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ABSTRACT

Imputation Match Bias in Immigrant Wage Convergence

Although immigrants to the United States earn less at entry than their native-born counterparts, an extensive literature finds that immigrants have faster earnings growth that results in rapid convergence to native-born earnings. However, recent evidence based on Census data indicates a slowdown in the rate of earnings assimilation. We find that the pace of immigrant wage convergence based on recent data may be understated in the literature due to the method used by the Census to impute missing information on earnings, which does not use immigration status as a match characteristic. Because both the share of immigrants in the workforce and earnings imputation rates have risen over time, imputation match bias for recent immigrants is more consequential than in earlier periods and may lead to an underestimate of the rate of immigrant wage convergence.

JEL Classification: J15, J31
Keywords: immigrant assimilation, imputation match bias

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I. Introduction

Although immigrants to the United States earn less at entry than their native-born counterparts, an extensive literature finds that immigrants have faster earnings growth than their native-born counterparts, leading to rapid convergence to native-born earnings (Chiswick 1978; Borjas 1985, 1994). Recent evidence, however, suggests a slowdown in the rate of economic assimilation.[1] A great deal of evidence on immigrant wage convergence draws on data from the U.S. Census, the American Community Survey (ACS), and the Current Population Survey (CPS), which are all administered by the U.S. Census Bureau. These data sources provide detailed information on immigrant status and year of entry, although missing information—especially for earnings—is common. When such information is missing (and cannot be inferred from other reported information), the Census imputes the information from a 'donor' respondent. A donor respondent is similar to the 'recipient' respondent on a preselected set of match characteristics, except for reporting the missing information.

Neither citizenship status nor nativity are match characteristics for imputing earnings in the Census, ACS, and CPS. Influential work by Hirsch and Schumacher (2004) and Bollinger and Hirsch (2006) establishes that imputation results in coefficients on variables not used as match characteristics that are biased toward zero in estimated wage equations. Based on CPS data, Bollinger and Hirsch (2006) show that the magnitude of attenuation on the coefficient of a specific characteristic is approximately equal to the proportion of individuals with that characteristic whose wages are imputed. This line of research supports estimating earnings regressions by excluding observations with imputed earnings in order to mitigate imputation match bias (Bollinger at al. 2015). Of relevance to immigrant wage convergence, Bollinger and

[1] This literature is reviewed in The National Academies of Sciences, Engineering, and Medicine (2016, Chapter 3).

Hirsch (2006) demonstrate substantial attenuation on the foreign-born coefficient with the inclusion of imputed earners, regardless of the method used to account for imputation. Their analysis does not take into account either duration in the United States or cohort effects on imputation rates, which forms the main contribution of our paper.

Four factors combine to render imputation match bias in estimates of immigrant wage convergence a larger problem now than in the past. First, the share of the workforce who is an immigrant has increased dramatically since 1970. Second, earnings imputation rates have substantially increased over time (Bollinger et al. 2015; Hirsch and Schumacher 2004). Third, as we show here, immigrants who have arrived more recently to the United States are more likely to have imputed earnings than those with longer duration in the United States. Fourth, immigrants from Mexico and Central America, who comprise a large share of recent immigrants, have substantially higher imputation rates than the native born. As a result, even in the absence of other factors that may slow down wage assimilation, the increasing importance of imputation match bias among recent immigrants—combined with the larger share of recent immigrants with imputed earnings—may indicate slower wage convergence over time.

II. Methodological Approach, Data, and Imputed Earners Matching

To demonstrate the increasing relevance of imputation match bias over time, we use data from the 1980, 1990, and 2000 Census, and from the 2010 and 2014 ACS. The Census and ACS contain missing values, and as with other datasets administered by the U.S. Census Bureau, the agency uses a procedure known as “hot deck” matching to allocate data from donor respondents to recipients with missing information. Hot deck imputation aims to find a donor who is the closest match to the recipient in order to impute the missing value. Neither citizenship status nor place of birth are match characteristics. As a result, because the majority of the workforce are

U.S. native-born citizens, an immigrant with missing earnings information is likely to be assigned the earnings of a U.S. native-born citizen, while some U.S. natives with missing information will be assigned the earnings of immigrants. Because immigrants earn less than U.S. natives upon arrival, a recent immigrant recipient who matches to a native donor will have wages that are, on average, higher than what the immigrant actually earned. Conversely, a smaller share of U.S. natives will be matched to a recent immigrant who has lower earnings. This imputation will overstate the wages of recent immigrants in particular, and consequently, will understate the rate at which immigrants' wages catch up to native wages over time.

We demonstrate the increased importance of imputation match bias by comparing earnings growth by cohort. Our dependent variable is the log of hourly wage, and, as conventional in the literature on immigrant wage assimilation, we control in the wage regressions for entry cohort, age, and education.[2] Our division into immigrant and native groups is based on the citizenship status question used in Census surveys. We use native or native born to refer to those with U.S. citizenship from birth, whether or not they were born in the United States. An immigrant is anyone who is either a naturalized U.S. citizen or not a U.S. citizen. With the exception of those who were born in the United States, all respondents report the year (or year range) when they came to live in the United States.[3] We use year of entry to create indicators for arrival cohorts, with each cohort representing 5-year arrival ranges.[4] We calculate years of

[2] See, for example, Borjas (2015) and The National Academies of Sciences, Engineering, and Medicine (2016, Chapter 3). Our dependent variable is the log of hourly wage as in Bollinger et al. (2015), Bollinger and Hirsch (2006), Borjas (1985, 1994), and Hirsch and Schumacher (2004). The dependent variable in Borjas (2015) is weekly earnings. All wages are standardized to 2014 dollars using the Consumer Price Index for all urban consumers without seasonal adjustment.

[3] In the 1980 Census and 1990 Census, all immigrants are grouped into multi-year arrival periods.

[4] The arrival cohorts generally remain consistent across datasets, with a few notable exceptions. The final cohort in the 1980 Census contains six years (1974–1980). In the 1980 Census and 1990 Census, all arrivals prior to 1950 are reported in a single category; all arrivals between 1950 and 1959 (inclusive) are also reported in a single category. In the tables, the earliest arrival cohort that appears in the data for all years 1980 through 2014 is the 1965–1969 cohort. We include indictor variables for earlier cohorts as appropriate for the survey year.

education from information on highest degree attained. We also consider country or region of birth, grouped into nine categories—United States and U.S. territory, Mexico, Central America and the Caribbean, South America, Asia, Australia and Oceania, Africa, Canada and the Atlantic Islands, and Europe.

Our sample is restricted to men ages 25 to 64, not living in group quarters or active military, who worked for pay in the week prior to the survey, who worked full-year (50 to 52 weeks per year) and full-time (35 or more hours per week), who do not report self-employment as their chief job activity or business in the last week, are not current students, and, if an immigrant, did not migrate to the United States before age 19. We further restrict our main sample to men with calculated real hourly wage (in 2014 dollars) from $1.00 to $300.00.[5]

III. Imputation Rates and Wage Convergence

Table 1 reports imputation rates by survey year, nativity, and arrival cohort, as well as the share of the sample in each group. We identify five key characteristics of imputation rates. First, imputation rates are on average higher for immigrants than for the native born and have increased for both groups over time. For example, the imputation rate for native-born men is 8.3% in 1980 and rose to 21.4% in 2014; the corresponding rates for immigrant men are 10.9% in 1980 and 26.6% in 2014. Second, imputation rates within cohorts increased dramatically over time. For example, consider the 1970–1974 arrival cohort. The imputation rate was 10.9% in the 1980 Census; the imputation rate for the 1970–1974 arrival cohort rose to 21.8% in the 2000 Census. Third, imputation rates seem to have largely stabilized by 2000 for native born as well as for immigrants, with imputation rates for the years 2000, 2010, and 2014 fairly similar to each

[5] Alternative specifications and sample restrictions show estimates similar to those reported here.

other at 19%–22% for native born and 24%–27% for immigrants. Fourth, within each Census or ACS survey, among immigrants, imputation rates are always substantially higher for recent arrivals than for those with longer duration in the United States. For example, based on the 2014 ACS, the 2010–2014 arrivals have an imputation rate of 30.9%, nearly double the imputation rate of those who arrived in 1965–1969, which is 16.9%. Fifth, imputation rates vary by nativity, and as the composition of the immigrant population has varied over time, it has largely shifted toward immigrants with average imputation rates that are substantially larger than the native-born rate.

Tables 2 and 3 report the wage regressions.[6] The regressions in Table 2 include controls for arrival cohort and age and education as third order polynomials. Table 3 additionally controls for country or region of origin. Odd-numbered columns include imputed earners, while even-numbered columns exclude them. As the pattern of imputation rates and accompanying effect of imputation match bias implies, comparisons of pairs of columns within survey years show that coefficients on cohort indicators are fairly similar in earlier years of data and are smaller in magnitude in more recent years and for more recent arrivals when imputed earners are included than when they are excluded.

To see the effect of imputation match bias on estimates of immigrant wage convergence, we compare the growth rate of specific cohorts over time based on observations with and without imputed earners. In earlier periods in which imputation rates were lower, we expect little effect of imputation match bias on estimates of wage convergence, but a larger effect in more recent surveys. Table 4 summarizes growth rates for arrival cohorts based on the wage regressions reported in Tables 2 and 3 (not all years reported in table). Consider as an example the 1995–

[6] Estimates for 2014 excluding potentially undocumented individuals, identified in the same manner as Borjas (2017), are similar to those reported in Tables 2 and 3.

1999 arrival cohort. In estimates reported in Table 2 without country controls, in 2000, their wages start 0.173 log points below comparable native born in estimates including imputed earners; excluding imputed earners shows a larger disparity of 0.192 log points. In 2014, the earnings disparity for this entry cohort relative to native born is 0.138 log points when imputed earners are included and 0.143 log points when imputed earners are excluded. In other words, including imputed earners shows a wage growth of 0.035 log points over the 2000–2014 period, while excluding imputed earners shows a wage growth that is 40% higher at 0.049 log points.

By understating the initial wage disparity because of imputation match bias, the wage growth for this cohort over the 2000–2014 period is understated. For comparison, consider the comparable growth rate between 1980 and 1990 (when imputation rates were far lower) for the 1975–1979 arrival cohort. Excluding imputed earners shows a growth rate that is only 20% higher than the rate based on estimates that include imputed earners. With some exceptions, examination of the other arrival cohorts in Tables 2 and 3 (not reported in Table 4) show the same pattern of understating wage assimilation rates over time due to imputation match bias that is more pronounced in recent data and for more recent arrivals.

IV. Conclusion

The severe match bias that arises from the Census imputation procedure is widely-recognized. In this paper, we provide the first evidence that imputation match bias may have important implications for estimates of immigrant wage convergence. Using data over the 1980 to 2014 period, a period in which both earnings nonresponse rates rose and immigrants comprised an increasing share of the labor market, we show that imputation match bias results in an underestimate of wage convergence of immigrants. This underestimation is particularly acute in more recent periods and for more recent arrivals. Our estimates suggest future research on

immigrant wage convergence should take into account the substantial impact of imputation match bias. Furthermore, in light of recent calls by politicians to enact highly restrictive immigration reform, our estimates suggest caution in using concerns about slower convergence rates as a basis for future policies designed to restrict the inflow of immigrants into the United States.

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Table 1. Imputation Rates by Cohort and Country or Region of Birth

	1980 Census		1990 Census		2000 Census		2010 ACS		2014 ACS	
	Percent of Sample	Imputation Rate	Percent of Sample	Imputation Rate	Percent of Sample	Imputation Rate	Percent of Sample	Imputation Rate	Percent of Sample	Imputation Rate
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Native Born	94.85	8.34	93.56	10.17	91.76	22.74	86.84	18.99	86.58	21.42
Immigrant	5.15	10.87	6.44	13.89	8.24	25.55	13.16	23.81	13.42	26.59
By Birth Region/Country										
U.S. State/Territory	94.60	8.34	92.97	10.16	91.01	22.77	85.82	18.98	85.42	21.40
Mexico	0.86	11.58	1.26	14.96	2.01	32.30	3.95	29.88	4.06	31.10
Central America/Caribbean	0.71	10.56	1.03	15.37	1.27	31.75	2.22	29.08	2.37	34.56
South America	0.27	8.84	0.42	11.92	0.57	24.93	1.01	25.08	0.94	28.53
Asia	1.04	6.48	2.04	8.38	2.74	19.72	4.13	18.16	4.23	21.03
Australia/Oceania	0.04	8.88	0.04	8.92	0.07	22.68	0.09	14.28	0.11	17.45
Africa	0.09	7.95	0.21	11.51	0.38	25.57	0.66	21.59	0.75	24.56
Canada/Atlantic Islands	0.32	5.71	0.21	8.65	0.26	17.23	0.27	12.36	0.26	13.72
Europe	1.83	7.46	1.58	10.09	1.69	21.18	1.84	17.02	1.86	19.09
By Entry Cohort (Immigrants Only)										
2010–2014 arrivals	---	---	---	---	---	---	0.88	35.10	11.88	30.92
2005–2009 arrivals	---	---	---	---	---	---	16.59	27.78	16.70	28.10
2000–2004 arrivals	---	---	---	---	0.97	49.62	22.58	24.52	21.20	28.17
1995–1999 arrivals	---	---	---	---	22.37	30.43	19.83	22.60	17.62	24.68
1990–1994 arrivals	---	---	9.89	22.29	21.90	26.48	13.81	23.85	12.37	25.66
1985–1989 arrivals	---	---	9.35	17.05	19.14	24.46	11.35	21.32	9.83	23.82
1980–1984 arrivals	---	---	24.65	14.50	14.55	22.91	7.88	20.79	6.32	24.91
1975–1979 arrivals	18.86	15.26	19.23	12.26	9.71	20.68	4.60	21.36	3.10	19.26
1970–1974 arrivals	22.30	10.89	13.71	12.27	6.00	21.83	1.96	22.05	0.95	22.10
1965–1969 arrivals	18.08	9.40	9.70	11.13	3.59	20.91	0.52	20.29	0.03	16.86
Arrivals before 1965	40.76	9.49	13.47	10.43	1.77	21.38	---	---	---	---
N	1,188,838		1,493,934		1,703,391		379,176		396,371	

Notes: Sample is restricted to men ages 25–64, inclusive, who worked at least 35 hours per week and at least 50 weeks per year, are not self-employed as their primary employment activity, and are not students. Immigrant sample is restricted to individuals who immigrated as an adult (19+). Wage includes wage and salary income only. All estimates are weighted using the Census population weight. The 1980 Census does not separate out 1980 arrivals from 1975–1979 arrivals, so the final observed cohort for 1980 is 1975–1980.

Table 2. Wage Regressions With and Without Imputed Earners

Dependent variable: ln(hourly wage)										
	1980 Census		1990 Census		2000 Census		2010 ACS		2014 ACS	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2010–2014 arrivals	---	---	---	---	---	---	---	---	-0.142**	-0.191**
									(0.012)	(0.015)
2005–2009 arrivals	---	---	---	---	---	---	-0.220**	-0.259**	-0.160**	-0.195**
							(0.009)	(0.011)	(0.009)	(0.011)
2000–2004 arrivals	---	---	---	---	---	---	-0.208**	-0.236**	-0.178**	-0.210**
							(0.007)	(0.008)	(0.008)	(0.010)
1995–1999 arrivals	---	---	---	---	-0.173**	-0.192**	-0.166**	-0.179**	-0.138**	-0.143**
					(0.005)	(0.006)	(0.008)	(0.008)	(0.008)	(0.009)
1990-1994 arrivals	---	---	---	---	-0.193**	-0.221**	-0.157**	-0.174**	-0.120**	-0.132**
					(0.004)	(0.005)	(0.009)	(0.010)	(0.010)	(0.010)
1985–1989 arrivals	---	---	-0.252**	-0.276**	-0.171**	-0.194**	-0.121**	-0.118**	-0.115**	-0.117**
			(0.007)	(0.008)	(0.004)	(0.005)	(0.009)	(0.010)	(0.011)	(0.012)
1980–1984 arrivals	---	---	-0.191**	-0.202**	-0.137**	-0.149**	-0.104**	-0.099**	-0.101**	-0.096**
			(0.004)	(0.005)	(0.005)	(0.006)	(0.011)	(0.012)	(0.013)	(0.014)
1975–1979 arrivals	-0.197**	-0.218**	-0.100**	-0.102**	-0.084**	-0.085**	-0.051**	-0.038*	-0.009	-0.016
	(0.005)	(0.006)	(0.005)	(0.005)	(0.006)	(0.007)	(0.014)	(0.015)	(0.019)	(0.020)
1970–1974 arrivals	-0.141**	-0.149**	-0.054**	-0.056**	-0.044**	-0.028**	-0.022	-0.001	0.031	0.065
	(0.004)	(0.005)	(0.006)	(0.006)	(0.008)	(0.009)	(0.022)	(0.022)	(0.043)	(0.049)
1965–1969 arrivals	-0.078**	-0.082**	-0.020**	-0.021**	0.024*	0.041**	0.101*	0.110**	-0.109	0.018
	(0.005)	(0.005)	(0.007)	(0.007)	(0.010)	(0.011)	(0.040)	(0.042)	(0.198)	(0.199)
R^2	0.16	0.16	0.23	0.23	0.22	0.23	0.29	0.31	0.28	0.31
N	1,188,838	1,085,052	1,493,934	1,341,564	1,703,391	1,309,792	379,176	319,039	396,371	323,357
* significant at 5%; ** significant at 1%										

Notes: Heteroskedasticity-robust standard errors in parentheses. Excluded group is native born. Odd-numbered columns include imputed earners; even-numbered columns exclude imputed earners. Equations also include third order polynomials for age and education. All estimates are weighted using the Census population weight. The 1980 Census does not separate out 1980 arrivals from 1975-1979 arrivals, so the latest observed cohort for 1980 is 1975–1980. 1980 Census regressions include additional controls for 1960–1964, 1950–1959, and 1949 or earlier immigrant cohorts. 1990 Census regressions include additional controls for 1960–1964, 1950–1959, and 1949 or earlier immigrant cohorts. 2000 Census regressions include additional controls for 1960–1964 and 1955–1959 immigrant cohorts.

Table 3. Wage Regressions With and Without Imputed Earners. Controlling for Country or Region

	Dependent variable: ln(hourly wage)									
	1980 Census		1990 Census		2000 Census		2010 ACS		2014 ACS	
	(1)	(2)	(3)	(4)	(3)	(4)	(5)	(6)	(7)	(8)
2010–2014 arrivals	---	---	---	---	---	---	---	---	-0.064**	-0.114**
									(0.017)	(0.019)
2005–2009 arrivals	---	---	---	---	---	---	-0.104**	-0.144**	-0.060**	-0.089**
							(0.015)	(0.016)	(0.015)	(0.017)
2000–2004 arrivals	---	---	---	---	---	---	-0.080**	-0.104**	-0.065**	-0.087**
							(0.014)	(0.015)	(0.015)	(0.017)
1995–1999 arrivals	---	---	---	---	-0.075**	-0.102**	-0.047**	-0.057**	-0.031*	-0.025
					(0.007)	(0.008)	(0.014)	(0.015)	(0.014)	(0.016)
1990-1994 arrivals	---	---	---	---	-0.088**	-0.117**	-0.045**	-0.060**	-0.017	-0.018
					(0.007)	(0.008)	(0.015)	(0.016)	(0.015)	(0.016)
1985–1989 arrivals	---	---	-0.116**	-0.108**	-0.050**	-0.068**	0.010	0.020	-0.001	0.009
			(0.009)	(0.010)	(0.007)	(0.008)	(0.015)	(0.016)	(0.016)	(0.018)
1980–1984 arrivals	---	---	-0.054**	-0.032**	-0.025**	-0.034**	0.020	0.032+	0.007	0.024
			(0.006)	(0.007)	(0.008)	(0.009)	(0.016)	(0.017)	(0.017)	(0.019)
1975–1979 arrivals	-0.160**	-0.159**	0.038**	0.069**	0.021*	0.023*	0.069**	0.086**	0.092**	0.098**
	(0.008)	(0.010)	(0.007)	(0.007)	(0.008)	(0.009)	(0.019)	(0.020)	(0.022)	(0.023)
1970–1974 arrivals	-0.099**	-0.084**	0.082**	0.116**	0.062**	0.084**	0.101**	0.128**	0.147**	0.204**
	(0.008)	(0.010)	(0.007)	(0.008)	(0.010)	(0.011)	(0.025)	(0.025)	(0.046)	(0.053)
1965–1969 arrivals	-0.052**	-0.033**	0.094**	0.127**	0.115**	0.137**	0.214**	0.230**	0.037	0.170
	(0.008)	(0.010)	(0.008)	(0.009)	(0.011)	(0.013)	(0.041)	(0.043)	(0.188)	(0.192)
Mexico	-0.034**	-0.055**	-0.290**	-0.328**	-0.262**	-0.289**	-0.212**	-0.230**	-0.202**	-0.233**
	(0.008)	(0.010)	(0.007)	(0.008)	(0.007)	(0.008)	(0.014)	(0.015)	(0.014)	(0.015)
Central America/Caribbean	-0.151**	-0.178**	-0.229**	-0.270**	-0.210**	-0.234**	-0.205**	-0.227**	-0.221**	-0.254**
	(0.009)	(0.010)	(0.007)	(0.008)	(0.007)	(0.009)	(0.014)	(0.016)	(0.015)	(0.016)
South America	-0.093**	-0.118**	-0.170**	-0.208**	-0.171**	-0.181**	-0.166**	-0.190**	-0.118**	-0.149**
	(0.011)	(0.012)	(0.009)	(0.009)	(0.009)	(0.010)	(0.017)	(0.018)	(0.018)	(0.020)
Asia	-0.104**	-0.128**	-0.139**	-0.170**	-0.075**	-0.072**	-0.072**	-0.070**	-0.025+	-0.030*
	(0.009)	(0.010)	(0.006)	(0.006)	(0.007)	(0.007)	(0.013)	(0.014)	(0.013)	(0.014)
Australia/Oceania	0.030	0.009	0.001	-0.012	0.132**	0.141**	0.090+	0.110+	0.122*	0.199**
	(0.028)	(0.029)	(0.026)	(0.028)	(0.022)	(0.025)	(0.050)	(0.056)	(0.050)	(0.052)
Africa	-0.066**	-0.094**	-0.171**	-0.210**	-0.165**	-0.194**	-0.204**	-0.253**	-0.204**	-0.252**
	(0.020)	(0.022)	(0.013)	(0.014)	(0.011)	(0.012)	(0.020)	(0.021)	(0.020)	(0.022)
Canada/Atlantic Islands	0.140**	0.131**	0.112**	0.097**	0.163**	0.191**	0.204**	0.221**	0.246**	0.266**
	(0.010)	(0.011)	(0.012)	(0.012)	(0.012)	(0.013)	(0.024)	(0.025)	(0.025)	(0.027)
Europe	0.104**	0.085**	0.026**	0.003	0.047**	0.044**	0.057**	0.060**	0.065**	0.068**
	(0.007)	(0.009)	(0.006)	(0.006)	(0.006)	(0.006)	(0.013)	(0.013)	(0.013)	(0.013)

R^2	0.16	0.17	0.23	0.23	0.22	0.23	0.29	0.31	0.29	0.31
N	1,188,838	1,085,052	1,493,934	1,341,564	1,703,391	1,309,792	379,176	319,039	396,371	323,357

+ significant at 10%; * significant at 5%; ** significant at 1%

Notes: Heteroskedasticity-robust standard errors in parentheses. Excluded group is native born. Odd-numbered columns include imputed earners; even-numbered columns exclude imputed earners. Equations also include third order polynomials for age and education. All estimates are weighted using the Census population weight. The 1980 Census does not separate out 1980 arrivals from 1975–1979 arrivals, so the latest observed cohort for 1980 is 1975–1980. 1980 Census regressions include additional controls for 1960–1964, 1950–1959, and 1949 or earlier immigrant cohorts. 1990 Census regressions include additional controls for 1960–1964, 1950–1959, and 1949 or earlier immigrant cohorts. 2000 Census regressions include additional controls for 1960–1964 and 1955–1959 immigrant cohorts.

Table 4. Effect of Imputation Match Bias on Immigrant Wage Convergence

Panel A: Without Country or Region Controls

Arrival cohort	Data years	Wage growth (log points)		Difference in wage growth (percent)
		With imputed earners	Without imputed earners	
1965–1969	1980–1990	0.058	0.061	5.2
1970–1974	1980–1990	0.087	0.093	6.9
1975–1979	1980–1990	0.097	0.116	19.6
1975–1979	1990–2000	0.016	0.017	6.3
1980–1984	1990–2000	0.054	0.053	1.0
1985–1989	1990–2000	0.081	0.082	1.2
1985–1989	2000–2014	0.056	0.077	37.5
1990–1994	2000–2014	0.073	0.089	21.9
1995–1999	2000–2014	0.035	0.049	40.0

Panel B: With Country or Region Controls

Arrival cohort	Data years	Wage growth (log points)		Difference in wage growth (percent)
		With imputed earners	Without imputed earners	
1965–1969	1980–1990	0.146	0.160	9.6
1970–1974	1980–1990	0.181	0.200	10.5
1975–1979	1980–1990	0.198	0.228	15.2
1975–1979	1990–2000	-0.017	-0.046	no growth
1980–1984	1990–2000	0.029	-0.002	no growth
1985–1989	1990–2000	0.066	0.04	0.6
1985–1989	2000–2014	0.049	0.059	20.4
1990–1994	2000–2014	0.071	0.099	39.4
1995–1999	2000–2014	0.044	0.077	75.0