Measures of elasticities of output with respect to labor and capital using I/O tables for the United States

Below are the two ways of calculating capital costs:

1 Calculation of Capital Costs based on Operating Surplus

Table 1 shows elasticities of output with respect to labor and capital using different assumptions about capital costs percent of operating surplus.

	50%		75%		100%	
Year	Labor Share	Capital Share	Labor Share	Capital Share	Labor Share	Capital Share
1997	0.692	0.308	0.619	0.381	0.563	0.437
1998	0.707	0.293	0.635	0.365	0.580	0.420
1999	0.706	0.294	0.634	0.366	0.580	0.420
2000	0.712	0.288	0.642	0.358	0.588	0.412
2001	0.710	0.290	0.641	0.359	0.588	0.412
2002	0.701	0.299	0.631	0.369	0.577	0.423
2003	0.694	0.306	0.622	0.378	0.568	0.432
2004	0.688	0.312	0.616	0.384	0.562	0.438
2005	0.679	0.321	0.607	0.393	0.552	0.448
2006	0.677	0.323	0.605	0.395	0.551	0.449
2007	0.675	0.325	0.604	0.396	0.551	0.449
2008	0.664	0.336	0.595	0.405	0.543	0.457
2009	0.668	0.332	0.596	0.404	0.542	0.458
2010	0.662	0.338	0.588	0.412	0.533	0.467
2011	0.661	0.339	0.587	0.413	0.532	0.468
2012	0.667	0.333	0.592	0.408	0.536	0.464
2013	0.666	0.334	0.591	0.409	0.535	0.465
2014	0.668	0.332	0.593	0.407	0.537	0.463
2015	0.677	0.323	0.602	0.398	0.547	0.453
2016	0.678	0.322	0.603	0.397	0.547	0.453
2017	0.678	0.322	0.603	0.397	0.548	0.452

Code: MacroNote_BEA_IO.m (Code folder)

Data: Use_SUT_Framework_1997-2017_SUM.xlsx (Data→USA folder)

Data source: https://apps.bea.gov/iTable/itable.cfm?reqid=52&step=1

2 Calculation of Capital Costs by Simcha Barkai

$$RK = \sum_s R_s (PK)_s \tag{1}$$

$$R_s = \underbrace{\left(\left(\frac{D}{D+E} i^D (1-\tau) + \frac{E}{D+E} i^E \right) - \pi_s + \delta_s \right)}_{\text{Weighted average cost of capital}} \frac{1 - z_s \tau}{1 - \tau} \tag{2}$$

Data for the U.S. non-financial corporate sector

- s capital types. 3 NIPA asset types: non-residential structures, equipment, and intellectual property products.
- D market value of debt. Data on market values are taken from the Integrated Macroeconomic Accounts for the United States Table S.5.a https://apps.bea.gov/itable/itable.cfm?reqid=14&step=1, 1960-2018
  - Bonds is the sum of lines 137 and 138
  - Commercial Paper is line 136
  - Loans is line 139
- i^D debt cost of capital. Combine data on rates and market values of bonds, commercial paper, and loans. The debt cost of capital is computed as the weighted average of
  - the (annual) yield on Moody's Aaa (Bonds), https://fred.stlouisfed.org/series/AAA#0, 1919-2019
  - the 3-Month AA Nonfinancial Commercial Paper Rate (Commercial Paper), https://fred.stlouisfed.org/series/CPN3M#0, 1997-2019 and

– the rate for commercial and industrial loans made by all commercial banks (Loans), Survey of Terms of Business Lending - Table E.2 - line 1 column 1=Weighted-average effective loan rate (percent) https://www.federalreserve.gov/releases/E2/default.htm, 1997Q2-2017Q2 (or https://fred.stlouisfed.org/series/EEANQ same quarterly data but with option to download annual data).

The weights are proportional to the market values. Thus, equation (2) becomes

$$\begin{aligned} R_s &= \left(\frac{D}{D+E} \left(\frac{B}{D} i^B + \frac{P}{D} i^P + \frac{L}{D} i^L \right) (1-\tau) + \frac{E}{D+E} i^E - \pi_s + \delta_s \right) \frac{1 - z_s \tau}{1-\tau} \\ &= \left(\frac{1}{D+E} \left(B i^B + P i^P + L i^L \right) (1-\tau) + \frac{E}{D+E} i^E - \pi_s + \delta_s \right) \frac{1 - z_s \tau}{1-\tau} \end{aligned} \tag{3}$$

where B denotes Bonds, P denotes Commercial Paper and L denotes Loans.

- E market value of equity. Line 144, Integrated Macroeconomic Accounts for the United States Table S.5.a https://apps.bea.gov/itable/itable.cfm?reqid=14&step=1, 1960-2018.

- i^E equity cost of capital. Approximate the equity cost of capital as the sum of the yield on the 10-year U.S. treasury (https://fred.stlouisfed.org/series/DGS10, 1962-2019) and a constant 5% equity risk premium.

- τ corporate income tax rate. Corporate income tax rate - shows the basic central government statutory (flat or top marginal) corporate income tax rate. OECD Tax Database: Statutory corporate income tax rates, 1981-1999 and 2000-2019, https://www.oecd.org/tax/tax-policy/tax-database/

- π_s inflation rate of capital of type s. Table 1.1.7. Percent Change From Preceding Period in Prices for Gross Domestic Product, 1930-2018, Lines 10, 11, and 12, https://apps.bea.gov/iTable/iTable.cfm?reqid=19&step=3&isuri=1&1921=survey&1903=11#reqid=19&step=3&isuri=1&1921=survey&1903=11

- z_s net present value of depreciation allowances for capital of type s. A capital allowance is the percentage of total investment that a business can recover through the tax code via depreciation. Tax Foundation:
  - OECD Capital Allowances, Three Assets (Industrial Buildings (Structures), Machines (Equipment), and Intangibles (IP)), 1979-2012, https://taxfoundation.org/oecd-capital-allowances-thr #ind
  - Missing years: 2013-2017
  - Net Present Value of Capital Allowances, OECD, 2018, Table 1 https://taxfoundation.org/capital-cost-recovery-across-oecd-2018/
  - Net Present Value of Capital Allowances, OECD, 2019, Table 1, Data for machinery, buildings and intangibles https://taxfoundation.org/capital-cost-recovery-across-the-oecd-2019/
- δ_s depreciation rate of capital of type s. For private non-residential structures and equipment and private intellectual property products https://bea.gov/national/pdf/BEA_depreciation_rates.pdf. Depreciation rates are disaggregated to industries within these 3 categories of capital. OR https://apps.bea.gov/national/FA2004/Details/Index.htm and then go to Nonresidential Detailed Estimates (Implied rate of depreciation, 1947-2018). Thus, this disaggregation at the industry level allows me to match this data on depreciation rates with the IO data which is also at the industry level. See excel file "BEA_industry_codes" located in "Data" Dropbox folder on how I handled the discrepancies between BEA industry codes in IO data and depreciation rate data. My method uses the BEA industry codes in IO data as the baseline. Thus, equation (3) becomes

$$R_{js} = \left(\frac{1}{D+E} \left(Bi^B + Pi^P + Li^L \right) (1-\tau) + \frac{E}{D+E} i^E - \pi_s + \delta_{js} \right) \frac{1 - z_s \tau}{1-\tau} \tag{4}$$

  where j denotes industries.
- PK_{js} nominal value of capital stock. Table 4.1. Current-Cost Net Stock of Private Nonres-

idential Fixed Assets by Industry Group (Farms, Manufacturing and Nonfarm nonmanufacturing) and Legal Form of Organization, 1925-2018, https://apps.bea.gov/iTable/iTable.cfm?ReqID=10&step=2. Since the nominal value of capital stock is available at the aggregated industry group level, I assign the nominal value of capital stock of farms to each farm industry in IO data. Similarly, I assign the nominal value of capital stock of manufacturing to each manufacturing industry in IO data, and so on. See excel file "BEA_industry_codes". Thus, equation (1) becomes

$$R_j K_j = \sum_s R_{js} P K_{js} \tag{5}$$

where j denotes industries.

Figure 1 shows the average rate of return across industries per capital type.

Figure 1: Average Rate of Return across industries per capital type, 1998-2012

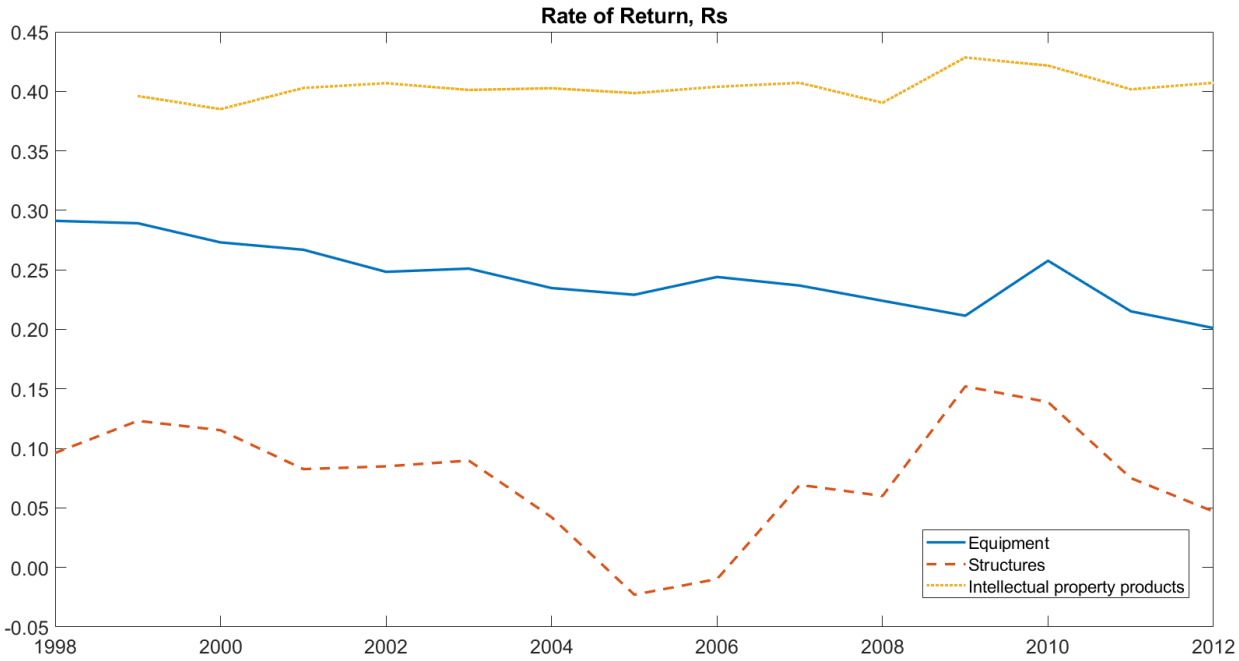

Table 2 shows elasticities of output with respect to labor and capital using the measure of capital costs outlined above.

Year	Labor Share	Capital Share
1999	0.073	0.927
2000	0.078	0.922
2001	0.081	0.919
2002	0.081	0.919
2003	0.080	0.920
2004	0.095	0.905
2005	0.129	0.871
2006	0.115	0.885
2007	0.083	0.917
2008	0.085	0.915
2009	0.062	0.938
2010	0.060	0.940
2011	0.078	0.922
2012	0.090	0.910

Two concerns about this table:

1. As I mentioned above the nominal value of capital stock is available at the aggregated industry group level (Farms, Manufacturing and Nonfarm nonmanufacturing) and not by individual industries as in the IO data. For this reason, I assigned the nominal value of capital stock of farms to each farm industry in IO data. Similarly, I assigned the nominal value of capital stock of manufacturing to each manufacturing industry in IO data, and so on. As a result capital costs per industry (R_jK_j) are very large numbers even larger than the value added. So, I think, to accurately calculate RK we need to find a way to split the aggregate value of capital stock into the respective industries.

2. The above data does not imply rates of return (R) for the last five industries in IO tables:

   (a) Federal general government (defense)

   (b) Federal general government (nondefense)

   (c) Federal government enterprises

   (d) State and local general government

   (e) State and local government enterprises

   For this reason, I excluded them in the calculation of the elasticities.

Code: capital_costs.m (Code folder)

Data (Data→USA folder):

- BEA_industry_codes.xlsx (description only, not used in the calculation)
- Implied_Depreciation_Rates_for_Private_Nonresidential_Fixed_Assets.xlsx
- Inflation_rate.xlsx
- value_debt_equity.xlsx
- i_b.xlsx , i_p.xlsx , i_l.xlsx , i_e.xlsx (rate for bonds, commercial papers, loans and equity)
- capital_allowances.xlsx
- corporate_income_tax_rate_a.xlsx , corporate_income_tax_rate_b.xlsx
- Capital_Stock_Value.xlsx

Some definitions:

Nonresidential structures consists of new construction—including own-account construction; improvements to existing structures; expenditures on new mobile structures; expenditures on mining exploration, shafts, and wells; brokers' commissions on sales of structures; and net purchases of used structures by private businesses and by nonprofit institutions from government agencies. In addition, it includes equipment that is considered to be an integral part of the structure (such as plumbing, heating, and electrical systems).

Nonresidential equipment consists of purchases by private businesses and by nonprofit institutions of new equipment (such as machinery, furniture, and motor vehicles) that meets the above definition of a fixed asset. It also includes dealers' margins on sales of used equipment to businesses and to nonprofit institutions; net purchases of used equipment from government agencies, from persons, and from the rest of the world; and own-account production of equipment. It is measured net of the value of worn out equipment sold for scrap.

Nonresidential intellectual property products consists of purchases and ownaccount production of software, of research and development (R&D), and of entertainment, literary, and artistic originals. R&D includes depreciation on other fixed assets used to produce R&D. Entertainment originals includes theatrical movies, longlived television programs, books, music, and other artistic originals that are used to produce copies for the public.