, for example, English is also an official language in Hong Kong and Singapore. This is nevertheless the best dataset available for economic analysis, and the issues identified do not affect the robustness of the economic argument and economic simulations in Chapter 5. This is because in Chapter 5 we recalculate the CSL index to take into account any changes associated with an increase in the UK population speaking another language other than English. As the CSL index is already a weighted average across most languages spoken in a country, the simulated changes implicitly take into account that in Hong Kong and Singapore a relatively large share of the population already speaks English.

37   In the vast majority of these, French has the status of statutory national language according to Ethnologue. We follow Melitz and Toubal (2014) in also including Burundi, Lebanon and Mauritius, where French is a de facto national working language, and Haiti, where it is a statutory national working language, but we exclude from their list Algeria, Morocco and Tunisia, where it is respectively classified as an educational language, a language of wider communication and a dispersed language.

38   Spanish is a de facto national working language in Andorra.

Table 4.2 reports global population share forecasts up to the year 2050 for each of the four country groups, as well as for the group of Anglophone countries, or where English is spoken by the majority of the country's population. To obtain harmonised global population data we draw on the UN Population Database, which provides demographic projections for all the countries included in the analysis up to the year 2050.[39]

In 2020, the population of Arabic-speaking countries represents about 5.8 per cent of world population. Based on UN Population Database forecasts this share is estimated to increase to 7.1 per cent by 2050, representing a 23.3 per cent increase over 30 years. The population of Chinese-speaking countries in 2020 represents 19.6 per cent of total world population but is estimated to decline to 15.4 per cent by 2050, representing a 21.6 per cent decrease over 30 years. While the Chinese population is estimated to be declining over the coming decades, it will still represent a large proportion of the world's population by 2050. The population of French-speaking countries represents about 5.2 per cent of world population in 2020 and is estimated to increase to 7.6 per cent by 2050, representing a 45.2 per cent increase over 30 years. The population of Spanish-speaking countries represents about 6.2 per cent of world population in 2020 and decreases to 5.9 per cent by 2050, representing a 4.8 per cent decrease. Anglophone countries and those where a majority of the population speaks English represent 6.4 per cent of world population in 2020, decreasing to 5.9 per cent in 2050, representing a decline of 7.5 per cent over 30 years.

Table 4.2: Share (%) of population among world population forecasts for countries grouped according to their official languages (Arabic, Chinese, French, Spanish)

Year	Arabic	Chinese	French	Spanish	English
2020	5.8	19.6	5.2	6.2	6.4
2025	6.1	19.0	5.5	6.1	6.2
2030	6.3	18.2	5.9	6.1	6.2
2035	6.5	17.5	6.3	6.1	6.1
2040	6.7	16.8	6.7	6.0	6.0
2045	6.9	16.1	7.1	6.0	5.9
2050	7.1	15.4	7.6	5.9	5.9
Change %: 2020−2050	*23.3*	*-21.6*	*45.2*	*-4.8*	*-7.5*

Source: UN Population Database

Notes: Entries represent population predictions for four country groups categorised according to their official language (Arabic, Chinese, French, Spanish) and compared with all Anglophone countries, or where English is spoken by the majority of the population (United Kingdom, United States, Canada, Australia, New Zealand, Republic of Ireland, Antigua and Barbuda, Barbados, Belize, Dominica, Grenada, Guyana, Jamaica, Malta, Saint Kitts and Nevis, Saint Lucia, Saint Vincent and the Grenadines, Trinidad and Tobago, and the Bahamas). The shares in each group among the projected total world population up to 2050 are reported using medium-fertility variant projections.

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39   https://population.un.org/wpp/ (last accessed 15 January 2022).

Other gravity control variables: Dynamic Gravity Dataset

In the empirical analysis we employ a set of covariates which represent a standard set and the most widely used gravity variables from the literature. We use the Dynamic Gravity Dataset (DGD) of the US International Trade Commission (Gurevich & Herman 2018). This includes the logarithm of the bilateral distance between trading partners; the presence of a shared border ('contiguity'); a colonial relationship (either directly in a colonial relationship or via a common coloniser); the presence of a preferential trade agreement or membership of the EU; and their hostility levels towards each other.

Furthermore, we control for importer and exporter fixed effects by sector which vary over time. These variables capture all effects related to a specific sector within a country which change over time (for instance a country's GDP, population, or sectorial productivity shocks). That is, these fixed effects clean out all unobserved macroeconomic shocks with homogenous or heterogeneous effects, thereby eliminating potentially confounding macroeconomic effects such as global business cycles or global financial crises, including those that may hit various sectors differently.

Implementation of trade cost based on empirical data

In our empirical model depicted in equation (5), the bilateral trade costs τ_{ijst} are determined as:

$$\tau_{ijst} = \delta_{1s} L_{ij} + \delta_{2s} \log distance_{ijt} + \delta_{3s} contig_{ijt} + \delta_{4s} legal_{ijt} + \delta_{5s} colony_{ijt} + \delta_{6s} WTO_{ijt} + \delta_{7s} PTA_{ijt} + \delta_{8s} EU_{ijt} + \delta_{9s} Host_{ijt} + \delta_{10s} \log GDP_{ijt} + \delta_{11s} Sanc_{ijt} \qquad (6)$$

Where $L_{ij} \in \{CSL_{ij}, CNL_{ij}\}$ represents the language measures for CSL and CNL. Furthermore, $distance_{ijt}$ represents the geographical distance between any given pair of countries; $contig_{ijt}$ represents an indicator function showing whether two countries share a common border; $legal_{ijt}$ reflects whether the two countries share a common legal system; $colony_{ijt}$ reflects whether the two countries have ever been in a colonial relationship or had a common coloniser[40]; WTO_{ijt} represents an indicator variable taking the value 1 if both countries are members of the World Trade Organisation and 0 otherwise; PTA_{ijt} represents an indicator variable taking the value 1 if two countries have a preferential trade agreement covering goods or services and 0 otherwise; EU_{ijt} takes the value 1 if both countries are members of the EU; $Host_{ijt}$ is an index function measuring the level of hostility between two countries at any given point in time[41]; $\log GDP_{ijt}$ measures the joint GDP of country i and j as a proxy for joint market size; and $Sanc_{ijt}$ takes the value 1 if country i has imposed any sort of sanctions on country j and 0 otherwise.

Our empirical approach is consistent with recommendations for best practice in empirically implementing a gravity model of trade (Yotov et al. 2016). First, if the data allows, the gravity model should be assessed at the disaggregated industry-level rather than solely at the aggregated country-pair level. Second, exporter- and importer-specific fixed effects are now routinely used in applied gravity models to account for multilateral resistances. To consider multilateral resistance terms we include in our analysis sector-specific exporter-time and importer-time specific fixed

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40   For instance, Jamaica and Canada are not directly in a colonial relationship but had the same coloniser (UK).

41   Where level 1 represents the presence of hostility but no militarised action, and level 5 represents the presence of a complete war.

effects Z_{ist}, Z_{jst}. Third, consistent with the economic theory underpinning the gravity model, gravity estimates should be performed with international trade flows and domestic trade. This is an important adjustment that is often overlooked in applied gravity models. A key feature of our trade data used for the analysis is the inclusion of domestic trade by industry. Fourth, we use the Pseudo-Poisson Maximum Likelihood (PPML) estimator to avoid potential inconsistencies of gravity estimates in the presence of heteroscedasticity and to take into account the information contained in zero-trade flows.[42] Another recommendation is to include country-pair fixed effects, although these are not included for the purposes of this study as they would be fully collinear with our language indicators L_{ij}. Instead, we control for a number of relevant bilateral trade cost variables which are commonly included in gravity models (e.g. distance).

One challenge in estimating the empirical parameters for the language effect on trade is that while countries which speak the same language most likely trade more with each other, conversely, countries that trade a great deal with each other have a larger incentive to learn the trading partner's language. This is usually called the 'reverse-causality' issue. Therefore, in an attempt to address this challenge, we include the values of L_{ijt} in the analysis based on the years 2005-2008 and regress them on the trade values pooled for the years 2010−2016.

4.2. Empirical results: the association between common spoken languages and bilateral trade across sectors

4.2.1. Associations between bilateral trade and common spoken and native languages

In Table 4.3 we report the empirical findings estimating the gravity equation using the PPML estimator that is recommended for accounting for zero-value trade flows. We report the effects at the broad sector levels, namely agriculture, manufacturing, mining & energy and services.

Our sectorial analysis confirms interesting gravity relationships already reported in numerous previous empirical international trade studies. First, distance is negatively associated with bilateral trade across all four sectors, with the magnitude of the negative effect being smallest in the services sectors. Sharing a common border (contiguity) matters for agriculture and manufacturing but less for mining & energy and services. A bilateral preferential trade agreement increases trade across manufacturing, mining & energy and service sectors. We find that EU membership is statistically significantly associated with higher bilateral trade for agriculture and manufacturing, but not statistically significant for the services and mining & energy sectors.[43]

Melitz and Toubal (2014) argue that the coefficients for CSL in the presence of CNL are important because ease of communication acts separately beyond ethnicity and trust (i.e. through shared native languages) and other economic factors affecting sectorial trade such as free-trade agreements or cultural factors like colonial ties. We find that CSL, or the ability to communicate with other countries beyond simply sharing native languages, is negatively associated with agriculture trade. For the manufacturing sector we do not observe a statistically

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42   Note that the existence of heteroscedasticity is a concern in regression analysis as it can invalidate statistical tests of significance that assume that modelling errors all have the same variance.

43   While the findings of this report cannot provide conclusive evidence, the EU Single Market for services may not have reached its full potential yet, and many barriers to access in services remain in one of the world's largest trading blocs (Ebeke et al. 2019).

significant association with the CSL index. We find that other determinants, rather than ease of communication in a common language, are relatively more important for manufacturing such as WTO membership, the prevalence of a preferential trade agreement, or EU membership.

Table 4.3: Language–trade effects by sector

Control variables	(1) Agriculture	(2) Manufacturing	(3) Mining & Energy	(4) Services
CSL	-0.9232	-0.0870	1.2170	0.4572
	(0.2978)***	(0.1456)	(0.4147)***	(0.2488)*
CNL	0.3194	0.2357	-1.0479	0.1927
	(0.3480)	(0.1738)	(0.4898)***	(0.2875)
Log Distance	-1.0082	-0.7689	-1.4350	-0.7194
	(0.0635)***	(0.0368)***	(0.1058)***	(0.0578)***
Contiguity	0.3954	0.2356	0.0766	0.0475
	(0.1066)***	(0.0669)***	(0.2324)	(0.0941)
Colonial relationship ever	0.3933	-0.0982	0.6043	0.0546
	(0.1700)***	(0.0896)	(0.2641)***	(0.1497)
Common legal origin	0.2213	0.6059	-0.1501	0.4727
	(0.1904)	(0.1069)***	(0.2652)	(0.2042)***
Common coloniser	0.1370	-0.0017	-0.1098	-0.2361
	(0.2188)	(0.1112)	(0.3251)	(0.1837)
PTA agreed	0.1289	0.2377	0.2563	0.4129
	(0.0947)	(0.0610)***	(0.1338)***	(0.1171)***
Both members WTO	1.0501	0.5269	0.2451	-0.0593
	(0.2099)***	(0.1530)***	(0.2490)	(0.3529)
Both members EU	1.1160	0.3324	-0.1858	0.0722
	(0.1841)***	(0.0953)***	(0.3220)	(0.2294)
Sanctions	0.3247	0.1134	0.4668	0.2947
	(0.1795)***	(0.1126)	(0.2545)***	(0.1318)***
Bilateral hostility level	-0.0648	-0.0220	0.0678	0.0193
	(0.0296)***	(0.0153)	(0.0417)	(0.0306)
Log (GDP both)	0.0130	0.0333	-0.0388	0.0243
	(0.0100)	(0.0061)***	(0.0203)***	(0.0107)***
Observations	75,097	113,206	59,194	15,161

Notes: Country-pair clustered standard errors in parentheses (*p < 0.1; **p < 0.05; ***p < 0.01). Beyond the control variables reported in the table, each regression model is additionally adjusted for exporter- and importer-specific fixed effects, as well as for a fixed effect for intra-country trade.

In contrast, we find that CSL is positively associated with bilateral trade in mining & energy and services. For instance, a 1 per cent increase in the CSL index (i.e. a 1 per cent increase in the probability that two randomly paired individuals from two countries can speak directly beyond a common native language) increases bilateral trade in mining & energy by 2.4 per cent.[44] Similarly, a 1 per cent increase in the CSL index increases bilateral trade in services by 0.6 per cent.[45] It is important to highlight that, while the parameter estimates for mining & energy associated with an increase in the CSL index are larger in magnitude than the estimates for services in percentage terms, if a country has larger trade volumes at baseline for services, then in absolute terms the change in trade volumes created by a reduction in language-related trade barriers may well be larger for services than for mining & energy.

For the service sectors we observe that ease of communication is a relatively important determinant of trade costs. This makes sense intuitively since the provision of services across borders is often related to direct interpersonal interaction and requires a certain knowledge of the trading partner's language and culture. It also shows the relative importance of sharing languages with other countries as the UK is a relatively strong service exporter. With regard to agriculture and mining & energy, the interpretation of the parameter findings is somewhat less straightforward. We find a relatively large positive association between CSL and trade in mining & energy while simultaneously observing a negative association with CNL. At face value this would mean that for mining & energy, trust and ethnicity could be less relevant in determining sectorial trade costs, all else being equal, and that the ability to communicate is a greater determinant of trade costs. With regard to agriculture, we find that trust and ethnic ties through CNL may matter more than CSL; in fact, speaking a common language seems to increase trade costs in agriculture once we adjust for CNL and other determinants of agriculture trade such as membership of the WTO or the EU Single Market, free-trade agreements or colonial ties.

4.2.2. Limitations of the empirical analysis

It is important to highlight that the empirical analysis is subject to several limitations.

First, the language dataset used is not longitudinal. Therefore, we cannot include country-pair fixed effects in the regression model. The country-pair fixed effects would control for other time-invariant cultural factors that could influence trade between two countries and which go beyond colonial ties.

Second, the associations between languages and bilateral trade in the empirical analysis have to be interpreted as correlations and not causal effects. While we have attempted to address reverse causality between languages and trade by using bilateral language variables which are determined in a previous period, only a suitable instrumental variable or a quasi-experimental approach (e.g. Fidrmuc & Fidrmuc 2016) could help us establish causality, but we were unable to find a suitable instrumental variable.

Third, a number of empirical results seem not to make sense intuitively, such as the finding that speaking a common spoken language is negatively associated with agricultural trade. It is not straightforward to find an explanation for this observation and more research is needed to determine the accuracy of this finding.

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44   Calculated as $e^{1.217} - 1$.

45   Calculated as $e^{0.4572} - 1$.

4.2.3. Providing a sense of the magnitude of trade effects associated with a common spoken language

The parameter coefficients in Table 4.3 provide estimates for the association between the CSL index and the estimated trade-volume effects. To provide a sense of the magnitude of these coefficients and what they mean in terms of existing UK trade, we use the bilateral trade data between the UK and countries in four specific language regions, as reported in Table 4.1. We then predict how much more the UK could export to those regions if trade costs were lowered through a larger proportion of shared spoken languages.

Trade flows including exports and imports between the UK and trading partners across these four language groups and the RoW are reported by sector (agriculture, mining & energy, manufacturing, services) in Table 4.4. Overall, the UK had an average trade deficit (i.e. imports exceed exports) with its trading partners, with exports averaging £447bn annually and imports £569bn annually. While the UK has a trade deficit in most sectors, it has a trade surplus in services. Roughly 22 per cent of UK exports and about 24 per cent of imports are with countries included in the four language groups. The UK has a relatively large trade deficit in mining & energy with Arabic-speaking countries and a relatively large proportion of its service-sector exports (about 10 per cent) are with French-speaking countries. Across all sectors, the UK has a trade surplus with Arabic- and French-speaking countries. For French-speaking countries the trade surplus is observed in manufacturing and services.

Table 4.4: Summary of UK exports and imports by sector and country groups by language (2010–2016)

	Arabic	Chinese	French	Spanish	RoW	Total
UK Exports (£, million, 2010-2016)						
Agriculture	238.8	69.3	277.5	239.4	1,981.8	2,806.9
Mining & Energy	129.1	534.8	1,509.1	929.0	14,698.9	17,800.9
Manufacturing	14,884.5	23,246.3	43,627.2	12,285.7	174,176.3	268,219.9
Services	323.5	6,708.9	19,229.2	2,743.4	128,910.4	157,915.5
All sectors	**15,576.0**	**30,559.4**	**64,643.0**	**16,197.4**	**319,767.3**	**446,743.1**
UK Imports (£, million, 2010-2016)						
Agriculture	283.6	252.6	1,106.7	2,814.4	7,178.4	11,635.7
Mining & Energy	6,386.9	62.2	2,211.9	911.0	30,394.0	39,966.1
Manufacturing	5,199.6	54,420.2	41,309.8	15,553.9	266,396.7	382,880.2
Services	315.7	4,658.6	18,376.7	1,976.3	108,899.5	134,226.7
All sectors	**12,185.9**	**59,393.7**	**63,005.0**	**21,255.6**	**412,868.5**	**568,708.7**

Notes: table entries show average annual UK exports and imports between 2010 and 2016 based on the International Trade and Production Database for Estimation. Original $ dollar values have been converted into £ using a $/£ exchange rate of 0.75.

Using the estimated trade-volume coefficients associated with the CSL index reported in Table 4.3, in conjunction with the export trade volumes reported in Table 4.4, we predict how much UK exports would change with respect to its trading partners in the four main language country groups (Arabic, Chinese, French, Spanish) if there were to be a perfect probability of two random people from two of these regions meeting each other and being able to communicate with each other in a shared spoken language, i.e. given a complete eradication of language barriers with regard to CSL. This is represented by an increase from the bilateral baseline CSL index to an index value of 1. Note that for each of the four main language regions the baseline population weighted average CSL indices between the UK and trading partners are as follows: UK–Arabic: 0.0337; UK–Chinese: 0.0046; UK–French: 0.2036; UK–Spanish: 0.1178.[46] The predicted trade-volume effects by sector resulting from moving these CSL indices to 1 for each of the four language groups are reported in Table 4.5.

We estimate that UK exports with Arabic-speaking countries could increase by a maximum of £329mn a year; with Chinese-speaking countries by a maximum of £5.1bn a year; with French-speaking countries by about £10.8bn a year; and with Spanish-speaking countries by £3bn a year. These changes are determined by the current level of sectorial exports between the UK and trading partners in the four language regions. Overall, a full eradication of the spoken language barrier between the UK and its trading partners from these four language regions is estimated to increase UK exports by about £19.2bn a year, or about 4.3 per cent of all exports. This corresponds to about 0.75 per cent of UK GDP in 2016.[47]

Table 4.5: Summary of predicted UK export changes associated with a full eradication of the spoken language barrier between the UK and its trading partners in four main language groups

	Arabic	Chinese	French	Spanish		
	UK Exports (£, million, 2010-2016)				Change £ bn	Change %
Agriculture	-141.0	-41.7	-144.5	-133.4	*-460.6*	*-16.4*
Mining & Energy	289.8	1,261.3	2,468.7	1,789.1	*5,808.9*	*32.6*
Services	180.0	3,866.6	8,446.1	1,362.9	*13,855.5*	*8.8*
Change £ bn	*328.7*	*5,086.2*	*10,770.4*	*3,018.6*	*19,203.8*	*4.3*
Change %	*2.1*	*16.6*	*16.7*	*18.6*		

Notes: table entries show changes in average annual UK exports predicted if the probability of a random person from the UK and a person from one of the other four language regions were to meet and be able to communicate in the same spoken language. Using the trade coefficients by sector provided in Table 4.3 and trade volumes by sector and language group from Table 4.4, the potential trade effects are estimated if the baseline CSL indices between the UK and trading partners in the four language regions were to increase to 1, up from their baseline values as follows: UK–Arabic: 0.0337; UK–Chinese: 0.0046; UK–Spanish: 0.1178; UK–French: 0.2036.

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46   Note that the baseline index suggests that if, for example, two random people from the UK or any of the Chinese-speaking countries were to meet, the probability that they can communicate in the same spoken language is a weighted average of 0.46 per cent (0.0046*100). It is important to highlight that this could be in either Mandarin or English. Similarly, if two random people from the UK and from a Spanish-speaking country were to meet, the probability that they can communicate in the same spoken language is about 12 per cent (0.1178*100).

47   Using the value provided by the World Bank of $2,693bn converted into pounds using an exchange rate of 0.75.

4.2.4. Sensitivity analysis to determine the significance of English as a lingua franca

We run different sensitivity analyses to assess whether English is the main driver behind the trade effects, as English is one of the most important business languages worldwide.

In Table 4.6 we replicate the same analysis reported in Table 4.3, but instead of using the combined CSL and CNL indices we distinguish between English-only and a combined metric for all other languages in order to test the relative importance of English as a global lingua franca determining bilateral trade. If English were the sole driver of the language effects in bilateral trade the parameter coefficients in Table 4.6 would be observed by using the English-only CSL and CNL. However, we observe that English does not seem to be the sole or main driver of trade effects. For instance, the positive association between CSL and trade in mining & energy and services is not statistically significant with respect to the English-only CSL but it is with the CSL that covers all other languages. It should be emphasised that the findings reported in Table 4.6 do not undermine the very important role of English in determining business relations worldwide; however, on a global scale, it may not be the only important language for determining bilateral trade.

Table 4.6: Language–trade effects by sector (English versus other languages)

	(1)		(2)		(3)		(4)	
	Agriculture		Manufacturing		Mining & Energy		Services	
CSL_English	-1.5679		-0.1552		0.7055		-0.0580	
	(0.3771)**		(0.1685)		(0.5394)		(0.2936)	
CNL_English	0.0005		0.0250		-1.8047		-0.0095	
	(0.5352)		(0.2297)		(0.8450)*		(0.5234)	
CSL_Other		0.3795		-0.2069		1.5085		0.5879
		(0.3165)		(0.2343)		(0.4295)***		(0.3201)*
CNL_Other		-0.3362		0.4646		-0.8555		0.2038
		(0.3920)		(0.2539)*		(0.5028)*		(0.3132)
Observations	75,097		113,206		59,194		15,161	

Notes: Country-pair clustered standard errors in parentheses (*p < 0.1; **p < 0.05; ***p < 0.01). The same variables as for the main model specifications presented in Table 4.3 have been controlled for.

4.3. Summary

The key findings of this chapter can be summarised as follows:

- Sharing spoken languages can reduce trade barriers. We find that if countries have a higher proportion of their populations sharing a common spoken language, they also tend to trade more with each other in two of the four sectors under consideration. Based on the application of a structural gravity model of trade, we find that an increase in the proportion of the

population of two countries being able to communicate with each other through a shared spoken language increases bilateral trade in mining & energy and services, all else being equal. Specifically, a 1 per cent increase in the probability that two people from two countries meet at random and are able to communicate with each other increases bilateral trade in mining & energy by 2.4 per cent, and trade in services by 0.6 per cent.

• While English as a lingua franca is an important business language worldwide, it may not be the sole driver behind existing observed trade flows across different business sectors. We conducted a sensitivity analysis distinguishing English versus other languages in their relative importance with regard to bilateral trade flows. We find that, while English is important, it is not the sole language determinant of observed trade flows and that other languages matter equally, if perhaps not more.

• UK aggregate trade flows are predicted to increase if there is an increase in the number of languages shared with its trading partners. For instance, we estimate that if the populations of Arabic-, Chinese-, French-, and Spanish-speaking countries could communicate effectively with the UK population (either through the UK population learning the other countries' languages or all the other populations speaking English), UK exports would increase by £19bn a year.

5 Quantifying the economic benefits of languages education for the UK economy

In Chapter 3 of this report, we noted that the existing economic literature suggests that there is potentially a positive impact of speaking more than one language on human capital, making people more productive and competitive in the labour market (see Chapter 3.2). In Chapter 4 we revisited the empirical relationship between speaking a common language and bilateral trade. We derived novel gravity estimates related to the extent to which spoken languages, and especially the ability to communicate with other countries in a common spoken language, can increase bilateral trade in specific sectors (see Table 4.3). We now use these parameter estimates in an international macroeconomic model to assess the potential impact on the UK economy of the productivity and trade effects associated with improving modern language skills among UK pupils. This model is akin to the UK government's computable general equilibrium (CGE) analysis used to assess the economic impact of Brexit (HM Government 2018) and, more recently, the economic impacts of a UK–US free-trade agreement (Department for International Trade 2020) and the UK–Japan free-trade agreement (Department for International Trade 2021).

Within the macroeconomic modelling framework, we compare the UK's economic performance under different scenarios. In a baseline scenario we project the UK economy under current levels of language-education provision in schools – the status quo or 'no change' scenario. Then, in a series of hypothetical scenarios we assess how UK economic activity would evolve from now to the year 2050 if more UK pupils were able to speak an additional modern language to a level where it can later be applied in a business setting.[48] In other words, we estimate how much more economic output and welfare could be created in the UK by improving modern-language skills. It is important to highlight that the analysis does not represent an economic forecast for the UK economy up to the year 2050 as it only considers the potential effects associated with a reduction in trade barriers and improvements in human capital, while holding all other factors constant. In reality there are many other factors that would influence the economy's performance (e.g. technological developments or fiscal and monetary policies). Hence, the estimates presented in this report show the relative effects between the baseline (without any changes in

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48   Taken to correspond roughly to level B1 under the Common European Framework of Reference for Languages (CEFR). In this framework B1 is classed as an independent user and includes the ability to understand the main points on familiar matters regularly encountered at work, and the ability to deal with most situations likely to arise whilst travelling in an area where the language is spoken; see https://www.coe.int/en/web/common-european-framework-reference-languages/table-1-cefr-3.3-common-reference-levels-global-scale (last accessed 15 January 2022).

language-education provision) and a scenario in which there is an increase in language-education provision either in Arabic, French, Mandarin or Spanish, although in all scenarios the economy is expected to grow over time. All values reported are in £ referenced to the year 2019 and are discounted to reflect the net-present value.[49]

In these scenarios we focus on the effects resulting from improving the language skills in four modern languages of UK KS3 and KS4 pupils aged between 11 and 16. In essence, there are many potential ways to foster languages education in the UK; however, in our scenario analysis we try approximately to mimic the MEP, introduced in 2016 (see Chapter 2), which aims to enable participating pupils in KS3/KS4 to attain at least a B1 level in Mandarin by the end of KS4, with early evaluation reports suggesting a successful programme.[50] As Ayres-Bennett and Carruthers (2020) point out, different levels of proficiency are required for different purposes in business. For instance, while one organisation may require basic language skills, such as the ability to answer the phone and forward calls in another language, other organisations may need high levels of fluency and cultural understanding for in-country work. The increased motivation and achievement of students completing a programme such as the MEP is likely to encourage them to continue with languages beyond GCSE to A Level and beyond as either part or all of their university degree, thereby giving a range of proficiencies. In our hypothetical modelling scenarios, we assume a similar type of programme applied to four modern languages, namely Arabic, French, Mandarin Chinese, and Spanish, which have been suggested as being among the most important business languages of the future. In making this selection, we have chosen two European languages firmly embedded in the UK education system (although of course French and Spanish are also widely spoken beyond Europe) and two non-European languages where there is great potential for growth. A 2017 British Council report cited these as the four languages which will be of most importance for the UK's future prosperity, security and world influence (British Council 2017), and they also feature in the top five languages needed for business in the CBI's annual skills reports (CBI/Pearson 2018 & 2019).[51] This is not to deny the importance of other languages for business, particularly German (which topped the list of languages in the 2019 CBI/Pearson report), and the analysis could fruitfully be applied to this and other important business languages such as Portuguese. It is also important to note that this analysis focuses on improving the language skills of UK citizens rather than exploring other possible options such as encouraging more migrants with the desired language skills to come to the UK, funding English-language training overseas for foreign nationals, or providing student placement schemes to enable foreign students to undertake placements in UK businesses, all of which also involve

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49   Using a discount rate of 3.5 per cent. A net-present value means that all future costs and benefits are reported in current values, for instance, to take into account potential for inflation or other investment opportunities that might give a specific return in the future.

50   As well as taking GCSE Mandarin at the end of Year 11, pupils are targeted to take the HSK3 examination, administered by the Chinese Testing International Co., Ltd (CTI), at the end of Year 10, which corresponds to level B1 of the CEFR.

51   Other indicators of their international importance include internet usage, for which Chinese, Spanish, Arabic and French feature in the top seven languages worldwide: https://www.internetworldstats.com/stats7.htm (last accessed 15 January 2022).

additional costs. This choice seems to align with current government policy to upskill UK citizens, especially post-Brexit, and to control inward migration to the UK.[52]

In our scenarios we model the impact of increasing the proportion of KS3/KS4 pupils learning one of the four modern languages selected.[53] It is important to highlight that the analysis assumes that, as is the case with the current MEP programme (see Chapter 2), the addition of more languages education to the curriculum does not come at the expense of reducing the time devoted to STEM (science, technology, engineering and mathematics) and other EBacc subjects, since the additional face-to-face hours are mostly timetabled outside the core timetable at lunchtimes and after school. In other words, we assume that children in KS3/KS4 will experience an intensive, enhanced-quality languages education on top of the normal curriculum in these other subjects. Of course, were additional languages education to be implemented in a manner that was at the 'cost' of STEM subjects, then there would necessarily be an economic trade-off, as STEM subjects such as mathematics are associated with relatively high labour-market returns.

In the analysis we focus on two specific economic outcome variables, GDP and consumer welfare. GDP is the total monetary or market value of all the finished goods and services produced within a country's borders in a specific time (e.g. within a year). As a broad measure of overall domestic production, it functions as a metric of a given country's economic health. Welfare concerns the question as to whether households within a country are better or worse off after an economic shock or policy change.[54] For instance, households in a country are better off if they can either buy their current basket of goods and services for cheaper prices or alternatively receive a higher income with which to buy more goods and services at given prices. To welfare we also add changes in government expenditure, as any increase in taxable income for the government will lead to a larger provision of public goods for the UK population. The modelling approach used for this analysis is particularly well suited to quantify these welfare effects since the model framework incorporates the effects of an event on all quantities and prices in an economy and across all economic actors, including households, firms and the government.

The chapter begins by describing the macroeconomic model and the input parameters and data used to run a variety of different scenario analyses, as well as outlining our approach to dealing with uncertainty around key input parameters. The chapter then concludes with a report on the estimated effects on UK GDP and welfare for different language uptake scenarios and an assessment of their economic benefits relative to the costs of implementation.

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52   Another potential source of UK linguists is heritage or community language speakers, i.e. speakers of the various immigrant communities of the UK, both longstanding and more recent. However, the teaching of heritage languages in the UK currently takes place mainly through supplementary schools, outside the mainstream school system. It should also be noted that heritage language speakers and those who have acquired another language later in life through education have different linguistic skills (Montrul 2015, chapter 8). Heritage language speakers tend to have stronger listening and speaking skills, but they may be illiterate in the heritage language, be unfamiliar with more formal written modalities or, in the case of a language like Arabic, have little knowledge of the standard language.

53   We assume here that each student would follow an intensive course in one additional language, but that there would still be a range of languages available for students to choose from and they might well choose to study another language as part of the normal curriculum alongside the intensive language course, as evidenced in the MEP evaluation report.

54   Note that welfare in this context refers to economic well-being more generally and not directly to social security payments such as unemployment benefits.

5.1. Model description, data source and analytical approach

We use a multi-country multi-sector CGE model in order to provide a comprehensive analysis of the potential economic effects of improving language skills among UK pupils. As discussed by Lofgren et al. (2002), a CGE model is essentially a large numerical macroeconomic model which combines economic theory with real economic data in order to estimate the economic impacts of events in an economy. Our core multi-country and multi-sector CGE model resembles that used by Lanz and Rutherford (2016). The model is numerically simulated with the computer program GAMS,[55] using the MPSGE solver (Rutherford 1999). As stated above, the model is akin to the UK government's CGE model used to assess the economic impact of Brexit (HM Government 2018) and, more recently, the economic impacts of a UK−US free-trade agreement (Department for Trade 2020) and the UK−Japan free-trade agreement (Department for Trade 2021).

5.1.1. Model description and data source

CGE models arrive at their outputs by capturing the behaviour of different economic agents in the economy, including (1) firms, (2) consumers, (3) government and (4) foreign agents. Firms seek to combine factor inputs such as capital and labour to maximise profits; consumers allocate their disposable income between savings and consumption to maximise their welfare; the government levies and collects taxes, distributes social benefits but also purchases goods; and foreign agents interact with domestic agents through international trade and international factor flows (e.g. migration, foreign direct investment). The behaviour of each of these agents is based on economic theory and specified mathematically as a system of equations which are solved simultaneously. The model includes different production sectors and goods markets as well as a government budget constraint which allows the model to capture military expenditure.

The base year underlying economic data used for the purpose of these analyses is taken from the Global Trade Analysis Project (GTAP) database, which has been continuously updated by the Centre for Global Trade Analysis at Purdue University since 1993. Overall, GTAP covers 140 countries for 57 GTAP commodities and includes all bilateral trade patterns, production, consumption and intermediate inputs of commodities and services. For this report we use the GTAP 10a version. From the GTAP database, we extract a social accounting matrix (SAM) for the specific countries and regions included in the analysis. The SAM is a complex table expressed in terms of incomes and expenditures, i.e. following the double-entry accounting method. GTAP includes SAMs for individual countries based on national accounts data (e.g. use−supply tables, input−output tables) and information from household survey data and trade data. GTAP collects and coordinates country SAMs from researchers across the world and cleans and standardises the data.

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55   General Algebraic Modeling System: https://www.internetworldstats.com/stats7.htm (last accessed 15 January 2022).

5.1.2. Scenario analysis: the effect of increasing the proportion of pupils speaking additional languages

In the model, events are evaluated as 'shocks' to the economic system which are solved for two equilibrium solutions for the state of an economy at a given point in time. The initial baseline solution reflects a scenario which represents the state of a country's economy in the absence of a specific shock. This is called the status quo or baseline scenario. The model is then 'shocked' to reflect the new state of the world (e.g. improved modern-language skills among the population), with the new equilibrium representing a 'what-if' scenario. The comparison between this scenario and the pre-shock baseline scenario at any given point in time represents the impact of the event; for instance, by comparing the economy between two states of the world in terms of their difference in overall economic outcomes such as GDP or welfare. The scenario analysis basically runs an experiment by comparing how the simulated economy of a country evolves by changing specific parameters while holding other parameters constant.

We run a series of different scenarios in which we mimic the effects of the government-funded MEP to foster Mandarin skills among UK pupils in secondary schools (see Chapter 2). While the MEP specifically relates to the teaching of Mandarin Chinese, there are calls to introduce a similar scheme of intensive learning for other modern languages such as German, which is in serious decline in UK schools.[56]

Of course, an equally intensive language programme for other modern languages may look different; for our scenario analyses we assume a similar type of programme applied to the other three languages selected, Arabic, French and Spanish.

In essence, the scenarios applied in the model can be described as follows:

- **Scenario 0 (baseline scenario):** current levels of language skills prevail into the future. The proportion of UK pupils being able to apply modern languages in a business setting in the future stays as it is now.

- **Scenario 1**: the proportion of KS3/KS4 pupils learning **Arabic increases** by x percentage points and learners are able to apply the language later in the labour market and a business setting.

- **Scenario 2**: the proportion of KS3/KS4 pupils learning **Mandarin Chinese increases** by x percentage points and learners are able to apply the language later in the labour market and a business setting.

- **Scenario 3**: the proportion of KS3/KS4 pupils learning **French increases** by x percentage points and learners are able to apply the language later in the labour market and a business setting.

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56   See, for instance, British Academy et al. (2020). The submission made by the British Academy, ASCL and the All-Party Parliamentary Group on Modern Languages to the Comprehensive Spending Review 2021 also called for a 'German for All' programme to include financial support to provide resources for schools with a high share of pupils on free school meals that teach German in the curriculum from KS3 (British Academy et al. 2021). As noted in Chapter 2, the government has already announced plans to introduce a Latin Excellence Programme modelled on the MEP.

- **Scenario 4**: the proportion of KS3/KS4 pupils learning **Spanish increases** by *x* percentage points and learners are able to apply the language later in the labour market and a business setting.

In the scenario analysis we increase the pupil population speaking a specific language by 10 or 25 percentage points, $x \in (10, 25)$.

It is important to highlight that our scenario analysis is very different to the scenarios assumed in Foreman-Peck and Wang (2014). In their analysis they calculate the trade loss associated with the lack of a common official language between the UK and all its trading partners. Therefore the de facto counterfactual or 'what-if' scenario in Foreman-Peck and Wang (2014) is the lack of a common language, with virtually all other countries that do not have English as the common official language, and consequently their study finds large returns for this scenario, approximately an increase in UK exports valued at about 3.5 per cent of UK GDP every year. Our 'what-if' scenarios are different as we assume a slowly evolving cumulative increase in the language skills among UK workers in a specific language, which has been learnt in school. In our analysis the simulated shocks are manifested through either an improvement in human capital or better trade relationships. In what follows we describe in more detail how we parameterise both effects.

Trade effects

In order to examine the corresponding economic effects of changes in trade volumes associated with changes in the population speaking languages as reported in Table 4.2, in the macroeconomic model we have to transform the percentage changes in terms of trade into an 'ad valorem equivalent' (AVE), which represents the equivalent of imposing a tariff, or in other words a percentage increase in the cost of importing or exporting a specific good or service. In order to translate the trade effect into an AVE we follow the standard technique to estimate changes in non-tariff barriers based on trade effects by using the percentage change in trade and dividing it by the estimated elasticity of substitution by sector.[57]

To estimate the AVE from an increase in UK pupils learning an additional language we draw on the sectorial coefficients δ_{1s} reported in Table 4.3 and the induced changes in the CSL index by assuming the UK population learns additional languages over time. Therefore, we calculate the changes in the CSL index under different assumptions, along with the associated predicted changes in trade. To do so, we follow the approach of Melitz and Toubal (2014). The CSL index is defined as follows:

$$CSL_{ij} = \max(a_{ij}) + (a_{ij} - \max(a_{ij}))(1 - \max(a_{ij})) \qquad (7)$$

In this formula, $a_{ij} = \sum_1^n L_{1i} L_{1j}$ for country pair *ij* represents the unadjusted value of a common spoken language, with L_1 being a particular language, and *n* being the number of languages shared by the two countries. The CSL value ranges between 0 and 1.

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[57]   Yotov et al. (2016). Note that the elasticity of substitution by sector represents how domestic consumers switch between domestic and foreign goods in light of trade cost changes. The elasticities by sector are provided by the GTAP 10a database.

As described previously, we base our model on the language dataset provided by Melitz and Toubal (2014). Based on the classification provided in Table 4.1 we have grouped the countries into different language groups: Arabic-speaking countries, Chinese-speaking countries, French-speaking countries, Spanish-speaking countries, and the RoW. As discussed above, we use the demographic projections of the UN Population Database, which provides population forecasts for each country in five-year intervals by age and gender.[58] Hence, for each of the scenarios, the timeline is made up of five-year intervals until 2050 (including year 0, the baseline), and thus we have six time periods in total. Given that the outcome we are interested in is the change in the CSL index per group of countries, per year and per scenario, the weighted average CSL index and its change over time is computed accordingly. The calculated changes of the CSL index over time for each of the scenarios takes into account the relative changes of the population in each country group based on the projections reported in Table 4.2, which show population growth for the Arabic- and French-speaking country groups and population decline for the Chinese- and Spanish-speaking country groups. That is, the analysis implicitly takes into account that some languages may gain relatively in importance over time compared to others.

Using the calculated changes in the CSL over time by the different scenarios, ΔCSL_{ijst}, the change in AVE by scenario can be written as follows:

$$\Delta AVE_{ijts} = e^{\left(\Delta CSL_{ijst}\frac{\delta_{is}}{\alpha_s}-1\right)} * 100 \qquad (8)$$

The magnitude of ΔCSL_{ijst} is determined by the assumed percentage increase of UK pupils learning a second language (10 or 25 percentage points). Note that in each scenario over the time horizon of 30 years (up to 2050) ΔAVE_{ijts} changes over time as more pupils who have learned an additional language become active in the labour market. For the simulation analysis we assume that the potential trade-enhancing effects of more individuals in the UK being able to apply a second language in the business context will take time to have an effect, and hence we assume that these effects will not kick in for at least ten years after any language-policy change.[59]

Human-capital effects

Similar to the method used by Taylor et al. (2014) and Hafner et al. (2016), for each time period t the macroeconomic model assumes that effective labour supply in each sector s and type of labour r, high- and low-skilled, is adjusted for efficiency units by $L_{srt} = \bar{L}_{srt} \cdot E_{srt}$, with the physical supply of labour input $\bar{L}_{s,t}$ and efficiency of labour $E_{s,t}$. That is, the overall labour supply in the economy can be improved if individuals become more productive. Productivity in economic terms can be assessed through different means, including a higher attractiveness in the labour market as firms tend to want to hire more skilled and productive workers. In economic theory, higher productivity, all else being equal, leads to higher wages, as firms need to compensate for the higher skill set of a worker. Based on the review of the literature, we know that workers speaking additional languages receive, all else being equal, a return in the labour market for their language

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skills, making them more competitive and productive. We model this increase in productivity as follows:

$$E_{srt} = (1 + \theta_{lrt})e_{srt} \qquad (9)$$

Where θ_{lrt} is the language-specific productivity enhancement parameter for language l and e_{srt} is the baseline productivity in the absence of any upskilling event or intervention[60]; that is, speaking additional languages increases the disposable income of workers. In the model this leads not only to a direct impact due to higher household incomes but also to an induced demand effect, since part of the additional disposable household income that could be spent by individuals on goods and services will be saved, which in the model creates the opportunity for capital investment by firms. These induced activities then lead to further economic activity and increased government income through additional taxes.

As discussed in Chapter 3, the existing literature suggests that speaking an additional language could increase a person's productivity by up to 17 per cent, although results vary substantially across studies. The analysis of the human-capital effects of multilingualism closest to our intended scenarios is Saiz and Zoido (2005), which examines the return within the same degree subjects; controlling for other factors, it shows a wage premium of around 2 per cent. The magnitude of this productivity effect is echoed by Wang et al. (2017) in the European context (including the UK). However, this study finds heterogeneous wage returns depending on the skill level of the individual, as only high-skilled individuals may profit in the labour market from the knowledge of an additional language. Furthermore, the findings suggest that returns decrease the more similar the additional language is to the official language spoken in the country. For instance, in the UK context, the returns for speaking Mandarin or Arabic would be around 2.5 per cent, whereas the returns for Spanish or French would be lower on average at around 1.96 per cent. In order to be conservative, we apply these parameters in the simulation analysis but use them as upper ranges in the sensitivity analysis (see below), de facto assuming a central estimate θ_{lr} of a 1.25 increase in productivity for Mandarin and Arabic, and 0.98 per cent for Spanish and French. In the model we assume only that the productivity effect of this magnitude would be achieved by age 30 and would then continue until retirement at age 65. This inherently assumes that there is no depreciation effect on language skills, which most likely is not realistic. However, there are no studies showing the wage returns of speaking a second language over the life cycle of an individual and hence we assume a constant return over time.

Monte Carlo simulations to account for uncertainty among key input parameters

Within the modelling framework a number of sources of uncertainty exist. These refer to the trade-volume parameters associated with spoken languages drawn from econometric gravity modelling, as well as productivity parameters of multilingualism based on the existing literature and other parameters in the model such as the behavioural responses of firms and households related to changes in relative prices in the economy.[61]

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60   Note that for the modelling purpose of this analysis, it has been normalized to 1 at baseline.

61   So called 'elasticities'.

We deal with this uncertainty by introducing sensitivity ranges around the main results of the scenario analyses. To that end we follow a Monte Carlo approach drawing (randomly) parameters from distributions rather than just providing single central estimates. The applied distributions for the Monte Carlo draws are based either on the estimated statistical distribution in the econometric gravity analysis (e.g. the language effects on bilateral trade) or on uniform distributions in the case of parameters drawn from the literature or databases (e.g. elasticity parameters based on GTAP). For each parameter we take 50,000 samples[62] and model the ranges for the key input parameters so that there is a 99 per cent probability that the true values lie within the provided range. Table 5.1 shows the model parameters and values which are varied in order to undertake a sensitivity analysis and generate a range of results.

Table 5.1: Summary of model parameters and values used as part of the sensitivity analysis

Parameter	Definition	Source	Distribution used	Range of values
δ_{1s}	Estimated trade-volume effects associated with prevalence of common spoken language between two countries	Econometric modelling Table 4.3; sector specific parameters	Normal (sector-specific model parameters)	Statistical distribution estimated econometrically around central estimates, building on corresponding standard errors
σ_s	Trade elasticity between different varieties (domestic and foreign)	GTAP 10a; for more information see section 5.1.1	Uniform	Agriculture: 3.68−6.14 (midpoint 4.91); Mining & Energy 7.5−12.6 (midpoint 10.1); Manufacturing 5.6−9.3 (midpoint 7.5); Services 2.9−4.8 (midpoint 3.8)
θ_l	Productivity parameter speaking a second language	Saiz & Zoido (2005); Wang et al. (2017)	Uniform	Mandarin: 0−0.025 (midpoint: 0.0125); Arabic: 0−0.025 (midpoint 0.0125); Spanish: 0−0.0196 (midpoint 0.0098); French: 0−0.0196 (midpoint 0.0096)

Varying these key model inputs is associated with different results. For instance, a higher value for δ_{1s} when the estimated parameters are positive (e.g. for mining & energy and services) increases trade volume when there is an increase in the populations sharing the same language, leading to a larger decrease in trade barriers and hence to a larger effect on GDP and consumer

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62   That is, for each parameter 50,000 samples are taken and separately modelled.

welfare. A lower value of σ_s increases the GDP and consumer welfare gains from additional trade volumes. This is because lower values of the elasticity mean that varieties of particular goods or services are less similar in nature and hence less easily substitutable. Lastly, higher values of θ_l increase GDP gains because the improved productivity of workers adds more to production, which in turn increases the wages of high-skilled workers.

5.2. The simulated macroeconomic effects of improving language learning at KS3/KS4

5.2.1. Potential trade and human-capital effects on UK GDP and welfare

Tables 5.2 and 5.3 report the results from the scenario simulation analysis in terms of GDP (Panel A) and welfare (Panel B). Table 5.2 reports the findings for an assumed 10 percentage point increase in the KS3/KS4 pupil population learning a language and being able to communicate in a business setting when they enter the labour market. Table 5.3 shows the findings for an assumed 25 percentage point increase. For each scenario we present ranges based on the 99 per cent confidence interval (CI), where the midpoint is labelled M, the lower bound threshold is labelled L and the upper bound threshold is labelled H. We report the findings separately for trade effects alone and for a combination of trade effects and the potential human-capital effect.

Table 5.2: Scenario: economic benefits over a 30-year horizon measured in GDP and welfare following a 10 percentage point increase in uptake of a language at KS3/KS4

	Arabic		Mandarin		French		Spanish	
	Panel A: Cumulative GDP by 2050							
	£, million	%, GDP 2019	£, million	%, GDP 2019	£, million	%, GDP 2019	£, million	%, GDP 2019
I. Trade effect only								
M	928.2	0.0379	716.6	0.0292	672.5	0.0274	631.2	0.0257
L	918.6	0.0375	706.7	0.0288	664.5	0.0271	623.2	0.0254
H	944.4	0.0385	733.0	0.0299	685.7	0.0280	644.4	0.0263
II. Trade and human capital effects								
M	12,206.1	0.4978	11,978.2	0.4885	9,546.5	0.3893	9,468.6	0.3861
L	11,767.5	0.4799	11,517.7	0.4697	9,152.3	0.3732	9,142.1	0.3728
H	12,612.6	0.5144	12,354.1	0.5038	9,858.3	0.4020	9,762.4	0.3981
	Panel B: Cumulative consumer welfare gain by 2050							
I. Trade effect only								
M	1,210.0	0.0493	1,843.1	0.0752	1,154.9	0.0471	947.0	0.0386
L	1,196.7	0.0488	1,817.1	0.0741	1,140.4	0.0465	934.8	0.0381
H	1,232.2	0.0503	1,885.5	0.0769	1,178.8	0.0481	967.3	0.0394
II. Trade and human capital effects								
M	12,239.1	0.4991	12,856.3	0.5243	9,833.2	0.4010	9,589.5	0.3911
L	11,806.3	0.4815	12,389.8	0.5053	9,441.1	0.3850	9,265.8	0.3779
H	12,643.0	0.5156	13,250.4	0.5404	10,149.0	0.4139	9,884.1	0.4031

Notes: M refers to the midpoint estimate based on the Monte Carlo simulation parameter inputs reported in Table 5.1. L refers to the lower bound threshold of 99% confidence interval and H refers to the higher bound threshold of the 99% confidence interval. All values are reported in 2019 £.

We find that a 10 percentage point increase in UK pupils in KS3/KS4 learning Arabic and able to apply the language effectively in a business setting could increase UK GDP cumulatively over 30 years by between £919mn and £944mn through a reduction in non-tariff trade barriers related to languages alone. This corresponds to about 0.04 per cent of UK's GDP in 2019. For a 10 percentage point increase in the UK KS3/KS4 pupil population learning Mandarin and able to use the language effectively in a business setting later, we estimate a cumulative GDP increase between £707mn and £733mn. For French we estimate a cumulative GDP increase between £665mn and £686mn, and for Spanish between £623mn and £644mn.

The equivalent welfare effects are somewhat higher as the reduction in trade cost associated with reducing language barrier in the model increases the availability of imported goods at lower prices for households. Welfare reflects whether consumers are better off thanks to better access to goods and services (e.g. either through a larger variety of available goods or through lower prices) and whether the government has more income to spend on public goods, measured by government expenditure. For example, for Arabic we estimate a cumulative increase in UK welfare by 2050 between £1,197mn and £1,232mn by reducing non-tariff barriers only. The cumulative welfare gain for learning Mandarin is estimated between £1,817mn and £1,886mn, for learning French between £1,140mn and 1,179mn, and for learning Spanish between £935mn and £967mn.

If we add potential human-capital effects associated with learning languages to the scenario analysis, the estimated cumulative increase in the UK's GDP by 2050 for Arabic is estimated between £11,768mn and £12,613mn, for Mandarin between £11,518mn and £12,354mn, for French between £9,152mn and £9,858mn, and for Spanish between £9,142mn and £9,762mn. This corresponds to about 0.4 per cent of the UK's GDP in 2019 for French and Spanish and to about 0.5 per cent of the UK's GDP in 2019 for Arabic and Mandarin. As before, the equivalent welfare effects are higher across all scenarios than the estimated GDP effects.

Table 5.3 reports the estimated findings where a 25 percentage point increase in the KS3/KS4 UK pupil population learning one of the four languages and were able to apply it effectively later on in a business setting is assumed.

We find that a 25 percentage point increase in UK pupils in KS3/KS4 learning Arabic and able to apply the language effectively in a business setting could increase UK GDP cumulatively over 30 years by between £2,292mn and £2,357mn through a reduction in non-tariff trade barriers related to languages alone. This corresponds to about 0.09 per cent of UK's GDP in 2019. For a 25 percentage point increase in the UK KS3/KS4 pupil population learning Mandarin and able to use the language effectively in a business setting later, we estimate a cumulative GDP increase between £1,768mn and £1,834mn. For French we estimate a cumulative GDP increase between £1,660mn and £1,713mn, and for Spanish between £1,517mn and £1,569mn. The additional cumulative GDP effects of taking into account potential human capital effects, as well as the consumer welfare effects (Panel B), are also provided in Table 5.3.

Table 5.3: Scenario: economic benefits over a 30-year horizon measured in GDP and welfare following a 25 percentage point increase in uptake of a language at KS3/KS4

	Arabic		Mandarin		French		Spanish	
Panel A: Cumulative GDP by 2050								
	£, million	*%, GDP 2019*	£, million	*%, GDP 2019*	£, million	*%, GDP 2019*	£, million	*%, GDP 2019*
I. Trade effect only								
M	**2,316.1**	***0.0945***	**1,793.4**	***0.0731***	**1,680.2**	***0.0685***	**1,537.0**	***0.0627***
L	2,292.2	*0.0935*	1,768.4	*0.0721*	1,660.2	*0.0677*	1,517.3	*0.0619*
H	2,356.5	*0.0961*	1,834.4	*0.0748*	1,713.4	*0.0699*	1,569.2	*0.0640*
II. Trade and human capital effects								
M	**30,471.0**	***1.2427***	**29,907.2**	***1.2197***	**23,840.6**	***0.9723***	**23,605.9**	***0.9627***
L	29,377.4	*1.1981*	28,759.2	*1.1729*	22,857.0	*0.9322*	22,792.0	*0.9295*
H	31,484.3	*1.2840*	30,844.6	*1.2579*	24,618.2	*1.0040*	24,338.0	*0.9926*
Panel B: Cumulative consumer welfare gain by 2050								
I. Trade effect only								
M	**3,022.6**	***0.1233***	**4,603.0**	***0.1877***	**2,884.5**	***0.1176***	**2,315.9**	***0.0944***
L	2,989.5	*0.1219*	4,538.1	*0.1851*	2,848.3	*0.1162*	2,285.7	*0.0932*
H	3,078.1	*0.1255*	4,708.9	*0.1920*	2,944.1	*0.1201*	2,365.3	*0.0965*
II. Trade and human capital effects								
M	**30,555.5**	***1.2461***	**32,096.6**	***1.3090***	**24,555.8**	***1.0014***	**23,897.5**	***0.9746***
L	29,476.5	*1.2021*	30,933.5	*1.2615*	23,577.3	*0.9615*	23,090.7	*0.9417*
H	31,562.4	*1.2872*	33,079.1	*1.3490*	25,343.4	*1.0336*	24,631.4	*1.0045*

Notes: M refers to the midpoint estimate based on the Monte Carlo simulation parameter inputs reported in Table 5.1. L refers to the lower bound threshold of the 99% confidence interval and H refers to the higher bound threshold of the 99% confidence interval. All values are reported in 2019 £.

How do these estimated figures broadly compare against other recent trade-related impact assessments? Table 5.4 compares the trade effects on UK GDP based on the figures reported in Table 5.2 and Table 5.3 for UK pupils learning Arabic, Mandarin, French or Spanish. In comparison, the UK government's assessment of a UK–US free-trade agreement using a very similar modelling framework estimates a £15.3bn UK GDP gain over 15 years. Over the same number of years, the UK government estimates that a comprehensive free-trade agreement with Japan would add £1.5bn in GDP terms to the UK economy. As a crude comparison, this would correspond to about £1bn and £0.1bn per year on average compared to £0.02bn and £0.06bn a year from a 10 or 25 percentage point increase of KS3/KS4 pupils learning Mandarin. Or, in other

words, increasing the number of secondary-school pupils learning Mandarin intensively could possibly represent between approximately 20 and 60 per cent of the GDP gains per year that would accrue from a comprehensive free-trade agreement with Japan.

Table 5.4: Comparison of trade effects associated with reducing trade barriers by improving language skills with recent impact assessments for UK–US and UK–Japan trade and economic cooperation agreements

Reduction in trade barriers		Total gain (£, billion)	Average gain per year (£, billion)
FTA	UK-US	15.3	1.02
	UK-Japan	1.5	0.1
Languages	10% Mandarin	0.7	0.02
	25% Mandarin	1.8	0.06
	10% Arabic	0.9	0.03
	25% Arabic	2.3	0.08
	10% Spanish	0.6	0.02
	25% Spanish	1.5	0.05
	10% French	0.7	0.02
	25% French	1.7	0.06

Source: authors' calculations

It is important to highlight that these figures should be taken with a word of caution as their like-for-like comparison is challenging. The UK government's assessment of the benefits of reducing trade barriers with the US and Japan was based on a static model and assumes that the reported full benefits would arise after about fifteen years. The estimated effects associated with reducing trade barriers by learning Mandarin or other languages are based on a dynamic model where the benefits increase over time, as more UK individuals become able to speak the language well enough to function in business. That is, in our model, the potential contribution to the economy of cohorts learning the language by 2040 would not be considered over their full working life as the cut-off point for the analysis is 2050.

5.2.2. Comparing the estimated benefits against potential costs of a simulated intensive language-education programme

Tables 5.2 and 5.3 reported the estimated cumulative economic benefits for the UK over 30 years from improving languages education in KS3/KS4 by providing pupils with intensive education in either Arabic, Mandarin, French, or Spanish. In the simulation analysis it is assumed that from now into the future each cohort of pupils entering the programme would receive this intensive language programme, rather than just one cohort at the beginning. In order to understand the magnitude of the estimated effects they have to be set against the relevant cost of achieving them. While there is no direct publicly available data on the cost of providing education in one of

the four languages considered, we apply a cost per student per year estimate for Mandarin of at least £480 based on information that is publicly available about the MEP in the evaluation report (Nicoletti & Culligan 2021), discussions with MEP stakeholders and other documents.[63] It is likely that programmes for French and Spanish, which are already well embedded in schools, would cost less to run, whereas Arabic is likely to be at least as costly as the MEP because it is starting from an even lower base in UK schools than Mandarin.[64] We have also factored in certain costs which might be associated with scaling up such a programme. However, as we cannot assume the costs of running intense language programmes in schools are fully known, we introduce ranges into our cost assumptions which are outlined in Table 5.5.

Table 5.5: Assumed cost per student per year (£) for an intensive education programme across four different languages – midpoint, low and high estimates

	Arabic	Mandarin	French	Spanish
M	720	600	420	420
L	600	480	240	240
H	840	720	600	600

Source: Authors' assumptions
Notes: M refers to the midpoint cost assumption; L refers to the lower bound value cost assumption; and H refers to the higher bound value cost assumption. If we assume a four-year language programme, costs per student per year are multiplied by four; if we assume a five-year language programme, the costs per student per year are multiplied by five.

Note that for Arabic we assume a midpoint cost estimate of £720 per student per year. For Mandarin we assume a midpoint cost estimate of £600 per student per year, for Spanish and French £420 per student per year. Furthermore, we assume that the intensive language programme either has a four- or five-year duration, where the five-year course would cover the entire time a student is in KS3 and KS4. For example, assuming a cost per student per year of £600 for an intensive Mandarin Chinese education programme, a four-year programme would cost £2,400 per student and a five-year programme would cost £3,500 per student.

Using the information about the cumulative benefits to GDP and welfare terms provided in Table 5.2, for a 10 percentage point increase in the number of pupils participating in an intensive language programme, and the assumed cost per student per year ranges provided in Table 5.5, we report estimated benefit-to-cost ratios (BCR) in Table 5.6. Note that, as before, we provide the

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63   According to the evaluation report, the MEP includes practical and pedagogical support, including support with curriculum development, teaching resources, training events, and opportunities for teaching practice so as to help build the supply of qualified Mandarin teachers. Information about the proposed number of contact hours and the cost per pupil for the Latin Excellence programme will not be known until the current tendering process is complete in spring 2022.

64   As with the MEP, building up teaching resources and the supply of qualified Arabic teachers would be vital.

midpoint estimate labelled as 'M' and the lower and upper bound estimates labelled 'L' and 'H'. It is also important to highlight that all benefits and costs are given in net-present values.[65]

For instance, if we only take into account the economic benefits associated with trade effects, we estimate a BCR between 0.13 to 0.18 for a four-year intensive Arabic programme and a BCR between 0.10 to 0.14 for a five-year programme. In other words, for each pound spent, and considering only trade effects, between £0.10 and £0.18 would be paid back respectively.

Table 5.6: Benefit-to-cost ratios across four different languages – medium, low and high estimates

	Arabic		Mandarin		French		Spanish	
	4 year	*5 year*	*4 year*	*5 year*	*4 year*	*5 year*	*4 year*	*5 year*
Benefit to cost ratios based on GDP gains								
I. Trade effect only								
M	**0.15**	*0.12*	**0.14**	*0.11*	**0.18**	*0.15*	**0.17**	*0.14*
L	0.13	*0.10*	0.11	*0.09*	0.13	*0.10*	0.12	*0.10*
H	0.18	*0.14*	0.18	*0.14*	0.33	*0.26*	0.31	*0.25*
II. Trade and human capital effects								
M	**1.95**	*1.56*	**2.30**	*1.84*	**2.62**	*2.09*	**2.60**	*2.08*
L	1.61	*1.29*	1.84	*1.47*	1.76	*1.40*	1.75	*1.40*
H	2.42	*1.94*	2.96	*2.37*	4.73	*3.78*	4.68	*3.75*
Benefit to cost ratios based on welfare gains								
I. Trade effect only								
M	**0.19**	*0.15*	**0.35**	*0.28*	**0.32**	*0.25*	**0.26**	*0.21*
L	*0.16*	0.13	0.29	0.23	*0.22*	0.18	*0.18*	0.14
H	*0.24*	0.19	0.45	0.36	*0.57*	0.45	*0.46*	0.37
II. Trade and human capital effects								
M	**1.96**	*1.57*	**2.47**	*1.97*	**2.70**	*2.16*	**2.63**	*2.10*
L	*1.62*	1.29	1.98	1.58	*1.81*	1.45	*1.78*	1.42
H	*2.43*	1.94	3.18	2.54	*4.87*	3.89	*4.74*	3.79

Notes: 4-year assumes that language programmes last four years; 5-year assumes that language programmes last five years. M refers to the midpoint estimate based on the Monte Carlo simulation parameter inputs reported in Table 5.1. L refers to the lower bound threshold of the 99% confidence interval and H refers to the higher bound threshold of the 99% confidence interval. All values are reported in 2019 £. Future benefits and costs are discounted with a 3.5% discount rate.

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65   Where we apply a 3.5 per cent discount rate.

The estimated values are in a similar ballpark for Mandarin and a little higher for French and Spanish; despite the overall lower cumulative economic benefits, due to assumed lower costs, they achieve a slightly better BCR. Also, if we believe that from a policy perspective we should focus on overall welfare (e.g. how well consumers do in terms of the availability of goods and services and how much extra the government could spend on public goods) then the BCRs are also higher than if we just take into account gains in GDP.

Importantly, if we also take into account potential human-capital effects on top of trade effects, we find that, for instance, providing an intensive Arabic programme would result in an estimated BCR between 1.61 and 2.42 for a four-year programme and between 1.56 and 1.94 for a five-year programme. Or in other words, for each pound spent, the return is between £1.56 and £2.42. The BCR for Mandarin varies between 1.76 and 2.96 depending on whether we assume a 4-year or 5-year programme respectively. Similarly, when we consider only the benefits from the trade effects, the overall estimated BCRs for Spanish and French are somewhat higher as we assume a lower cost per student per year. Equally, if we use overall welfare rather than GDP as the benefit metric, we estimate higher BCRs for all four languages than for GDP alone.

In summary, the findings presented in Table 5.6 suggest that even under relatively conservative assumptions, taking into account trade and human-capital effects and independent of the language learnt, the BCR is always greater than 1, suggesting that the investment in languages education pays back more than the cost.

5.3.2. Limitations of the CGE analysis

It is important to highlight that the CGE modelling analysis presented in this chapter is subject to several limitations.

First, the CGE modelling approach taken is not intended to provide an exact forecast of the UK economy at a given point in time in the future. The deterministic model does not consider transitory (stochastic) short-term changes to the overall economic growth path. The aim of the applied modelling framework is to examine the effects of relative changes across different modelling parameters representing different scenarios and then to compare how the economy of a country would evolve in the medium- to long-term in the counterfactual scenarios compared to the baseline, holding all other factors constant. This is a simplification of how events would affect the economy in reality. However, it allows the analysis of specific factors in isolation such as, for the purpose of this analysis, potential changes to trade costs and improvements in human capital associated with an increase in languages education.

Second, the scenarios examined within the CGE economic modelling framework depend heavily on parameter assumptions made about how increased languages education affects trade and human capital and hence key economic metrics, such as productivity or capital formation. We have applied sensitivity analyses to take into account uncertainty about the true values of these parameters and have generally aimed to take a conservative approach. The assumptions made during the modelling of this study have been made based on the evidence from the existing literature or other economic modelling available at the time of the analyses. In the future it may be possible to amend certain assumptions based on better empirical evidence that may emerge.

Third, the CGE modelling framework is based on a micro-foundation of the underlying equations that determine the economic behaviour of the various economic agents such as households, firms or the government. However, some of the microeconomic parameters are fixed and are hence invariant across different scenarios. Such fixed input parameters include, among others, different demand, substitution, and income elasticities, as well as parameters relevant to the production technology, such as the relative importance of each of the production inputs. Therefore, the analysis does not take into account the impact of future technologies or policies that may affect the language skills of a country's population.[66]

5.3. Summary

The key findings of this chapter can be summarised as follows.

- Improving language provision in KS3/KS4 would be associated with an increase in UK GDP and welfare over time. We find that a 10 percentage point increase in UK pupils at KS3/KS4 learning Arabic and able to apply the language effectively in a business setting could increase UK GDP cumulatively over 30 years by between £919mn and £944mn through a reduction in non-tariff trade barriers related to languages alone. This corresponds to about 0.04 per cent of the UK's GDP in 2019. For a 10 percentage point increase in the UK KS3/KS4 pupil population learning Mandarin and able to use the language effectively in a business setting later, we estimate a cumulative GDP increase between £707mn and £733mn. For French we estimate a cumulative GDP increase between £665mn and £686mn, and for Spanish between £623mn and £644mn. The estimated cumulative gains are higher if we also take into account potential human capital effects, between 0.4 per cent of the UK's GDP in 2019 (French and Spanish) and 0.5 per cent of the UK's GDP in 2019 (Arabic and Mandarin).

- Investing in languages education will most likely more than return the investment cost, even under conservative assumptions. We find benefit-to-cost ratios of 2:1 for promoting Arabic-, Mandarin-, French-, and Spanish-language education, meaning that even under conservative assumptions, spending £1 could return approximately £2 on average.

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66   For example, new simultaneous translation technologies that enable people from different languages to communicate with each other in real-time; or changes in migration policies that increase migrants from specific countries and hence increase the proportion of foreign language speakers in the UK.

5 Discussion and conclusion

This research aimed to assess the economic relevance of languages generally and then to evaluate the potential economic impact of enhancing current language-education provision in UK schools by simulating the economic benefits that could occur if an intensive language programme akin to the MEP were established in UK schools for Arabic, French, Mandarin or Spanish. The idea behind the simulation analysis was not in any way to substitute or diminish education in STEM or other EBacc subjects and replace them with languages but, keeping everything else constant, to demonstrate the value of improving the quality and quantity of languages education of secondary school pupils across the UK.

In Chapter 3 we demonstrated how sharing spoken languages can reduce trade barriers. Contrary to what is frequently believed, English – though important as a lingua franca in business worldwide – is not the sole driver behind existing trade flows across different business sectors. For instance, we estimate that if the populations in the world who speak Arabic, French, Mandarin, and Spanish could communicate with the UK population without difficulty, then UK exports would increase by £19bn a year.

In Chapter 4 we considered ways in which these potential financial benefits for the UK might be realised. For example, we found that a 10 percentage point increase in the UK KS3/KS4 population undertaking an intensive Mandarin programme, enabling them to use this language later in a business setting, could improve the UK's GDP cumulatively over 30 years by between £11.5bn and £12.3bn, which corresponds to about 0.5 per cent of the UK's GDP in 2019. If more pupils were engaged in such a programme, the cumulative benefits would of course be higher. For example, we found that a 25 percentage point increase in the UK KS3/KS4 population undertaking an intensive Mandarin programme could improve the UK's GDP cumulatively over 30 years by between £28.8bn and £30.8bn, which corresponds to about 1.2 per cent of the UK's GDP in 2019. We estimate economic benefits of comparable relative magnitude for Arabic, French and Spanish. If we compare these benefits to their potential costs, we find that £1 spent today could return £2 over time.[67] It is important to highlight that the approach taken in the analysis is conservative,

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67   The analysis also does not take account of all the other educational benefits from enhanced language learning and travel abroad. The Salzburg Statement for a Multilingual World (2017) speaks of proficiency in additional languages as 'a new kind of global literacy'; see https://www.salzburgglobal.org/fileadmin/user_upload/Documents/2010-2019/2017/Session_586/EN_ SalzburgGlobal_Statement_586_-_Multilingual_World_English.pdf (last accessed 15 January 2022).

applying higher cost estimates whenever possible and trying to take input parameters which are potentially associated with lower economic returns in the simulation. However, we should also point out the potential limitations of the empirical analysis. This assumes that additional languages education is not crowding out STEM subjects such as mathematics and science, which have been reported to provide relatively large labour-market returns. This is not currently the case in the MEP programme we have chosen as the example for our analysis.

It is also important to note that the economic analysis presented only considers trade and human-capital effects associated with improving language-education provision in the UK. There are other potential effects which we have not taken into account either because they are more difficult to monetise or because there is insufficient quantitative evidence to provide a suitable basis for modelling work. There are nevertheless a number of studies and reports which demonstrate the importance of languages for literacy and skills (Stewart 2005); community and social cohesion and integration (e.g. Ayres-Bennett & Carruthers 2018; Mepham & Martinovic 2018) ; international development and soft power (Footitt et al. 2018) ; defence, diplomacy and national security (British Academy 2013); developing cognitive flexibility (Adesope et al. 2010; Prior & MacWhinney 2010) and health and well-being, amongst others. To take the case of health, there is emerging evidence that the onset of dementia occurs later in bilinguals than monolinguals and that bilinguals recover better from strokes than monolinguals (Alladi et al. 2013; Alladi et al. 2015; Bialystok et al. 2014). If indeed knowing more than one language is associated with the delayed onset of dementia by some four to five years, then an increase in the provision of languages education could potentially not only reduce expenditures on drugs and medicines related to the disease but also reduce the carer burden for family members of patients with dementia. If someone is active in the workforce but also cares for an elderly family member, for instance, this could have secondary negative productivity effects due to higher rates of absenteeism or lower potential labour-market engagement than would otherwise be the case. Furthermore, producing linguists with better language skills would also be beneficial in providing the translators and interpreters who are needed, for instance, in international organizations, healthcare and courts. None of these effects are taken into account and monetised in our modelling, but if they were, they would inevitably increase the estimated economic benefits presented in Chapter 5.

In this report we have focused on potential improvements in both the quantity and quality of language provision in the UK. The MEP increases the hours devoted to language learning in a way which does not disrupt the timetabling of other EBacc subjects, is fully costed, and, if at times challenging logistically, has nevertheless been shown to be feasible. Moreover, the increase in pupil achievement and motivation recorded in the MEP evaluation report is likely to nurture students who wish to continue with languages beyond GCSE to A Level and beyond as either part or all of their university degree. The findings of the report suggest that there are identifiable returns for investing in languages education, not just in the economic terms on which this report has focused, but also in producing the workers with the language skills needed for the UK to compete in an increasingly globalised world.

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