What Is the Impact of Industrial Structure on Low-Skill Immigrants' English Language Fluency?

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Abstract

This paper examines whether people invest in skills that are especially highly rewarded in the industries located in their cities. In particular, we examine whether low-skill immigrants improve their English speaking abilities when communication with natives becomes more highly valued in their labor markets. Using 1980, 1990, 2000 U.S. Census and 2007-2011 American Community Survey (ACS) data, we find that, controlling for metropolitan area fixed effects, decreases in the size of a metropolitan area's manufacturing sector lead to improvements in low-skill immigrants' English speaking abilities. The estimated coefficient on the MSA's manufacturing share variable falls substantially in magnitude but remains statistically significant after controlling for individuals' industry of employment suggesting that there are spillovers in English language acquisition within cities.

Keywords: Language Ability, Manufacturing Sector, Immigrant Assimilation

Journal of Economic Literature Classification: J10, J61

1 Introduction

Language skills are an important form of host country-specific human capital for immigrants. While previous studies have shown a positive association between language skills and earnings (e.g. Angrist and Lavy, 1997; Dustmann and van Soest, 2002; and Bleakley and Chin, 2004), there is considerable variation in the extent to which immigrants become fluent in the host country language even after spending many years in the host country. In fact, according to a recent report, more than 20 percent of immigrants living in the U.S. for fifty years were not able to speak English "very well" (Jiménez 2011). Much of the literature on language acquisition focuses on factors making learning a new language easier, for example, age at arrival (Bleakley and Chin, 2004) and the similarity between an immigrant's native language and the host country language (Adsera and Chiswick, 2007). This paper examines how increases in the labor market returns to learning the host country language influence immigrants' fluency in the host country language. Specifically, we show how changes in industrial structure in U.S. cities, focusing on declines in manufacturing, affect low-skill immigrants' investments in English communication skills.

Because manufacturing jobs typically do not require communication with customers and clients, English fluency is likely to be less important for manufacturing workers than for workers in other sectors, especially service sectors. Given the repetitive nature of many manufacturing jobs, communication between managers and coworkers may be rather rudimentary. In fact, to the extent that immigrants can segregate into plants employing mainly speakers of their native language, the labor market returns to English speaking ability may be rather low.

As manufacturing jobs disappear, English language fluency among immigrants may improve through three main mechanisms. First, even the threat of job loss in the manufacturing sector may induce some immigrants to actively invest in their English speaking skills by enrolling in formal English classes or taking other active steps to improve their English. Second, if when low-skilled immigrants lose their jobs in the manufacturing sector, they take jobs in the service sector requiring their use of English on-the-job, then the increased exposure to the language is likely to increase fluency. Finally, even immigrants who are not directly affected by changes in the manufacturing sector may improve their English speaking skills as more people in their communities start speaking more and better English.

To identify the impact of changes in industrial structure on English language fluency, we use 1980, 1990, 2000 U.S. Census and 2007-2011 American Community Survey (ACS) data. We estimate a model with metropolitan area (MSA) fixed effects and year fixed effects to control for unobserved time-invariant MSA-specific and time-specific factors that can affect immigrants' English skills. Our results imply that for every one percentage point increase in manufacturing employment share, immigrants' likelihoods of speaking

English very well decreases by a little over a third of a percentage point. Further analyses suggest that these results are driven by Hispanics and are slightly stronger for immigrants arriving at older ages. For further evidence that our estimates might be interpreted as causal, we show that English speaking abilities of immigrants with some college experience or more are not significantly affected by changes in the share of employment in manufacturing in their cities—most likely because they do not themselves work in the manufacturing sector and may not have strong contact with those who do.

An important issue regarding interpretation of our results is the possibility that low skill immigrants with worse English speaking abilities selectively move to cities with smaller declines (or even increases) in the manufacturing sector. To examine how much selective migration may be driving our results, we split our sample into two groups: immigrants who have migrated across MSAs in the recent past (five years or one year depending on the survey year) and those who have not. If our results are driven mainly by internal migration decisions, the industrial structure effect on recent migrants should be greater in magnitude and significantly different than the effect on non-migrants. Our results suggest that impacts in the two groups are not significantly different from each other

The paper is organized as follows. Section 2 presents background and motivation for the study. Section 3 describes the data, section 4 introduces the empirical models, section 5 discusses empirical results, and section 6 performs robust checks. Section 7 concludes.

2 Background

The foreign born share of the total population in the US has increased from 4.7% in 1970 to 13.3% in 2014 and continues to increase (Colby and Ortman 2015).[1] Most of the recent immigrants are from non-English speaking countries (Hugo Lopez, Passel, and Rohal 2015). About 9% of the U.S. population can be considered Limited English Proficient (LEP)[2] and approximately 21% speak a language other than English at home (Zong and Batalova 2017).

Our paper contributes to a large literature on the determinants of host country language acquisition among immigrants. This literature, focused on immigrants in English-speaking countries, suggests that the likelihood of learning English is inversely related to the proportion of the local population that speaks an immigrant's native language (Chiswick and Miller, 1995, 1996; Lazar,1999; Dustmann and Fabbri, 2003). English fluency is also associated with a younger age at arrival (Chin and Bleakley 2004) and a smaller

[1] According to Colby and Ortman (2015), the foreign born are expected to account for 19 percent of the total population in 2060.

[2]Limited English Proficient individuals refers to anyone above the age of 5 who is reported as not being able to speak Egnlish ng English less than "very well," as classified by the U.S. Census Bureau.

linguistic distance between the immigrant's native language and English (Chiswick and Miller 2008). In several papers, Clingingsmith (2008, 2014) shows that the expansion of the manufacturing sector in India during the 20th century provided people an incentive to become bilingual and to reduce district level language heterogeneity. While Clingingsmith's papers are very closely related to our topic, he studies the increase in bilingualism in India among natives, but we focus on low-skill immigrants in the United States.

Our paper also contributes to a literature on the impact of local labor market changes on human capital investment more broadly. Existing evidence suggests that people will increase their investment in skills that are highly valued in their local labor markets. Bryce and Oster (2013) find that increases in high-skill IT service jobs in India promote school enrollment, and this effect is localized to within a few kilometers outside of the IT centers. In a developed country context, Weinstein (2017) uses three exogenous market shocks--the dot-com crash, the 2008 financial crisis, and a shock transforming Delaware into an international financial center—to show that in universities in areas more exposed to sectoral shocks, the number of majors in sector-relevant fields increases.

Finally, we contribute to a large and growing literature in the U.S. examining the impacts of the decline in manufacturing jobs on several different measures of wellbeing. Since 1980, the industrial structure in the U.S. has changed dramatically, with a shrinking manufacturing sector and an expanding service sector (Autor 2010). Two main factors have driven this trend. First, technology changes have increased the productivity in manufacturing sector after the World War II, decreasing the use of labor in production. Second, globalization makes it possible for producers to find low cost labor abroad (Autor, 2010). Cities in the U.S. have been differentially affected by these changes at least partly due to differences in initial conditions within the manufacturing sector before the changes. Using this type of variation, recent papers have shown that declines in the manufacturing sector have been associated with declines in wages (Autor and Dorn 2013), declines in marriage (Autor, Dorn, and Hanson 2017), increases in out of wedlock births (Autor, Dorn, and Hanson 2017), and even increases in political polarization (Autor, Dorn, Hanson, and Majlesi 2016).

Our paper contributes to this literature by considering the impacts of changes in the manufacturing sector on a specific type of human capital investment of a particular population: English language fluency among immigrants. Because workers in the manufacturing sector are mainly engaged in routine manual work (Autor, 2010), communication skills are less important. Managers are able to communicate instructions without requiring complex language and work within teams is probably not necessary. At the same time, most of the workers within manufacturing, those involved in production, do not often communicate with customers. Consistent with this idea that English language proficiency is less important

for manufacturing workers, Chiswick and Miller (2010) show using O*NET data that workers in low-skilled occupations, such as production, transportation, and material moving occupations, have a distribution of English language importance scores skewed towards the left, while service and sales occupations have a relatively high mean score for the importance of English language fluency. In our paper, we will consider whether changes over time in the share manufacturing sector in a city lead to changes in the English fluency among immigrants in that city. The key identifying assumption we make are that manufacturing plants are not choosing location decisions based on the English language fluency of the immigrant population across cities and that immigrants are not selectively migrating based on changes in the manufacturing sector across cities. Admittedly, these are very strong assumptions. We will address the plausibility of these assumptions later in the paper.

3 Data

The data used in this study comes from the 5% state samples of the U.S census data from 1980, 1990 and 2000 as well as the 5-year 2007 to 2011 5% sample of the American Community Survey (ACS). These data are particularly well suited for this study because they contain information on immigrants' English proficiency and the large sample sizes allow us to create accurate measures of industrial structure changes within metropolitan areas over many decades.

Our main sample consists of immigrants from non-English speaking countries,[3] living in a metropolitan area, who arrived in the U.S. after age 18 and have completed at most a high school degree. We also drop those immigrants who report speaking only English since for them, English is a native language despite their being born abroad. Our justification for dropping childhood immigrants is that they are often fluent in English by the time they join the labor market (Bleakley and Chin 2004). We restrict our sample to low skill immigrants because they are more likely to work in production within the manufacturing sector. They are also less likely to have been fluent in English before coming to the United States making them more sensitive to changes in U.S. industrial structure. In our main analysis, we only include people living in the 116 MSAs that are consistently identified from 1970 to 2010, excluding individuals who don't live in identified MSAs. Even MSAs with the same codes over the years can consist of different counties in different years, but counties that are in an MSA one year but not in another year typically have small

[3] English speaking countries are defined as countries from which more than half the recent adult immigrants speak English at home. Countries with English as an official language are also excluded from the sample. Puerto Rico is classified as a non-English speaking country (Details can be found in Appendix Table A2).

populations and so this is unlikely to severely bias estimates.[4]

Our measure of English proficiency is based on answers to the survey question: "How well does this person speak English?" In our sample, the question has four possible responses: "very well," "well," "not well", and "not at all." Following Bleakley and Chin 2004, we create an English fluency dummy variable equal to one for immigrants speaking English very well and zero otherwise.[5] Our main right hand side variable is the manufacturing sector employment share. To construct this variable, we start with the full sample of working age individuals (including the native born) who report being currently employed. We use the 1990 Census Bureau industrial classification scheme to create the share of all workers in the manufacturing sector. The manufacturing sector includes not only plants, factories, and mills but also establishments that transform materials or substances into new products by hand or in the worker's home. It also includes those engaged in selling to the general public products made on the same premises from which they are sold, such as bakeries, candy stores, and custom tailors.[6]

Table 1 presents descriptive statistics of our sample separated by year. As can be seen from the table, manufacturing sector employment share declined from 21.5% in 1980 to 9.76% in 2010 in the US. The share of immigrants who speak English very well also decreased from 21% in 1980 to 13.9% in 2010. In all years, the share female in our sample is larger than the share male. In recent years, immigrants tend to have slightly younger ages at arrival. Educational attainment increased in our sample period, even among the low-skilled immigrants in our sample as more of them have a high school diploma in recent years. The racial composition also changed significantly with a huge decline in the share of non-Hispanic whites and an increase in the share of Hispanic and non-Hispanic blacks as well as Asians.

4 Empirical Strategy

Our basic strategy to identify the effect of the manufacturing sector on immigrants' English proficiency is to exploit variation within metropolitan areas across time with the following equation:

$$ENG_{imt} = \alpha_1 MF_{mt} + \beta X_{imt} + \mu_m + \theta_t + \varepsilon_{imt} \quad (1)$$

[4] We keep the MSAs that are consistently defined between 1970 and 2011 because as we proceed with this project, we expect to construct an instrumental variable for share manufacturing based on industry composition across U.S. cities in 1970.

[5] Because this information is self-reported (or reported by the person in the household filling out the survey), the English speaking ability variable may suffer from measurement error. Different people might have different answers to the English speaking ability question even holding constant actual English speaking ability. We note, however, that the statistical consequence of error in a dependent variable is that the estimates of the regression coefficients will be imprecise. However, this will not result in biased estimated effects.

[6] We use the North American Industry Classification System.

The variable *ENG*, our measure of English speaking ability, takes on the value one if person *i* in MSA *m* in year *t* speaks English very well and zero if the person speaks English well, not well, or not at all. The share of workers employed in the manufacturing sector is denoted *MF*. The vector *X* includes individual characteristics such as race, gender, educational attainment, marital status, age, years in the US, and the square terms of the last two variables. The model includes MSA and year fixed effects. Unobserved determinants of English speaking ability are in the error term, ε. If indeed declines in the manufacturing share lead to improvements in immigrants' English speaking abilities, we expect α_1 to be negative.

5 Empirical Results

5.1 Baseline Model

Table 2 displays our baseline results using several model specifications. Standard errors are clustered at the MSA level. The first column presents results from estimating the simplest possible specification without any control variables. The estimate suggests a positive, although only marginally statistically significant, correlation between manufacturing employment and immigrants' English speaking ability. This may be because historically manufacturing-intensive cities have been attracting immigrants for many years, and so the immigrants in these cities might have lived in the US for more years. It is also possible that new immigrants to historically manufacturing-intensive cities arrive with better English-speaking abilities.

To address these issues, we add MSA fixed effects and year fixed effects in column (2). When examining whether *changes* in a city's manufacturing share result in *changes* in immigrants' English speaking abilities, we find that indeed decreases in manufacturing are associated with improvements in English fluency. A ten percentage point increase in a city's manufacturing share is associated with 3.7 percentage point increase in the likelihood that immigrants in that city speak English very well. As can be seen in column (3), controlling for immigrants' age, years in US, educational attainment,[7] gender, race, and marital status only very marginally decreases the magnitude of the estimate. Estimated coefficients on the controls variables are consistent with the existing literature. English speaking ability decreases with age but at a decreasing rate. Immigrants with more education and more years spent in US are more likely to speak English very well. Also, English fluency varies by race. The final model suggests that a ten percentage point decrease in a city's manufacturing share leads to a 3.5 percentage point increase in the likelihood that immigrants in that city speak English very well, a magnitude corresponding to about 20 percent of the mean English

7 : We just keep low-skill immigrants in my sample, so the variable used to control education is "high school graduate" dummy.

fluency rate in our sample. To put this in perspective, the average city manufacturing share in our sample decreased about ten percentage points between 1980 and 2007-2011, as can be seen in Table 1.

5.2 Identification Tests

Interpretation of our baseline results may be difficult because changes in industrial structure in a city are not exogenously determined and even if they were, immigrants may selectively respond to these changes based on their English fluency. In this section, we present results suggesting that selective location choices of manufacturing plants and migration decisions of immigrants are not likely to be the central drivers of our findings.

To start, we examine whether manufacturing firms tend to move to cities where immigrants have worse English speaking abilities. This may sound unlikely because, first of all, immigrants in general make up a relatively small share of the labor force—ranging from 6 percent in 1980 to 13 percent in 2010 (Singer 2012). That said, immigrants are overrepresented in manufacturing in general and it is possible that they are especially highly represented in less established plants that are likely to have closed or moved during the time period under investigation. Even if manufacturing firms were responding to changes in immigrant English fluency rates, it seems more plausible that they would choose locations where immigrants spoke better English, not worse. That said, equilibrium wages may be lower in cities with more immigrants with worse English speaking skills, and if English proficiency really does not make manufacturing workers more productive, it is possible that manufacturing plants employing many immigrants are more profitable in cities where immigrants are less fluent in English.

To explore this issue, we test whether increases in English fluency among immigrants in a city between two time periods are associated with decreases in manufacturing jobs in that same city in future years. Column 1 of Table 3 shows that there is no statistically significant relationship between changes in English fluency of immigrants between 1980 and 1990 and changes in manufacturing shares in these cities between 1990 and 2000. Column 2 shows a similar result when examining differences ten years later. In both cases, if we are to take the magnitude of the estimate seriously, it suggests that a one percentage point increase in a decadal difference in a city's share of immigrants who speak English very well is associated with a 0.0001 percentage point decrease in the future decadal difference in that city's share manufacturing—not only is the estimate statistically insignificant, it is very small in magnitude.

Next, we consider the likelihood our baseline results are driven migration of low English fluency immigrants to cities with increases (or smaller decreases) in the manufacturing sector. We begin by testing for heterogeneity in impacts by how much time the immigrants have been in the United States. Immigrants arriving in the U.S. for the first time may be especially sensitive to recent changes in industry composition

when deciding where to live. After establishing roots in a city, it becomes more difficult to move to a different city in response to relatively recent changes in industry composition.[8] Barring a significant amount of foresight, immigrants who have been in the US more than ten years could not have chosen their settlement cities based on changes in industry structure in the most recent decade. Thus, separating the sample by whether immigrants have been in the US for more than ten years can provide some initial indication of whether our results are likely to be driven completely by the most recent immigrants' decisions of where to settle.

Columns 1 and 2 of Table 4 show results from estimating our baseline model separately by whether the immigrants in our sample have been in the US more than ten years. The results suggest that indeed recent immigrants' language abilities are slightly more sensitive to changes in industry structure than immigrants who have been in the U.S. more than ten years. This should not be surprising since after living in the U.S. for more than ten years, many immigrants are likely to have already reached the level of speaking English very well making it difficult to improve further. What is more noteworthy is the fact that *even* among established immigrants, decreases in the size of the manufacturing sector lead to improvements in English fluency. Column 3 of Table 4 shows results from a model with interactions between years in the U.S., separated into five year intervals, and the share manufacturing variable. The estimates again imply that immigrants who have been in the U.S. fewer years improve their English fluency more in response to decreases in the manufacturing sector, but those who have been in the U.S. more years are always less sensitive to changes in industry structure even among those who have been in the U.S. more than ten years.

While these results should assuage concerns that initial settlement decisions of immigrants are driving our baseline findings, it is still possible that after arriving in the U.S., immigrants move between MSAs in response to changes in the manufacturing sector. For example, facing a decline in manufacturing jobs in city A, some immigrants in city A may migrate to city B where the manufacturing share is larger or the decline in the manufacturing sector appears slower. To address this concern, we add an interaction to the baseline model between share manufacturing and whether the immigrants recently moved to that city (in the past 5 years for Census years 1980, 1990, and 2000 and in the past year for the ACS data). Results shown in column 4 of Table 4 do not suggest any difference in the impacts by whether immigrants recently moved to their current city. We interpret this as evidence that selective domestic migration is not likely to be driving our main findings.

5. Additional Tests of Heterogeneous Responses

[8] Because we have MSA fixed effects in our preferred models, selective migration of immigrants will only bias our estimates if immigrants are moving in response to changes in industry structure within a city.

In this section, we explore whether the impacts of changes in industrial structure in a city are uniform across different types of immigrants, and if not, whether the differences are consistent with what we would expect if changes in industrial structure indeed have causal impacts on immigrants' English fluency. We start by examining how immigrants with different educational attainments react to decreases in employment in the manufacturing sector in their cities.

The first two columns of Table 5 show how the impacts of changes in industrial structure differ by whether the low skilled immigrants in our sample have a high school degree. Estimates are slightly larger in magnitude for those with a high school degree compared to those with less than a high school degree. This may be because high school graduates have more resources to improve their English speaking abilities than immigrants with less than a high school degree. Next, we conduct a type of placebo test by considering the impacts of changes in the size of the manufacturing sector on immigrants who are not likely to be employed in manufacturing: those with more than a high school degree. These immigrants are not included in our baseline sample. The results in columns 3 and 4 of Table 5 show that the language abilities of high skilled immigrants are not sensitive to changes in industrial structure. Estimated standard errors are large, and so we cannot rule out negative impacts but interestingly, the estimate of the impact is practically zero for immigrants with some college and even positive for those with a college degree. This may be because the college educated immigrants working in the manufacturing industry have professional jobs which require or reward English fluency.

Returning to our sample of low skilled immigrants, we next explore heterogeneity in effects by age. Because it is easier to learn new languages at younger ages, we expect impacts to be largest among younger people. The results in column 1 of Table 6 show that indeed this is case. In fact, estimates for individuals above the age of 50 have estimated impacts only about half the size as the impacts of individuals between the ages of 18 and 30, the youngest in our sample. This finding may also be interpreted as additional evidence that our baseline results are not driven by location decisions of manufacturers since the profitability of manufacturing companies should depend on equilibrium wages and productivity levels of all workers—not just the youngest workers.

Next, we consider heterogeneous by race. Results shown in column 2 of Table 6 suggest that the effect of manufacturing share on English fluency is driven by Hispanics and non-Hispanic whites. There are much smaller but still negative estimated impacts for Asians, but perhaps a small positive impact for non-Hispanic blacks. These differences by race may be explained by differential tendencies to be employed in the manufacturing sector. Finally, we examine whether there are differences by gender in the impact of changes in manufacturing share on English speaking abilities. The results in the last column of Table 6 show no evidence of this.

6 Mechanisms

Changes in job opportunities may affect English fluency of immigrants through several different mechanisms. First, if immigrants with marginal English speaking abilities lose (manufacturing) jobs that do not require or reward English fluency and obtain new ones where English is used throughout the workday (service), then the mere exposure to English may improve speaking ability. Second, immigrants who have lost or feel at risk for losing manufacturing jobs may actively invest in learning English to improve their job prospects. Finally, there might be spillover effects in families and communities. As English speaking abilities improve among some members of families and communities, English will be more often used (or more often used well) in casual conversations and this may improve English speaking abilities even among immigrants who are not directly affected by changes in the manufacturing sector. We investigate the potential mechanisms driving our results in this section.

As a first step, we add to our baseline model a dummy variable equal to one if the individual lists a manufacturing occupation as his occupation and zero otherwise. Survey respondents are asked to either report their current occupation if they are employed or their most recent occupation if they have been employed in the past five years. If our results were driven solely by immigrants who are either currently or recently employed in the manufacturing sector, then adding the occupation dummy variable to the model should drastically decrease and potentially drive to zero the estimated impact on the MSA manufacturing variable. For convenience, we start by reproducing the baseline estimates (column 3 of Table 2) in the first column of Table 7 but then add a dummy variable for manufacturing occupation in column (2). The estimated coefficient on the dummy variable is negative and statistically significant suggesting that immigrants employed in the manufacturing sector do indeed have worse English speaking skills. The estimated coefficient on the share of the MSA employed in manufacturing decreases in magnitude by almost 20 percent but remains rather large and statistically significant. This suggests that declines in the manufacturing sector in a city do not improve English speaking abilities of immigrants in that city solely via the direct impacts of changing people's own occupations. Even conditional on listing a manufacturing occupation in the survey, immigrants in cities with declining experience improvements in their English speaking abilities. This may be because they fear losing their manufacturing jobs (or have already lost them) and start investing in their own English speaking skills. Alternatively, others in their communities have lost their manufacturing jobs and their English improvements are due to spillover effects.

In the next column of Table 7 we add an interaction variable between the share of the MSA employed in manufacturing and the dummy variable measuring whether the individual lists a manufacturing occupation

in the survey. The estimated coefficient on the interaction variable is negative and marginally statistically significant. This suggests that immigrants employed in the manufacturing sector are more sensitive to changes in the share manufacturing sector than immigrants employed in other sectors. This makes in that they would have the largest incentives to improve their English skills for fear of losing their manufacturing jobs. Moreover, because their social networks are likely to be comprised more heavily of people who have lost their jobs in manufacturing and have perhaps improved their English by working in service sector occupations, their English skills may improve when manufacturing declines via spillover effects. On the other hand, the group most likely to have responded to declines in manufacturing with improvements in English are those who have lost their manufacturing jobs and started service jobs. Unfortunately, there is no way to identify these individuals in our data.

7 Conclusion

In this paper, we argue that increases in the share of the MSA employed in manufacturing (or smaller declines) are associated with fewer improvements in English fluency, as measured by the ability to speak English "very well". Our analyses suggest that this relationship is not likely to be driven by location decisions of manufacturing firms or selective migration by low skilled immigrants. We find that results are stronger among immigrants with a high school degree than those with less than a high school degree, presumably because they have the resources to improve their English. However, no impacts are found among immigrants any college experience, a result that can either explained by the fact that they are already quite fluent in English or the fact that they are unlikely to employed in the manufacturing sector—at least not in production. Our baseline results are driven by younger immigrants and immigrants who are either white or white non-Hispanic.

We end our analysis with a preliminary examination of the likely mechanisms behind our baseline results. Our finding that changes in manufacturing share affect English fluency even holding constant whether they list manufacturing as their occupation suggests that our results are not driven solely by on-the-job English learning in service sectors. Some of the English fluency improvements appear to be a result of active investments in language acquisition among those at risk of job loss or spillovers across members of the community. Consistent with this, we find that immigrants who list manufacturing as an occupation are more sensitive to changes in the manufacturing sector in the MSAs than those who are not employed in manufacturing.

There is a large literature pointing to the importance of host country language fluency on the success of immigrants measured in many different ways (see Bleakley and Chin 2004, Dustmann 1994 and the references therein). Borjas (2000) points to the role of poor English language proficiency in explaining why

the most recent cohorts of immigrants are assimilating in the U.S. at a slower pace than immigrants in the past. Our paper contributes to this literature by showing host country language fluency cannot be taken as exogenous; immigrants improve their English language fluency when presented English proficiency is more needed and highly rewarded. Moreover, because of spillover effects in language acquisition, small increases in the rewards to English proficiency may result in large improvements in the language proficiency of an immigrant community.

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Table 1: Summary Statistics

Year	1980		1990		2000		2010		Total	
	mean	sd	mean	sd	mean	sd	mean	sd	mean	sd
Share Speaking English Very Well	0.210	0.408	0.209	0.407	0.169	0.375	0.139	0.346	0.173	0.379
Manufacturing Share	0.215	0.0618	0.163	0.0490	0.128	0.0429	0.0976	0.0334	0.138	0.0596
Female	0.554	0.497	0.568	0.495	0.576	0.494	0.561	0.496	0.566	0.496
Years in the US	9.957	9.065	11.80	9.506	12.88	9.690	15.89	10.13	13.23	9.934
Age	40.32	12.45	40.07	12.09	39.96	11.44	43.21	11.12	41.10	11.72
Age on Arrival	30.36	9.251	28.27	8.710	27.08	8.390	27.32	8.400	27.88	8.660
High School Graduate	0.338	0.473	0.429	0.495	0.505	0.500	0.540	0.498	0.477	0.499
Less than High School	0.662	0.473	0.571	0.495	0.495	0.500	0.460	0.498	0.523	0.499
White non-Hispanic	0.333	0.471	0.173	0.379	0.116	0.321	0.108	0.310	0.157	0.363
Black non-Hispanic	0.0169	0.129	0.0196	0.139	0.0250	0.156	0.0294	0.169	0.0242	0.154
Asian	0.110	0.313	0.131	0.338	0.125	0.330	0.138	0.345	0.128	0.334
Hispanics	0.537	0.499	0.674	0.469	0.708	0.455	0.717	0.451	0.679	0.467
Other Race	0.00386	0.0620	0.00239	0.0488	0.00301	0.0547	0.00388	0.0622	0.00329	0.0572
Married	0.700	0.458	0.605	0.489	0.578	0.494	0.597	0.490	0.607	0.488
Married Spouse not Present	0.151	0.358	0.196	0.397	0.215	0.411	0.202	0.402	0.198	0.398
Single	0.149	0.356	0.198	0.399	0.207	0.405	0.200	0.400	0.195	0.396

Sample includes immigrants living in 116 consistently identified MSAs, from non-English speaking countries, who were between 18 and 65 (exclude those in Armed Forces), living in 116 consistently identified MSAs when taking the survey, with no more than a high school degree, don't speak English only and arrived in the US after the age of 18. Industrial share is calculated by using job information of all individuals including immigrants and natives.

Table 2: Baseline regressions

VARIABLES	(1)	(2)	(3)
Dependent variable:	Speaks English Very Well		
Manufacturing Share	0.188*	-0.367***	-0.345***
	(0.113)	(0.120)	(0.0678)
Age			-0.000304
			(0.000348)
Age Square			-4.66e-05***
			(4.84e-06)
Years in US			0.00794***
			(0.000388)
Years in US Square			2.71e-05***
			(6.80e-06)
High School Graduate			0.123***
			(0.00367)
Gender(Female=1)			0.00107
			(0.00278)
White non-Hispanic			0.156***
			(0.0183)
Black non-Hispanic			0.138***
			(0.0156)
Asian			-0.0427***
			(0.00591)
Two or more Major races			0.0338***
			(0.00237)
American Indian			0.0998***
			(0.0335)
Other Races			0.127***
			(0.0111)
Married Spouse Present			-0.00895***
			(0.00287)
Married Spouse not Present			0.00959**
			(0.00454)
Constant	0.148***	0.492***	0.320***
	(0.0114)	(0.0351)	(0.0310)
Observations	774,339	774,339	774,339
R-squared	0.001	0.020	0.104
MSA FE	No	Yes	Yes
Year FE	No	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

All standard errors clustered at the MSA level. The sample for this table is restricted to low skill immigrants who were in working age (excluding Armed Forces), living in the 116 consistently identified MSAs when taking the survey, arrived in US after the age of 18, from non-English speaking countries, don't speak English only, and the highest educational attainment is high school. Variables not shown in table include: Hispanics, Single.

Table 3: Manufacturing Employers' Response to Changes in Share of Low Skilled Immigrants Speaking English Very Well

VARIABLES	(1) Δ % Manufacturing from 1990 to 2000
Δ % Speak English Very Well from 1980 to 1990	-0.012
	(0.0251)
Observations	116
R-squared	0.002

VARIABLES	(2) Δ % Manufacturing from 2000 to 2010
Δ % Speak English Very Well 1990 to 2000	-0.010
	(0.0221)
Observations	116
R-squared	0.002

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

Share of good English speakers is the ratio of good immigrant English speakers to total immigrants in each of the 116 consistently identified MSA. Immigrants includes those who were in working age (excluding Armed Forces) when taking the survey, from non-English speaking countries and don't speak English only.

Table 4: Heterogeneous Effects by Years in the U.S. and Internal Migration

VARIABLES	(1) Individuals in the US <=10 years	(2) Individuals in the US >10 years
Dependent variable: Speaks English Very Well		
Manufacturing Share	-0.419***	-0.385***
	(0.0925)	(0.0771)
Age	-0.00518***	-0.00903***
	(0.00103)	(0.00143)
Age Square	2.96e-05***	2.61e-05*
	(1.11e-05)	(1.37e-05)
Years in US	0.00724***	0.0104***
	(0.000673)	(0.00100)
Years in US Square	-2.74e-05	6.78e-06
	(8.70e-05)	(1.47e-05)
High School Graduate	0.0886***	0.151***
	(0.00302)	(0.00484)
Gender(Female=1)	0.000740	0.00268
	(0.00183)	(0.00352)
White non-Hispanic	0.118***	0.177***
	(0.0146)	(0.0212)
Black non-Hispanic	0.132***	0.152***
	(0.0143)	(0.0179)
Asian	-0.0209***	-0.0572***
	(0.00440)	(0.00708)
Two or more Major races	0.0298***	0.0373***
	(0.00452)	(0.00373)
American Indian	0.111**	0.0843
	(0.0440)	(0.0540)
Other Races	0.0970***	0.176***
	(0.0190)	(0.0126)
Married Spouse Present	-0.00217	-0.0127***
	(0.00184)	(0.00479)
Married Spouse not Present	0.00206	0.0142**
	(0.00258)	(0.00715)
Constant	0.400***	0.542***
	(0.0371)	(0.0575)
Observations	348,600	425,739
R-squared	0.055	0.125
MSA FE	Yes	Yes
Year FE	Yes	Yes
Mean of Good English Speaker Share	0.130	0.209

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

VARIABLES	(3)	(4)
Dependent variable: Speaks English Very Well		
Manu%	-0.441***	-0.322***
	(0.0952)	(0.0702)
Manu%*migrate		0.0343
		(0.0443)
migrate		0.00458
		(0.00672)
Manu%*5-10 years in US	0.0476*	
	(0.0246)	
Manu%*10-15 years in US	0.0201	
	(0.0328)	
Manu%*15-20 years in US	0.156**	
	(0.0628)	
Manu%*20-25 years in US	0.278***	
	(0.106)	
Manu%* more than 25 years in US	0.639***	
	(0.175)	
5-10 years in US	0.0394***	
	(0.00496)	
10-15 years in US	0.0842***	
	(0.00794)	
15-20 years in US	0.103***	
	(0.0120)	
20-25 years in US	0.125***	
	(0.0185)	
25-30 years in US	0.166***	
	(0.0256)	
Observations	774,339	664,311
R-squared	0.102	0.107
MSA FE	Yes	Yes
Year FE	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

All standard errors are robust and clustered at the MSA level. The sample for the two tables is restricted to low skill immigrants who were in working age (excluding Armed Forces), living in 116 consistently identified MSAs when taking the survey, arrived in the US after the age of 18, from non-English speaking countries, don't speak English only, and the highest educational attainment is high school. In column (3), variable for immigrants who have been in the U.S. for less than 5 years is not shown in table. Immigrants who were not in US 5 years (1980, 1990 and 2000 census data) or 1 year (ACS data after 2000) before the survey are not included in the sample of column (4). Migrated group is consisted of immigrants who have migrated across MSAs in past 5 or 1 year.

Table 5: Heterogeneous effect of education

VARIABLES	(1) Less than High School	(2) High School Graduates	(3) Some College	(4) College Graduate
Dependent variable: Speaks English Very Well				
Manufacturing Share	-0.319***	-0.343***	0.00996	0.221
	(0.0588)	(0.104)	(0.165)	(0.161)
Observations	405,091	369,248	189,338	279,887
R-squared	0.052	0.102	0.131	0.136
MSA FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Mean of Good Speaker Share	0.111	0.242	0.403	0.540

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

All standard errors are robust and clustered at the MSA level. The sample for this table is restricted to immigrants who were in working age (excluding Armed Forces), living in 116 consistently identified MSAs when taking the survey, arrived in US after the age of 18, from non-English speaking countries, and don't speak English only.

Table 6: Heterogeneous effect of age, race and gender

VARIABLES	(1)	(2)	(3)
Dependent variable: Speaks English Very Well			
Manu%	-0.433***	-0.304**	-0.324***
	-0.088	-0.127	-0.0605
Manu%*age interval 30-40	0.0572**		
	-0.0264		
Manu%*age interval 40-50	0.113**		
	-0.0508		
Manu%*age interval 50-	0.205**		
	-0.102		
Age 30-40	-0.0281***		
	-0.00409		
Age 40-50	-0.0777***		
	-0.0077		
Age above 50	-0.144***		
	-0.015		
Manu%*White non-Hispanic		-0.113	
		-0.162	
Manu%*Black non-Hispanic		0.452*	
		-0.247	
Manu%*Asian		0.147**	
		-0.064	
White non-Hispanic		0.175***	
		-0.0352	
Black non-Hispanic		0.0920***	
		-0.0348	
Asian		-0.0616***	
		-0.304**	
Manu%*Female			-0.0394
			-0.0275
Female			0.00649
			-0.00543
Observations	774,339	774,339	774,339
R-squared	0.103	0.105	0.104
MSA FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

All standard errors are robust and clustered at the MSA level. The sample for this table is restricted to low skill immigrants who were in working age (excluding Armed Forces), living in 116 consistently identified MSAs when taking the survey, arrived in the US after the age of 18, from non-English speaking countries, don't speak English only, and the highest educational attainment is high school.

Table 7: Mechanisms

VARIABLES	(1)	(2)	(3)
Dependent variable: Speaks English Very Well			
Manufacturing Share	-0.345***	-0.281***	-0.238***
	(0.0678)	(0.0635)	(0.0624)
Manufacturing Dummy(=1 if has a manufacturing job)		-0.0389***	-0.0274***
		(0.00383)	(0.00573)
Manufacturing Share * Manufacturing Dummy			-0.0747*
			(0.0403)
Age	-0.000304	-0.000194	-0.000196
	(0.000348)	(0.000358)	(0.000359)
Age Square	-4.66e-05***	-4.75e-05***	-4.75e-05***
	(4.84e-06)	(5.05e-06)	(5.07e-06)
Years in US	0.00794***	0.00800***	0.00800***
	(0.000388)	(0.000380)	(0.000379)
Years in US Square	2.71e-05***	2.63e-05***	2.63e-05***
	(6.80e-06)	(6.84e-06)	(6.88e-06)
High School Graduate	0.123***	0.121***	0.121***
	(0.00367)	(0.00376)	(0.00376)
Gender(Female=1)	0.00107	-8.14e-05	-9.10e-05
	(0.00278)	(0.00238)	(0.00238)
White non-Hispanic	0.156***	0.154***	0.154***
	(0.0183)	(0.0186)	(0.0186)
Black non-Hispanic	0.138***	0.135***	0.136***
	(0.0156)	(0.0152)	(0.0152)
Asian	-0.0427***	-0.0410***	-0.0411***
	(0.00591)	(0.00583)	(0.00583)
Two or more Major races	0.0338***	0.0329***	0.0329***
	(0.00237)	(0.00248)	(0.00247)
American Indian	0.0998***	0.0986***	0.0985***
	(0.0335)	(0.0336)	(0.0336)
Other Races	0.127***	0.124***	0.124***
	(0.0111)	(0.0112)	(0.0112)
Married Spouse Present	-0.00895***	-0.00773***	-0.00771***
	(0.00287)	(0.00275)	(0.00275)
Married Spouse not Present	0.00959**	0.00936**	0.00938**

	(0.00454)	(0.00446)	(0.00446)
Constant	0.320***	0.322***	0.314***
	(0.0310)	(0.0307)	(0.0296)
Observations	774,339	774,339	774,339
R-squared	0.104	0.105	0.105
MSA FE	Yes	Yes	Yes
Year FE	Yes	Yes	Yes

Standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1
All standard errors clustered at the MSA level. The sample for this table is restricted to low skill immigrants who were in working age (excluding Armed Forces), living in the 116 consistently identified MSAs when taking the survey, arrived in US after the age of 18, from non-English speaking countries, don't speak English only, and the highest educational attainment is high school. Variables not shown in table are: Hispanics, Single.