Data Appendix to

Engel versus Baumol: Accounting for Structural Change Using Two Centuries of U.S. Data

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A Data on the U.S. structural change

Aligning theoretical concepts with available data is especially challenging for long-run sectoral data. Our theoretical setup distinguishes sectors by the differentiated products they produce. So, ideally, our sectoral data, say, on agricultural employment (or hours worked) should pertain to those engaged in agricultural production. Similarly, data on agricultural value added should ideally correspond to value added in the production of agricultural goods. Both the nineteenth and twentieth century data we have are far from this ideal state. Instead, we have data on agricultural employment (or labor force) corresponding to those reside on farms, or declare their primary source of employment as farm employment. Clearly, such farm workers may have off-farm jobs. Also, many farm workers do not directly engage in agricultural production: land improvements, fencing, and home manufacturing generate incomes for the farm households, but do not constitute part of the agricultural value added.

In our empirical work, we use the raw farm employment data, without making an attempt to distinguish between employment strictly related to agriculture and on-farm non-agricultural employment. For the nineteenth century, we include land improvements and home manufacturing in agricultural value added, because a non-negligible portion of farm employment was directed towards these activities, especially towards land improvement. (However, relative to total agricultural value added both land improvements and on-farm home manufacturing had shrunk significantly by mid-nineteenth century.) However, to calculate agricultural labor productivity growth in a fashion that is consistent across the two centuries, we exclusively use agricultural production as the appropriate output measure.

A.1 The nineteenth century data

Output

- 1839–1899: Value added by the commodity sector, 1839–1899 ("variant A"), from Gallman (1960), and value added by the service sector, Gallman and Weiss (1969).

The total commodity sector is agriculture, mining, manufacturing and construction ("variant A"). There are no comparable estimates that cover earlier episodes as such estimates usually rely on questionable and unverifiable assumptions about both sectoral productivity levels and productivity growth rates (Weiss, 1992, Note to Table 1.2).

Labor

- 1800–1860: Total and farm labor force (10 years and older), Weiss (1992).
- 1870–1900: Total and farm labor force (10 years and older), Weiss (1993) and unpublished spreadsheets of Weiss, which revises the farm employment data used in Weiss (1993).

Manufacturing employment estimates are from Lebergott (1966, Table A.1).

Capital stock

- 1840–1900: Depreciable capital stock estimates at current and constant (1860) prices, from Gallman (1986).

We calculated the U.S. total fixed capital stock as the sum of domestic capital and equipment both given in Gallman (1986, Table 4.A.1, "Variant A"). Unfortunately, Gallman does not present capital stock estimates by sector directly. However, his Table 4.8 contains the ratios of capital stock to value added by sector. Gallman (in notes to Table 4.8) states that the ratios for each sector are based on the value added by sector calculated in Gallman (1960). We therefore use these agricultural value added estimates and the capital stock to value added ratio to calculate the agricultural capital stock. (This measure of capital stock naturally excludes the capitalized value of improvements to farmland, livestock, and inventories.)

Kendrick (1961, Tables A-XVI and B-III) also gives estimates of capital stock in the domestic private economy by sector. However, his capital stock estimates for the domestic economy are decade averages for 1869-1878 and 1879-1888, so they are not directly comparable with those based on Gallman (1986). In any case, the ratio of farm capital (net of cropland value, but inclusive of livestock) to domestic capital (net of land, farm and forest and excluding inventories) generally yield slightly larger ratios for farm capital compared to those we used in our analysis.

Factor shares

- Farm: Gallman (1972, Table 5) gives the following for labor shares in agricultural income (in percent): 1840=78.7, 1850=74.6, 1860=70.4, 1870=75.6, 1880=76.7, 1890=70.4, and 1900=71.0. Mundlak (2005, Figure 4) sets the share of labor at 40 percent for the entire nineteenth century, but provides no explanation for his choice.
- Nonfarm: Sokoloff's (1986) TFP estimates are based a capital share of 30 percent in manufacturing output (net of intermediate inputs).

Labor productivity in agriculture

- 1800–1900: Net farm output (net of intermediate inputs), which includes farm shelter but excludes improvements to land and home manufactures, from Weiss (1993) and unpublished spreadsheets on employment by Weiss.

Weiss (1993) revises the gross farm output estimates of Towne and Rasmussen (1960, Table 1) by correcting several entries in the livestock and crop output series. We converted the net output series in current prices into net output in 1840 prices using the implicit price index given in Towne and Rasmussen.

Manufacturing labor productivity

- 1820–1860: Sokoloff (1986).
- 1860–70: Annualized growth rate of a three-year centered-moving-average of the manufacturing production index (from 1861–71) of Frickey (1947, Table 6) minus the 1860–70

annualized growth rate of manufacturing employment from Lebergott (1964, Table A.1). Frickey and Lebergott's data yield 2.3% for 1870–80, 2.1% for 1880–90, 1.2% for 1890–1900.

- 1870–1900: output per person engaged in manufacturing, from Kendrick (1961, Table D-I).

Agricultural TFP

- 1800–1840: Gallman (1972, Table 7).
- 1840–1900: Craig and Weiss (2000, Table 3), who correct for changes in agricultural hours worked (both estimates include improvements to land as agricultural output).

Alternative agricultural TFP growth estimates by Gallman (1972) from 1800 to 1860, and by Kendrick (1961, Table B-I, "net output") from 1870 to 1900 are slightly higher for overlapping decades. However, none of these studies take into account changes in hours worked, which Craig and Weiss argue have increased at least after 1840. Moreover, Gallman's (1972, pp. 201–204) estimates are based on 1840 factor shares, and linear extrapolations of land and capital inputs between 1800 and 1840 and 1805 and 1840, respectively. Mundlak (2005, Figure 1) reports his own estimates of TFP growth in agriculture, but assumes constant capital stock and output growth rates for 1800–1840, and constant capital-output ratio for 1840–1900. Mundlak's estimates are uniformly lower than those reported by Gallman, and Craig and Weiss; see Sources to Table A.1.

Manufacturing TFP

- 1820–1860: The most widely cited estimates for manufacturing are from Sokoloff (1986) who provides a range of labor productivity and total factor productivity (TFP) growth estimates based on 13 manufacturing sectors from 1820 to 1860, and we take them as representative. (In several years data are missing for a number of industries.)
- 1860–1870: There are no data available for this period, so we used the GDP per capita growth rate (0.4 percent per annum) to proxy for manufacturing TFP growth rate from Gallman (2000, Table 1.6). Manufacturing labor productivity estimates based on Frickey (1947, Table 6) for manufacturing output index and Lebergott (1966, Table A.1) manufacturing employment also indicate an essentially flat productivity during this period.
- 1870–1900: Kendrick (1961, Table D-I).

Discussion of productivity estimates

Table A.1 summarizes the labor and total factor productivity estimates we rely upon. Here we provide a brief discussion.

Non-farm productivity estimates for the mid-nineteenth century are limited. Sokoloff (1986, p. 700) compares his estimates, which we use, with earlier studies, and concludes that evidence from cotton textiles in Massachusetts reveal generally lower estimates, but textile industry estimates in Davis and Stettler (1966) are higher. Sokoloff's labor productivity estimates are also consistent with those based on censuses of manufacturing from 1850 to 1870 (e.g., Atack, Bateman and Margo 2005), which essentially imply significant labor productivity growth between 1850 and 1860, followed by very little or no growth from 1860 to 1870, and robust growth afterwards. Our conclusion that, over the nineteenth century, TFP growth rate in the non-agricultural sector exceeded that of agricultural sector is also consistent with Kendrick's (1961, Tables B-I and D-I) estimates for agriculture and manufacturing for the period from 1870 to 1900. Finally, for 1840–1900 Gallman (2000, Table 1.7) estimates TFP growth for the total economy as 0.71 percent per annum, which is considerably higher than that of agriculture (0.46) reported by Craig and Weiss.

We checked the representatives of these estimates using Kendrick's (1961, Table D-I) estimates of manufacturing labor productivity after 1869. Kendrick's manufacturing labor productivity estimates are comparable with those based on Frickey and Lebergott, except for the period 1870–80 (0.7 versus 2.3 percent, respectively). Kendrick's data for the rest of the period show that manufacturing labor and TFP productivity growth was higher than farm labor and TFP growth (see his Table B-I for farm (net output), Table D-I for manufacturing, and Table A-XXIII for non-farm private sector TFP indexes). Atack et al. (2000, pp. 261–62) attribute three-fourths of the increase between 1840 and 1910 in the productivity of farm labor (engaged in land intensive production) to mechanization. They argue that livestock productivity growth was very low (as mechanization in dairy production only emerged in the twentieth century). Weiss's estimates are consistent with these observations. The balance of these estimates therefore suggest that labor and total factor productivity growth in agriculture lagged behind manufacturing throughout the period from early 1800's to 1900, a conclusion also shared by Williamson and Lindert (1980, pp. 170–72).

Prices

- 1800–1890: Wholesale price indexes for all commodities (series E52) and farm products (E53) from the U.S. Department of Commerce (1975, Warren and Pearson series).
- 1860–1990: Wholesale price indexes for all commodities other than farm products, and farm products, both from Hanes (1998, reprinted in Sutch and Carter, series Cc126 and 127, respectively). Hanes constructed his 1890–1990 series by extending the Warren and Pearson indexes using identical aggregation methods and products.
- 1869–1913: Consumer price index from Perez and Siegler (2003).

The wholesale prices in the Warren and Pearson indexes primarily relate to New York City. In this series, there is a gentle upward trend in the relative price series, favoring farm products, especially after about 1820.

One shortcoming of the non-agricultural prices cited above is that they refer to industrial commodities or manufactured products only. To see whether the relative price indices with a more comprehensive coverage of goods and *services*, we also consulted several other sources—though, these data tend to be sparser. The best estimates available are those recently synthesized by Perez and Seigler (2003) and Balke and Gordon (1989). We find that these price indices with a more comprehensive coverage of goods and services exhibit trends similar to those present in the prices of the more narrowly defined goods. For instance, the CPI-like index constructed by Perez and Siegler (2003), and the GNP deflator constructed by Balke and Gordon (1989) are highly correlated over their overlapping sample from 1869 to 1913 (correlation 0.96) and both exhibit a substantial decreases, which are consistent with the non-farm commodity price indices.

Gallman (1960) also reports implicit price deflators for final goods from 1839 to 1900. His data suggest that over the entire period, the implicit price index for agricultural goods was essentially flat (despite a transitory surge during the Civil War). Towne and Rasmussen's (1960) implicit agricultural price index estimates from 1809 to 1900 also show no increase in agricultural prices. Weiss's (1993 and unpublished spreadsheets) revised estimates of Towne and Rasmussen data exhibit the same tendency. Gallman's implicit price index for manufacturing goods, however, declined by about 0.7 percent per annum. This declining manufacturing implicit price index was reflected in the dramatic decline in the prices of both semi-durables and durables (Gallman, 2000, p. 33 and p. 41). Further, Brady's (1966) price indices suggest that whereas from 1834 to 1899 prices of producer durable goods (as measured by machine-shop products) or consumer durables (such as stoves) declined (anywhere from 2.6 to 0.5) percent per annum, most perishable consumer goods prices (butter, wheat, and processed or fresh meat) either increased or were stable. We also calculated the relative price of farm goods (implied by Weiss's estimates) to a measure of non-farm goods (based on the un-weighted average of shoes, stoves and machine-shop products from Brady) and found an overwhelming upward trend over the period 1810 to 1900. Atack et al. (2000, p. 280) thus summarize the existing evidence from that period: "farm terms of trade, defined as the ratio of farm prices to all prices, generally improved."

A.2 The twentieth century data

Output

- 1900–1929: Gross private domestic product, farm and non-farm, 1929 prices, from U.S. Department of Commerce (1975, series F126 and F127). These are essentially Kendrick's (1961, Table AIII) estimates.

- 1929–2000: Gross value added by the business sector, farm and non-farm, current prices, from the Bureau of Economic Analysis (2006, Table 1.3.5) Non-farm business sector excludes output of governments of all levels and government enterprises, output of household workers, nonprofit institutions, gross housing product of owner-occupied dwellings, and the rental value of nonprofit institutional real estate. The two series were very similar at the break year (1929) and the remaining overlapping years (until 1960).

Since the business sector data excludes output at all levels of government, we also considered GDP excluding housing value added (only available after 1929). These series have essentially the same trend, with the exception of the WWII period.

Labor

- 1900–1947: Farm employment and total employment (14 years old and over), U.S. Department of Commerce (1975, series D5 and D6). According to this series employment share of farm sector in 1900 is about 41 percent, which is significantly larger than the 36 percent based on Weiss (1993 and unpublished worksheets). The main difference between the two series is the age cutoff for employment (14 years old for Department of Commerce and 10 years old for Weiss). Since for 1910 the employment share of agriculture for 10 years old and older (Tostlebe, 1957, Table 4, who corrects the census figures for known underreporting problems), and for 14 years old and older are virtually identical (31 and 32.6 percent, respectively), and since these differences remain minor thereafter, in the final series shown in Figure 1 in Dennis and İşcan (2008), we used Weiss's data until 1900, and Department of Commerce numbers after 1910.

- 1948–2000: Agricultural employment and total employment (16 years old and over), Bureau of Labor Statistics (2005, Table 1).[1]

Capital

- 1900–1953: Farm capital stock (net of cropland value, inventories, livestock and workstock), and nonresidential real capital stock, equipment, and structures (1929 prices) in the private domestic economy, Kendrick (1961, Tables A-XVI for non-farm and Table B-III for farm). Inventories are excluded from both farm and total capital stock estimates for consistency with the 1947–2000 period estimates. Including workstock in both the farm and total capital stock estimates does not affect the results materially, especially during the later periods. These are available for the following key years: 1899, 1909, 1919, 1929, 1937, 1948, and 1953, but we did not use the last two observations. Kendrick (Table A-XV) includes annual capital stock data, 1889–1953, for the farm and private non-farm, nonresidential sectors, but these are not separated by fixed physical assets and land and real estate. Moreover, Kendrick's (1961: 354–356) annual farm capital stock data are essentially interpolations using Tostlebe's (1957) estimates, which are in turn based on census data.

- 1947–2000: Current-cost net stock of private fixed assets by industry, farm and non-farm, excluding real estate and rental and leasing (in current dollars, year end estimates), U.S. Department of Commerce (2006, Table 3.1ES). (These data do not include livestock and work stock.) We also computed the capital stock in the farm and non-farm sectors using current-cost net stock of private fixed assets, equipment and software, and structures by type which starts in 1929 (U.S. Department of Commerce 2006, Table 2.1). To compute farm equipment and structures we added agricultural machinery and farm structures. To compute non-farm structures, we added nonresidential equipment and software and nonresidential structures. These series are consistently below those obtained from the industry side, but the overall trends are identical.

[1] Mundlak (2005, Figure 1) reports Gardner (2002, Figures 8.1 and 8.2) for his twentieth century labor series. Figure 8.1 in Gardner shows real agricultural GDP and agricultural output. Figure 8.2 in Gardner shows real farm GDP per person measured either by farm employment or farm population, but Gardner does not explicitly state his data sources on farm employment and population.

Gross investment

- 1900–1930: Gross domestic private investment (Kendrick 1961, Table A-IIa) minus net non-farm private residential investment (derived from annual capital stock estimates in Kendrick, Table A-XVI), both in 1929 prices.

- 1929–2000: Gross domestic private nonresidential fixed investment, current prices, Bureau of Economic Analysis (2006, Table 5.2.5).

Unfortunately, gross investment divided by private (or business sector) non-farm output series from Kendrick and the Bureau of Economic Analysis (BEA) are significantly different and difficult to reconcile. We, therefore, bracket our estimates using three alternative series: (i) investment-output ratio based on parsed Kendrick-BEA data, (ii) investment-output ratio set equal to its value in 2000 (about 0.16), which represents a "high" value , and (iii) investment-output ratio set equal to half its value in 2000 (about 0.08), which represents a "low" value.

Factor shares

- 1900–1953: Factor shares in the farm and non-farm private domestic economy, Kendrick (1961, Table A-10). Although, Kendrick's numbers for the farm sector are broadly consistent with those reported by Gallman (1972, Table 5) for earlier periods, Kendrick's non-farm sector capital shares are slightly below those typically used in modern studies.

- 1948–1979: Average value shares of capital and labor input, Jorgenson, Gollop, and Fraumeni (1987), Table 7.3 for agricultural production, and Table 9.8 for aggregate output.

Farm and non-farm labor productivity

- 1900–1966: Farm and non-farm output per man-hour in the private economy (1958 = 100), U.S. Department of Commerce (1975, series D683–688, columns 684, 686).

- 1947–2000: Non-farm business sector output per hour (1992=100), Bureau of Labor Statistics (2005a, series PRS85006093).

- 1948–2000: Farm output per unit of farm labor (1996=100), U.S. Department of Agriculture (2006). See Ball et al. (1997) for a detailed description of output and inputs.

Farm TFP

- 1900–1953: Farm (net output based) TFP (1929=100), Kendrick (1961, Table B-I).

- 1948–2000: U.S. Department of Agriculture (2006). These are updated series based on the basic methodology discussed in Ball et al. (1997).

Non-farm TFP

- 1900–1956: Private domestic non-farm economy TFP, 1929=100, from Kendrick (1961, Table A-XXIII).

- 1948–2000: Private non-farm business sector multifactor productivity, Bureau of Labor Statistics (2005b).

Discussion of productivity estimates

We compared the Kendrick and ERS farm and Kendrick and BLS non-farm TFP growth rates during the period 1948–1953. Non-farm TFP growth rates were very similar, but the farm TFP growth rates were not, with Kendrick's data exhibiting a much faster TFP growth rate.

Taking sectoral factor intensities (α and β) and the allocation of labor and capital across agriculture and non-agriculture as data, the production efficiency condition (5) in in Dennis and İşcan (2008) provides a simple way to compute an implied relative farm–non-farm productivity (z).[2]

In Table A.2, we compare the relative TFP *growth* rate derived by using the production efficiency condition ("implied" series) with those obtained by using growth accounting techniques (as in figure 3 in Dennis and İşcan (2008)). Unfortunately, the years for which we have TFP data for the nineteenth century do not perfectly overlap across the implied and measured estimates. We therefore present a qualitative comparison of the relative TFP growth rates for the nineteenth century. Overall, we find that for both the nineteenth and twentieth centuries the two estimates point to similar tendencies (except for the period after 1977), although there are some important differences in terms of magnitudes. More important for our purposes, both measures reveal the following chronology of relative TFP growth: a faster TFP growth rate in non-agriculture in the postbellum nineteenth century, an even sectoral performance during the interwar period, and an acceleration of the TFP growth rate in agriculture relative to that of non-agriculture thereafter.[3]

Consumption expenditures

- 1900–1929: Personal consumption expenditures and consumption expenditures on food, in current and in 1987 constant prices, from Lebergott (1996, Tables A1 and A2).
- 1929–2000: Price indexes for personal consumption expenditures by type of product (2000=100), and personal consumption expenditures and consumption expenditures on food, in current prices, from Bureau of Economic Analysis (2006, NIPA Tables 2.4.4 and 2.4.5).

[2]Specifically, we computed the implied series by first calculating the implied relative productivity. We solved for the implied z using equation (5) in Dennis and İşcan (2008) for given values of $L_{At}, \kappa_{At}, \alpha$, and β. These implied productivity levels do not depend on preference parameters. However, they do depend on perfect factor mobility across sectors. The implied relative productivity series should be interpreted with the understanding that, prior to the mid-twentieth century, the quality of the κ_A series is relatively poor. Sectoral productivity estimates based on growth accounting rely on separate estimates of K_A and K_M, and thus are more reliable.

[3]For completeness, we also calculated the employment share of non-farm sector using the implied relative productivity growth series. The results (not reported) were quantitatively similar to those reported in the text based on measured series—with the difference that the model-based series using TFP-based z series exhibit a reallocation of labor into the farm sector in the first two decades of the twentieth century, whereas the implied z series do not exhibit any significant change in employment shares.

We parsed these series by deflating the Lebergott series using the ratio of real personal expenditures in 1929, which is a common observation.

Population

- 1900–1999: mid-year population estimates, U.S. Census Bureau (2006a).
- 2000: mid-year population estimates, U.S. Census Bureau (2006b).

National population data for the years 1900 to 1949 exclude the population residing in Alaska and Hawaii. National population data for the years 1940 to 1979 cover the resident population plus Armed Forces overseas. National population data for all other years cover only the resident population.

Prices

- 1913–1954: Wholesale price index for industrial commodities (series E23), and the wholesale price index for farm goods, (E25), U.S. Department of Commerce (1975).
- 1955–2000: Producer price index for total industrial commodities and producer price index for farm products, Council of Economic Advisors (2002, Table B–67).
- 1913–2000: CPI all items, all urban consumers, city average, (1982-84=100), Bureau of Labor Statistics (2005c).

All series are constructed by the Bureau of Labor Statistics.

Trade shares

We computed the ratio of net exports to value added for agriculture and non-agriculture. Agricultural export and import values are from U.S. Department of Agriculture (2007). Exports and imports of goods are from Bureau of Economic Analysis, U.S. International Transactions Accounts Data.

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Table A.1: Productivity Growth by Industry, Nineteenth Century U.S.
(annualized growth rate, percent)

Period	Q_A	N_A	Q_A/N_A	Q_M/N_M	TFP_A	TFP_M	GDPP	TFP
1800-1810	3.02	2.90	0.12	–		–	–	
1810-1820	3.03	2.96	0.06	–	} 0.60	–	1.1	}0.55
1820-1830	3.17	2.76	0.40	3.94		3.03	0.8	
1830-1840	3.62	2.77	0.83	}0.68		}0.97	1.3	
1840-1850	2.13	2.37	−0.23		} −0.14		1.9	
1850-1860	3.64	2.53	1.08	3.21		2.44	1.6	
1860-1870	1.92	0.12	1.80	0.82	1.47	–	0.4	
1870-1880	4.36	2.68	1.63	0.76		0.87	2.3	}0.71
1880-1890	1.93	1.28	0.65	2.24	} 0.52	1.96	1.7	
1890-1900	2.45	1.08	1.36	1.25		1.12	1.1	

Notes and Sources: Annualized growth rates (g) are computed using the compound growth rate formula: $x_t = x_0(1+g)^t$, and are expressed in percent.
$\mathbf{Q_A}$: Farm net output ("narrow") which includes farm shelter but excludes improvements to land and home manufactures from unpublished data underlying Weiss (1993, Table 4).
$\mathbf{N_A}$: Farm employment from Weiss's unpublished worksheets.
$\mathbf{Q_A/N_A}$: Farm labor productivity (equivalent to y_A in the text).
$\mathbf{Q_M/N_M}$: Manufacturing labor productivity. 1820–1832, 1832–1850, and 1850–1860 are from Sokoloff (1986, Table 13.4) based on weighted averages of net output in 13 manufacturing industries, and is the mid-point of the (Northern) firm and aggregate level estimates of Sokoloff's "variant B", 1861–71 are annualized growth rate of three year centered moving average of manufacturing production index of Frickey (1947, Table 6) minus 1860–70 annualized growth rate of manufacturing employment from Lebergott (1966, Table A.1), and from 1870 to 1900 are from Kendrick (1961, Table D-I, "output per person engaged").
$\mathbf{TFP_A}$: Farm total factor productivity (TFP). 1800–1840 are from Gallman (1972, Table 7), and 1840–1860, 1860–1870, and 1870–1900 are from Craig and Weiss (2000, Table 3), who account for increases in average hours worked by farm workers. Both Gallman and Craig and Weiss use agricultural output figures that include improvements to land and maintenance. Gallman (1972) also provides decennial estimates based on extrapolation of agricultural capital stock and land from 1800 to 1840: 1800–1810=−0.31, 1810–1820=0.36, 1820–1830=1.11, and 1830–1840=1.40. Kendrick's (1961, Table B-I, "net output") TFP indexes imply the following farm TFP growth: 1870–1880= 1.46, 1880–1890=0.54, and 1890–1900=1.05. Mundlak (2005, Table 2), after accounting for factor biased technological change, reports the following TFP growth rates in agriculture: 1800–1840=0.19, 1840–1880=0.56, and 1880–1900= [0.15–0.56].
$\mathbf{TFP_M}$: Manufacturing TFP. 1820–1832, 1832–1850, and 1850–1860 are from Sokoloff (1986, Table 13.9) based on "variant B" weighted averages of net output in 13 manufacturing industries, and is the mid-point of the firm and aggregate level estimates (1820-30 is 1820-32). 1870–1900 are from Kendrick (1961, D-I). 1860–1870 growth rate is approximated by 0.4 percent per annum based on Gallman (2000, Table 1.6) GDP per capita growth rate.
GDPP: Gross domestic product per capita from Gallman (2000, Table 1.6).
TFP: Aggregate TFP. 1800–1840 and 1840–1900 are from Gallman (2000, Table 1.7). Most years (e.g., 1869, 1879) are reported by the census year (e.g., 1870, 1880).

Table A.2: Growth Rate of Ratio of Nonfarm to Farm TFP
(annualized compound growth rate, percent)

Period	Implied	Measured	Period	Implied	Measured
1820–1830	—	+	1900–1909	−0.18	1.99
1830–1840	—	(+)	1909–1919	−2.37	1.62
1840–1850	0.25	+	1919–1929	0.64	0.80
1850–1860	1.77	+	1929–1937	0.15	0.89
1860–1870	−2.96	(−)	1937–1947	−0.93	−0.55
1870–1890	0.98	+/(−)	1947–1957	−5.32	1.09
1880–1890	3.92	+	1957–1967	−5.81	−0.29
1890–1900	0.02	+	1967–1977	−3.07	−0.86
			1977–1987	0.46	−2.01
			1987–2000	1.18	−1.00

Notes: Implied relative TFP growth rates are based on the production efficiency condition, sectoral labor and capital stock shares, and sectoral factor intensities as discussed in the text and given by equation (5) in Dennis and İşcan (2008). For the non-farm sector, we used a constant share of capital, $\alpha = 0.3$, throughout. For the farm sector, we used the following share of capital (β) parameters: 1840=0.22, 1850=0.25, 1860=0.30, 1870=0.24, 1880=0.23, 1890=.30, 1900=0.29, and thereafter 0.30. Note that Jorgenson et al. (1987) and Young (2006) estimate different sectoral labor shares for agriculture and non-agriculture after 1950s. For the nineteenth century, since the periods for which we have farm and non-farm TFP growth rates do no overlap, using data in Table A.1, we indicated the likely sign of measured relative TFP growth rates (likely signs assigned using average labor productivity growth rates are given in parentheses, when either they are different in sign from the likely relative TFP growth estimates or relative TFP growth estimates are not available for the period). Measured relative TFP growth rates are based on farm and non-farm TFP estimates. The numbers are the annualized compound growth rates in percent. A positive number means faster TFP growth rate in the non-farm sector. Measured series are non-farm minus farm TFP growth rate.
Sources: For measured series, see the sources to figure 3 in Dennis and İşcan (2008), and for implied series, see the discussion in the text.