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Appendix J

U.S.

The broad problem was to investigate the effect of international migration on marriage rates. We would expect a net immigration into a country to swell its marriage rates and a net emigration from a country to dampen these rates, since a large fraction of the migrants are single and of prime marriageable age. To answer this problem fully for a given country, we would need to know the age distribution and marriage status of its immigrants, emigrants, and native-born population. Unfortunately, for the period under consideration (1880–1910) this data is not available. Thus, we were forced to narrow the scope of our investigation and estimate only the percentage of migrants in the nation's marriageable stock. Due to further limitations of the data, we defined this marriageable stock as individuals between the ages of 20 and 29, disregarding their marriage status at the time.

We were able to compute from the U.S. census data the number of immigrants in this age bracket for 10-year periods in the United States, and dividing this figure by the native-born Americans in the 20–29 age bracket we obtained the percentage of immigrants to the native-born Americans in the 20–29 age bracket. (See Table J-1.) This percentage gives a rough estimate of the contribution immigrants made to U.S. marriage rates in the latter part of the nineteenth century.

United Kingdom

Our inquiry into U.K. relationships of emigration to marriage rates concentrated on the unmarried component of British emigration and marriage time series. Our basic data was obtained from [51].

Carrier presents the per cent and total number of married

TABLE J-1

Foreign-Born and Immigration by Decade Totals, U.S., 1870–1910

Item	Decade Ending				Average
	1880	1890	1900	1910	
A. Foreign-born, 20–29 age bracket (Census)	1,199,000	1,990,000	2,017,000	3,093,000	
B. Estimated net new arrivals, 20–29 census age bracket	693,321	1,440,060	1,143,596	2,306,934	
C. All other U.S. population, 20–29 age bracket (Census)	8,474,679	9,984,940	12,661,404	14,848,066	
Decade averages	7,206,839	9,229,810	11,323,172	13,754,735	
D. Estimated net new arrivals, 20–29 as per cent of native white, 20–29 (B/decade averages)	9.6	15.6	10.0	16.8	
E. Unadjusted increment total foreign-born	1,068,000	2,537,000	1,092,000	3,130,000	
F. Estimated net new arrivals, 20–29, as per cent of unadjusted increment total foreign-born (B/E)	64.9	56.8	104.7	73.7	75
G. Kuznets and Rubin estimates of net immigration into U.S.	2,143,000	4,263,100	2,426,400	5,024,200	
H. Estimated net new arrivals, 20–29, as per cent of total net immigration (B/G)	32.4	33.8	47.1	45.9	39.8
I. Total gross immigration into U.S.	2,812,191	5,246,613	3,687,564	8,795,386	

NOTE (by lines):

A, [250, p. 146].

B. [250, p. 146]. New arrivals refer to immigrants entering the U.S. in the intracensal period. For example, new arrivals in the decade ending 1880.

(a Census year) include immigrants who arrived between 1870 (a Census year) and 1880. The detailed adjustments of the data presented by Thompson and Whelpton are presented herewith for the first decade, 1880.

705,000 foreign-born age 5–19 in U.S. Census 1870
84,000 foreign-born age 0–4 in U.S. Census 1870

To obtain an estimate of those immigrants who remained in the 5–19 age bracket in the U.S. Census of 1880, we performed the following computation:

$$\frac{1/3 \text{ of } 705,000 + 84,000}{2} = 159,500$$

159,500 of the 705,000 in the 5–19 bracket in the 1870 Census remained in this bracket in 1880. Therefore, 705,000 minus 159,500 = 545,500 left the 5–19 bracket and moved into the 20–29 bracket of the 1880 Census. By applying survival ratios* this figure shrinks to 505,679. The number of new arrivals (entering U.S. between 1870 and 1880) in the 20–29 bracket in the Census of 1880 is computed by subtracting 505,679 from the foreign-born 20–29 age bracket in the 1880 Census.

1,199,000	Foreign-born age 20–29 in U.S. Census of 1880.
−505,679	Foreign-born age 20–29 in 1880 Census who were in U.S. at the time of 1870 Census.
693,321	New arrivals, entered U.S. between 1870 and 1880, in the 20–29 bracket in 1880 Census.

C. All other U.S. population 20–29 includes native white 20–29, Negroes 20–29, and foreign-born 20–29, who have resided in U.S. for at least 10 years [250, pp. 145, 146, 152].

E. [250, p. 146].

G. [162, pp. 100–101]. These estimates were computed by applying survival rates to the foreign-born white population in census data.

I. [272, p. 56].

* Five year survival ratios for five year age brackets were obtained from [162, p. 97]. To apply this data for 10-year age brackets over 10-year periods, the following adjustments were made:

1870–80. 10-year survival ratio = .927, obtained as follows:

$$\frac{.969 \text{ (5-yr. s.r. for 10–14 to 15–19 age bracket)} + .964 \text{ (15–19 to 20–24)} + .956 \text{ (20–24 to 25–29)}}{3}$$

= .963 (average 5-year. s.r.), and therefore, $(.963)^2 = .927$.

1880–90.   10-year survival ratio = .939.
1890–1900. 10-year survival ratio = .941.
1900–1910. 10-year survival ratio = .953.

TABLE J-2

Distribution by Sex or Marital Condition of Adult Passengers from England and Wales, 1877–1907

Year	To U.S.				To British North America				To Australia				To British South Africa			
	MM	MF	SM	SF	MM	MF	SM	SF	MM	MF	SM	SF	MM	MF	SM	SF
1877–80	16.5	18.7	49.7	15.1	11.3	16.6	59.1	13.0	17.0	17.2	47.3	18.5	24.8	15.3	47.4	12.5
1881–90	13.6	18.1	50.6	17.7	13.3	15.8	55.3	15.6	15.4	17.7	47.4	19.5	21.7	15.6	48.7	14.0
1891–1900	16.4	20.9	44.7	18.0	13.1	16.8	52.8	17.3	17.3	19.5	42.9	20.3	18.0	15.7	53.3	13.0
1901–7	18.3	23.3	42.0	15.4	16.1	17.7	53.2	13.0	20.6	23.0	38.3	18.1	20.6	21.3	40.3	17.8

NOTE: MM means "married male"; MF means "married female"; SM means "single male"; SF means "single female."
SOURCE: [51, p. 104].

adults (over 12 years of age) migrating from England and Wales to the U.S., British North America, Australia and British South Africa.[18] We cannot directly apply the per cent of unmarried or married to the various totals because the per cent refers only to those emigrants over 12 years of age. Hence, we must make some estimation of the age structure of British migrants. This was made by applying 1912–13 age distribution totals of English and Welsh migrants to the years 1870–1910. This approximation would be valid if the age structure of English migration was relatively constant in the years 1870–1913. Evidence in support of this supposition is given by data on English and Welsh emigration to the U.S. [88, I, p. 444], which shows a relatively constant yearly per cent of emigrants in the 0–14, 14–44, and over 44 age brackets for the years 1899–1910. Tables J-2 to J-4 present data as given by Carrier; Tables J-5 to J-8 show the various adjustments necessary to obtain the number of unmarried emigrants to all extra-European countries.

In Table J-8, col. D, we have extended the coverage of emigration from four major countries to all extra-European countries and we have reduced the age limit estimate to 40 years of age. We should like to have, however, figures that are net for returnees and in-migration into the U.K. Decade estimates of net migration have been prepared from periodic census and other data and these estimates have been found reliable. (See [245, pp. 123–25].) These estimates are presented in col. B of Table J-8. We list in col. A gross decade emigration, and the corresponding rate of net to gross emigration in col. C, Table J-8. We then assume that net migration rates for all migrants are applicable to unmarried migrants aged 18–40; estimates for net unmarried 18–40 migration are then listed in col. E.

This estimation presupposes that marital and age characteristics of *immigrants* was similar to those of *emigrants*. For the

TABLE J-3

Per Cent Distribution of English and Welsh Migrants, 1912–13

Year	Under 12	12–17	18–30	31–45	46 and Over
1912–13	17.6	6.1	47.2	22.9	6.1

SOURCE: [51, p. 106].

TABLE J-4
English and Welsh Migration, All Ages, to Four Major Countries, and Extra-European Totals

Year	U.S.	British North America	Australia	British South Africa	(E) Total to 4 Countries	(F) Extra-European Totals	Per Cent (E/F)
1871–80	549,756	126,381	200,353	44,172	920,662	970,365	94.9
1881–90	909,189	222,222	272,281	68,888	1,472,580	1,548,965	95
1891–1900	600,232	159,747	103,198	136,728	999,905	1,095,891	91.2
1901–10	649,721	623,585	187,785	223,335	1,684,426	1,875,534	90.0

SOURCE: [51, pp. 92–93, 95–96, 99–100].

TABLE J-5

English and Welsh Migration to Four Major Countries, over Age 12

Year	United States	British North America	Australia	British South Africa
1871–80	452,999	104,138	165,091	36,398
1881–90	749,106	183,111	224,360	56,764
1891–1900	494,591	131,632	85,035	112,664
1901–10	535,370	513,834	154,377	184,028

SOURCE: Computed by applying 1912–13 age distribution per cent (82.4%) to totals given in Table J-4.

TABLE J-6
Unmarried English and Welsh Emigrants over 12 Years of Age to Four Major Countries

Year	United States	British North America	Australia	British South Africa	Total to 4
1871–80	293,543	75,083	108,630	21,802	499,058
1881–90	511,639	129,826	150,097	35,591	827,153
1891–1900	310,109	92,274	53,742	74,696	530,821
1901–10	312,656	340,158	87,069	106,920	846,803

SOURCE: Computed by applying marriage-rate figures (Table J-2) to English and Welsh migration to four countries over age 12 (Table J-5).

TABLE J-7
Unmarried English and Welsh Emigrants to Four Major Countries,
Ages 18–45

Years	
1871–80	437,674
1881–90	724,586
1891–1900	463,938
1901–10	746,033

SOURCE: Figures for unmarried in Table J-6 refer to adults over the age of 12. We assume for this table that those between 12 and 17 were all unmarried; thus to eliminate this group from Table J-7 we used age distribution percentages of Table J-3, adjusting the percentages upward because totals in Table J-6 already exclude the under 12 class. Eliminating from the totals in Table J-6 unmarried persons over 45 was more complicated. This was computed in the following manner:

(A) Total to 4 Countries, 18	(B) Unmarried, 18	(C) Per Cent (B/A)
702,465	462,128	65.8
1,123,579	765,944	68.2
762,928	530,821	69.6
1,285,217	782,446	60.9

Col. A was obtained by applying age distribution percentages (Table J-3) to col. E, Table J-4. Col. B was obtained by excluding from Table J-6 totals individuals between 12–17 years of age by applying adjusted percentage of Table J-3 age distribution totals (12–17 bracket in Table J-3 comprises 6.1 per cent of emigrants while the adjusted percentage, which is applicable to Table J-6 totals, is 7.4 per cent). To exclude unmarried persons over 45 we applied percentages in col. C (above) to the adjusted percentage of emigrants over 45 (Table J-3; the 6.1 per cent figure in Table J-3 must be adjusted upward also because Table J-6 totals already exclude persons under 12) and then deducted these figures from col. B (above).

TABLE J-8
Net Unmarried Migration, 18–40 Years of Age, 1871–1910

Year	(A) Emigrants to Extra-European Countries	(B) Net Loss by Migration	(C) Per Cent (B/A)	(D) Emigrants to Extra-European Countries, Unmarried 18–40	(E) Net Unmarried 18–40 [(C) × (D)]
1871–80	970,565	164,000	16.9	461,198	77,942
1881–90	1,548,965	601,000	38.8	762,722	295,936
1891–1900	1,095,891	69,000	6.3	508,704	32,040
1901–10	1,875,534	501,000	26.7	828,925	221,322

SOURCE: Col. A from Table J-4, col. F.

1912–13 period, the mean age of immigrants over 18 was 33.7 compared to 30.5 for emigrants, a nearly comparable figure. Among emigrants over 18 years of age, 47.2 per cent were between 18 and 30, while 38.4 per cent of immigrants were in the same age class [51, p. 106]. American data for the 1908–10 period showed that 36.1 per cent of all English returnees were females, that only 14.9 per cent were over 45 years of age and that 83.3 per cent of returnees had resided in the country less than five years [272, pp. 113–16]. Then, too, European immigration into England may have brought into England adults with age and marital characteristics similar to British emigrants. There probably was a net tendency for overseas returnees to concentrate on older and single adults. However, our estimates are probably biased by less than 10 per cent by assuming homogeneity in emigration and immigration with regard to marital and age class.

NOTES TO APPENDIXES

1. Series 0018 and 00186 are fully described in Appendixes H and D, respectively.

2. On the southeast region and its ecological, demographic and industrial characteristics see [292, pp. 17–19, 35–42, 161–85].

3. On this region and its characteristics, see [292, pp. 21, 186–207].

4. For a record of constitution making, see [225, pp. 126 ff., 131 ff., 142 ff.].

5. "The Constitution authorizes the establishment, in the Secretary of State's Office, of a Bureau of Statistics. Some provision for the collection of statistical information is already made. The Township Assessors are required to make returns of the quantity of wheat and corn produced in their several Townships each year. The District Assessors are required to report, under a certain classification, once in six years, the number of acres of taxable land in the different counties. Various acts require the collection of other statistical information, more or less specific, in relation to production, education, population and crime. Under these acts, although from want of system and of adequate means of enforcement they are often very imperfectly executed, a large amount of useful information is collected. It is scattered, however, through many disconnected reports, and consequently fails to yield the full advantage which might be derived from it. To combine this, and collect other similar information, and to present the whole, so arranged as to exhibit the mutual relations of facts and classes of facts, together with their general bearing upon the public welfare, is the proper function of a Bureau of Statistics. I can perceive no insurmountable obstacle to the collection of all, or nearly all, the information required through agencies already existing, without incurring much new expense. For the present, little more would be necessary than to provide for the appointment of a thoroughly qualified person to superintend the whole work, prepare and prescribe all necessary forms, and to receive,

classify, and report the returns. I cannot doubt that such a provision for the collection and publication of the statistics of the State, Agricultural, Industrial, Social and Educational, would repay ten fold its cost in benefits" [208, 1856, I, pp. 438–39].

6. "Among the ablest statisticians and practical economists in the country was Edward Deering Mansfield (1801–1880). Educated at West Point and Princeton, lawyer and teacher and editor by turns, he possessed an intellectual equipment and a practical training almost unequalled in the West. While his pen with equal facility wrote newspaper articles and books of a historical, biographical and educational character, he was mainly occupied with his duties as editor of the *Railroad Record* and as State Commissioner of Statistics, an office created in 1857. No one possessed a wider knowledge of Ohio's economic growth and prospects or recorded his facts with greater care. His reports as Commissioner of Statistics are invaluable to the historian and economist today" [225, p. 173].

7. He helped to take a census of Cincinnati in 1825 and participated in the preparation of a brochure and trade directory [181, p. 190 ff.]. While investigating marine statistics in New Orleans and in Portland, Maine, in 1852, he encountered local officials who had for convenience "regularly copied into the last report all that was in the former one; so that in his report of what should be the then steam marine of New Orleans, he had put fifty or a hundred steamboats destroyed or lost years before." Difficulties were traced to "want of a supervising officer" with interest and ability for the work [181, p. 227 ff.].

8. The Secretary of State assumed responsibility for the bureau by an act of the state legislature dated 17 April 1868 [208, I, 1868, p. 178]. For complaints about the burden of handling this part of the "rubbish of state government" see [208, I, 1870]. For an extended statement of the reasons why the functions of the bureau required expert administration and adequate funding, see [208, I, 1869, pp. 139 ff.]. The 1869 legislature failed to provide sufficient funds to permit printing of extra copies of the report to be sent to county officers whose cooperation was needed [208, 1870, p. 221].

9. A later report identifies the statistician of the department in 1888 as Davis Collings who collects "with as great care as is possible" and compiles "with accuracy" the statistics of Ohio. This statistician was paid the munificent salary of $1,500 yearly and shared the office of the Secretary of State with a chief clerk and three clerks for "stationery, recording, and corporation." There was a "book-room" superintendent at $800 yearly and $400 allowed for extra clerk hire. Later an "assistant statistician" was added. See [10, 1889, pp. 16, 19]. Later holders of the office were C. M. Smith (1900), J. I. Allread (1902), C. D. Cain (1908), and S. M. Johnson (1910). These officers were appointed for relatively short terms by the elected officeholder. See [10, 1900, p. 10; 1902, p. 15; 1908, pp. 12f.; 1910, p. 39; 1914, p. 613]. No archives or records of the statistical bureau are available in the present office of Secretary of State nor do archives of the state contain papers or records of the bureau.

10. This system of assessment was commenced in 1846 legislation and held in essentials through the property tax reform of 1910–14 [23, pp. 216–56]. See [290]; *Acts of a General Nature–53rd General Assembly, State of Ohio*, Vol. LVI (Columbus, Ohio), 1859, "An Act for the Assessment of all Property in

This State," pp. 175–218; [294]; *Report of the Honorary Commission Appointed by the Governor to Investigate the Tax System of Ohio* (Columbus, Ohio) 1908; *Report of the Tax Commission of Ohio—1893* (Columbus, Ohio), 1893.

11. Thus the number and dollar value of mortgages for 1871 and 1872 are as follows:

	Number of Mortgage Recordings	Value Secured (Thousands of dollars)
Railway 1871	50	316,739
Railway 1872	80	560,462
Other 1871	42,886	49,765
Other 1872	45,463	63,619

12. [134, p. 446]. Another noted real estate authority reports that "in the past when a freehold was transferred the deed customarily set forth the actual amount of the 'valuable' consideration" [91, p. 118].

13. See basic explanation in [41, pp. 116–28].

14. See the experiment practiced in the effort to establish 20 temporal relationships for monthly series between 1903 and 1914. Series were stripped of trend and standardized for amplitude by reduction to units of standard deviation. Cycle charts drawn on translucent materials were placed over a lighted box with a glazed top. Twenty cycle charts were compared in this way, making 190 comparisons by each of three independent observers. The variances were slight when the "correspondence between the curves was simple and regular" but wide in the more frequent cases of a variable lag. See [123, pp. 121 ff.].

15. The use of correlation coefficients to determine lead-lag was most thoroughly explained in the initial publication of the Harvard group [123, pp. 120–39]. In work carried out within the National Bureau of Economic Research the method was evaluated in Mitchell's 1927 work on business cycles and was intensively employed in the early NBER work of Harry Jerome [146]. See also the instructive use of correlogram analysis in Zarnowitz [295, pp. 8 f., 14 ff.]. Burns and Mitchell in their basic treatise noted that the method "is more objective and elegant" but was marred by "three grave shortcomings": (1) failure to distinguish between time-periods which are turn points, (2) variations in timing from cycle to cycle, and (3) presupposing trend-adjusted data. The first two shortcomings argue against *exclusive* reliance on correlation analysis, not against its use along with NBER measures. The third can be met in part by correlating without adjustment for trend and then making a separate adjustment of the correlation coefficients to allow for trend [41, p. 127].

16. This conversion formula was developed by Jacob Mincer, member of the Senior Research Staff of the National Bureau. The formula involved the following terms:

R = correlation coefficients including trends
r = correlation coefficients adjusted for linear trends
k_x = time slope of series X

k_y = time slope of series Y

n = number of observations

$\sigma (X)$ = standard deviation of X

$\sigma (x)$ = standard deviation of the residuals from linear time trend

$$c_x = \frac{\sigma (X)}{\sigma (x)}$$

$$c_y = \frac{\sigma (Y)}{\sigma (y)}$$

It turns out that:

(1) $r = \dfrac{R \cdot \sigma (X) \, \sigma (Y) - 1/12 \, k_x k_y \, (n^2 - 1)}{\sqrt{[\sigma^2(X) - 1/12 \, k_x^2 \, (n^2 - 1)] \, [\sigma^2(Y) - 1/12 \, k_y^2 \, (n^2 - 1)]}}$

This is the best formula for calculation, given R, $\sigma(X)$, $\sigma(Y)$, k_x and k_y are easily estimated, freehand.

Formula (1) can be rewritten as:

(2) $r = c_x c_y R \pm \sqrt{(c_x^2 - 1) \, (c_y^2 - 1)}$

with + when both trends are in the same direction. Since c_x and $c_y > 1$, the *spread* of the *adjusted* correlogram will be less the spread of the unadjusted, by a multiplicative factor $c_x c_y$. The level, however, will depend on c_x, c_y, and R. Usually the larger c_x or c_y, the smaller will be r relative to R, given similar trends.

17. The inquiry whose results are presented in this appendix was carried out and written up, under my general direction, in 1962–63 by William M. Landes, then research assistant at the National Bureau of Economic Research, now member of the Department of Economics, University of Chicago, and member of the NBER Senior Research Staff.

18. [51, pp. 104, 95–96, 99–100]; emigration to these four countries accounts for over 90 per cent of English and Welsh total extra-European emigration.