Nicholas Crafts, "*The Rise and Fall of American Growth*: Exploring the Numbers", Online Appendix

Methods Used to Construct Table 1

Lower Mortality

The benefits are evaluated using a methodology proposed by Nordhaus (2002) but with the detailed implementation updated in line with the discussion in Viscusi (2013). It should be noted that in this approach, gains from lower mortality are treated as "an imputation for a change in the environment" (Usher 1980, pp. 133-5). In each period this is accounted separately, there is no value of life included in baseline income but changes in expectation of life are regarded as having a consumption equivalent. Usher argued that this is an appropriate way to proceed since, at least in recent times, improvements in mortality have accrued through a gradual accumulation of knowledge on how to prevent and cure disease which affects the life chances of all persons.

Nordhaus (2002) provides a way of operationalizing this approach. His method values increases in life expectancy by taking the change in the population-weighted average of age-specific mortality rates multiplied by the estimated value of a death averted. The data required to make this adjustment to the conventional estimate of national income are population by age, age specific mortality, and the value of a death averted which is based on the "value of a statistical life" (VSL). Data on mortality and age structure are available from the *Historical Statistics of the United States* (2006) and Haines (1994) and can be updated to 2007 using the *Current Population Survey* and *National Vital Statistics*. Estimates of VSL are based on recent guidance from the U. S. Department of Transportation informed by recent econometric analysis which is reviewed by Viscusi (2013). I have interpreted this to imply that VSL = 178.8 x real GDP/person, i.e., that VSL has an income elasticity = 1 and was equal to $9.2 million in 2012.

Reduced Market Work Hours

The benefits are evaluated using a method proposed by Usher (1980) which treats reduced work hours in a similar way to gains from lower mortality. In principle, this values the change in hours worked at the wage rate that could have been earned. As with mortality, each period is treated separately and the gain from reduced hours of market work per person at the end of the period compared with the beginning is added to real GDP per person in the final year to obtain the adjusted growth rate for real GDP. In practice, this is valued using labor's share of national income = 0.7 x real GDP per hour worked. This makes the quite conservative assumption that there is no productivity increases in the enjoyment of leisure.

Data on population and real GDP per person are available in *Historical Statistics of the United States*. Estimates of hours worked for 1870-1941 are based on Kendrick (1961, Table A-X) and for 1950-2007 on BLS data posted on Valerie Ramey's website at

http://econweb.ucsd.edu/~vramey/research/html#data

Estimates Used to Derive Table 2

The estimates are based on the dataset underlying Bakker et al. (2015) where full details of methods can be found. TFP growth for 1929 onwards is based on growth accounting procedures similar to those used by the BLS for the post World War II period. Crude TFP growth for the Private Domestic Economy is initially taken from Kendrick (1961) but the measurement of inputs is then refined. In particular, capital and labor inputs are revised to a capital-services and labor-services basis, respectively, which gives slightly faster growth of capital inputs and a considerably larger adjustment for labor quality.

Sectoral TFP growth was obtained as follows. Industry-level estimates of nominal value added were taken from NIPA and then deflated on the basis of wholesale prices from the U.S. Bureau of Labor Statistics, production prices from *Historical Statistics of the United States*, and, for some service sectors, relevant price indices from NIPA. Labor inputs are based on NIPA for employment adjusted for hours of work using Kendrick (1961) and *Historical Statistics*. Adjustments for labor quality improve on Kendrick by accounting for improvements in educational attainment within occupations. Labor quality growth in each industry is the growth rate of the compensation-weighted index of labor input minus total employment growth. The index of labor inputs was derived as follows. First, educational attainment for individual workers for the pre-1940 census samples was estimated on the basis of the 1940 returns. Second, an employment matrix was constructed for the entire period that groups workers according to their (predicted) educational attainment, gender, age and by industry. Lastly, the compensation matrix was derived on the basis of average wages for each labor category taken from the 1940 census of population. These employment and compensation matrices were then be used to calculate labor quality.

Capital inputs were estimated on the basis of capital services. The industry-level stock of capital for the private domestic economy between 1929 and 1941 was estimated using a Perpetual Inventory Method (PIM) and the investment and depreciation series taken from the BEA's *Fixed Assets* tables. Rental prices of assets at the industry level were based on the imputed industry rate of return, the asset-specific rate of depreciation and capital gains and losses from changing asset prices. This allows the calculation of 'capital compensation' weights to aggregate the capital input.

For 1919-1929, the estimates are derived differently. The starting point is Kendrick (1961) and capital inputs are on a capital-stocks basis. However, labor inputs have been revised and growth of labor quality is estimated as above. This reduces TFP growth in the private domestic economy by about 0.3 per cent per year compared with Kendrick's estimate. In addition, more detailed coverage at the sectoral level is provided with 5 additional sectors (construction, distribution, financial, post office and spectator entertainment) measured.

Methods Used to Construct Table 3.

'New Estimates' were constructed in the same way as the Bakker et al. (2015) estimates used for Table 2. 'Kendrick Traditional' is based on Kendrick (1961, Table-AXXII). 'Kendrick Modern NIPA' retains total factor input from Kendrick but the rate of growth of output is assumed to be the same as the chained-volume estimates of real GDP in *Historical Statistics of the United States*. 'Kendrick NIPA with LQ Adjustment' retains chained-volume GDP but replaces Kendrick's labor quality by the estimate used in 'New Estimates (1)' and 'New Estimates (2)'.

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