INFORMATION RENTS, ECONOMIC GROWTH, AND INEQUALITY: AN EMPIRICAL STUDY OF THE UNITED STATES

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Abstract

In this paper I estimate the impact of unproductive activities on economic growth, labor productivity, and income inequality in the United States from 1947 to 2011. Productive activities directly create value, while unproductive activities do not. I develop a new methodology to compute the growth of productive and unproductive activities in terms of flows of income and stocks of fixed assets using input-output matrices and national income accounts. A core feature of my methodology is the notion that the commodification of knowledge and information gives rise to "information rents". Information rents are, as I demonstrate, a determinant factor of growth and distribution. I find that unproductive activities have a net positive effect on economic growth and labor productivity, but at the price of increasing income inequality. Unproductive activities that rely on information rents, in particular, have increased income inequality and slowed down valued-added growth despite their positive contribution to labor productivity. Information rents have drawn too much value from productive activities and benefitted the top income earners.

Key Words: Unproductive Activity, Information Rents, Growth and Distribution, Inequality, Time Series Econometrics

JEL Codes: B51; E11; O47

Appendix

[The entire appendix can be placed online]

Appendix 1

In this appendix I provide further technical details on estimation and simulation procedures.

A.1 THE ARDL MODEL

I use the functional form in equation A.1 to estimate the auto-regressive distributed lag (ARDL) models in error correction form:

$$\Delta Y_t = \alpha + \left[\beta Y_{t-1} + \sum_{j=1}^{k} \beta_j X_{j,t-1}\right] + \left[\sum_{i=1}^{p} \gamma_i \Delta Y_{t-i} + \sum_{h=1}^{m}\sum_{i=1}^{p} \gamma_{h,i} \Delta X_{h,t-i}\right] + \varepsilon_t \qquad \text{(A.1)}$$

Where ΔY_t is the dependent variable in first difference, Y_{t-1} is the dependent variable in lagged level, $X_{j,t-1}$ are the k independent variables in lagged levels, ΔY_{t-i} are the p lagged differences of the dependent variable, $\Delta X_{h,t-i}$ are the p lagged differences of the m independent variables, α is a constant, and ε_t is a white noise error process.

The variables in lagged levels (the first bracket on the right-hand side) represent the permanent long-run effects. The variables in lagged differences (the second bracket on the right-hand side) represent the temporary short-run effects. The lagged independent variables $\Delta X_{h,t-i}$ should be at least weakly exogenous, and the error term ε_t must be a normally distributed white noise process free of serial correlation. To avoid endogeneity problems, the specifications include lagged terms only. The PSS bounds F-test procedure tests the null hypothesis that the long-run coefficients β and β_j are jointly equal to zero.

In an ARDL model with both long- and short-run effects, and in which the dependent variable ΔY_t is in first differences on the left-hand side of the equation, the coefficient on the lagged dependent variable Y_{t-1} in levels is expected to be negative. If the coefficient is negative, a rise in the level of the dependent variable will produce a change in the opposite direction, which implies a stable (self-correcting) long-run

equilibrium. If the coefficient were positive, the long-run equilibrium would be unstable and the trajectory of the dependent variable would not converge to its long-run equilibrium.

A.2 Asymmetry Between Short- and Long-Run Regressors

On July 6th, 2020, I sent the following email to the original authors of the ARDL bounds F-test (Pesaran, Shin, and Smith 2001):

> Dear Prof., I have a question about your PSS (2001) bounds F-test and would really appreciate it if you could help me. I have read a few publications that employ the PSS (2001) bounds F-test in an ARDL model in error correction (EC) form with a set of variables that are I(1) in levels and I(0) in first differences. However, the authors of these papers selectively drop regressors from the list of variables appearing in lagged level form if they do not cointegrate, while still keeping the same excluded variables in lagged difference form in order to control for short-run effects. Hence, some variables that are I(1) in levels are included in the ARDL EC model in lagged difference form only (to capture short-run effects) but not in lagged level form (within the long-run cointegrating relationship). So my question to you would be the following: Does your bounds F-test allow for this asymmetry between short-run and long-run variables? Or is it the case that the critical values for the PSS bounds F-test suppose that all I(1) variables included in lagged difference form must also be included in lagged level form?

Reply from prof. Yongcheol Shin on July 6th, 2020:

> Strictly speaking, only the number of I(1) regressors included as the level matters, because the stationary regressors (say first differences) do not affect the limiting distribution of the PSS test. Still, you need to justify why you use I(1) regressors differently.

Reply from prof. Ron Smith, also on July 6th, 2020:

> Hashem Pesaran passed your question to me, we work together. The bounds test only applies to the lagged level terms, there is no requirement that the same variables appear both in the first difference and levels terms. Notice that the bounds test is for a long run levels relationship, which is more general than a test for cointegration. It applies whether the variables are I(0) or I(1) in levels. But if they are I(1) in levels, it is perfectly possible for a variable to have a short run effect but no long run effect. If you think of logs of consumption and income being I(1), the consumption income relationship may be the only long run relationship, but growth rates of other variables or I(0) variables may influence the short run growth rate of consumption.

Hence, we can keep an asymmetric list of variables across short-run and long-run effects, giving us more freedom in building the ARDL model.

A.3 UNIT ROOT TESTS

The PSS bounds F-test allows for I(0) and I(1) variables, but it does not allow for I(2) variables. In Table A.1 I present the results from six unit-root tests on the variables in levels and in differences. The first five unit-root tests are: Augmented Dickey-Fuller (ADF), Philips-Perron (PP), Kwiatkowski–Phillips–Schmidt–Shin (KPSS), Elliott, Rothenberg, Stock (ERS) feasible point optimal test, and the Dickey-Fuller Generalized Least Squares (DF-GLS) test. Note that the KPSS has a null hypothesis of no unit root, which is the opposite of the other unit root tests. Test statistics, null hypotheses, and significance levels are summarized in Table A.1.

The unit root tests indicate that three variables might be I(2) in levels, namely the "share of finance and information rents in Kua", the "share of information rents in Kua", and the "Kua / Kpa" ratio. For these three variables we cannot unanimously reject the null of unit root in first differences. Visual inspection of the variables in first differences reveals a structural break in the 1980s which some of the unit root tests identify as a potential unit root process. I run the Zivot-Andrews (ZA) unit-root test with one endogenous structural break to account for the possibility that a seemingly I(1) process is an I(0) process with structural break. The Zivot-Andrews (ZA) model employs an intercept shift and a trend shift to identify a structural change in a time series, selecting the break point endogenously by minimizing the ADF t-statistic. There is strong evidence of an endogenous break point during the 1980s in the first differences given that the ZA test rejects the null of a unit root at the 1% significance level in these three series. Hence, the variables "share of finance and information rents in Kua", "share of information rents in Kua", and the "Kua / Kpa" ratio are non-stationary I(1) processes in levels and I(0) break-stationary processes in first differences, with a structural break in the 1980s. For this reason, I add the Neoliberal dummy variable (equal to 1 after 1980) within the long-run relationship in the ARDL models estimated in Tables 3 and 4.

Table A.1: Unit Root Tests

	ADF	PP	KPSS	ERS	DF-GLS	ZA	Conclusion
Null hypothesis	Unit root	Unit root	No unit root	Unit root	Unit root	Unit root	
Deterministic components	Drift	Drift	Drift	Drift	Drift	Drift and trend breaks	
Top 0.1% with capital gains							
Level	-0.44	-0.58	1.32***	17.14	-0.24		I(1): non-stationary
First difference	-5.89***	-9.64***	0.17	0.79***	-3.71***		I(0): stationary
Top 1% with capital gains							
Level	-0.38	-0.47	1.25***	16.04	-0.25		I(1): non-stationary
First difference	-5.79***	-9.26***	0.23	0.76***	-3.82***		I(0): stationary
Value Added							
Level	-1.25	-1.53	1.72***	760.01	1.16		I(1): non-stationary
First difference	-5.88***	-8.08***	0.19	0.97***	-2.72***		I(0): stationary
Rate of exploitation							
Level	0.002	-0.16	1.38***	32.06	0.67		I(1): non-stationary
First difference	-5.31***	-8.55***	0.15	1.39***	-2.41**		I(0): stationary
Labor productivity							
Level	-1.33	-1.35	1.70***	1831.1	1.35		I(1): non-stationary
First difference	-4.92***	-7.02***	0.25	1.05***	-3.63***		I(0): stationary
Share of finance and information rents in NIua							
Level	-0.22	-0.19	1.52***	35.83	0.18		I(1): non-stationary
First difference	-5.73***	-8.09***	0.17	0.67***	-3.98***		I(0): stationary
Share of information rents in NIua							
Level	-0.78	-0.80	1.31***	14.37	-0.61		I(1): non-stationary
First difference	-5.53***	-7.90***	0.12	0.69***	-3.87***		I(0): stationary
NIua / Value Added							
Level	-2.19	-1.70	1.57***	107.44	0.15		I(1): non-stationary
First difference	-5.27***	-9.22***	0.12	1.98**	-2.09**		I(0): stationary
Share of finance and information rents in Kua							
Level	-1.09	-1.74	1.70***	185.66	0.33		I(1): non-stationary
First difference	-2.52	-5.31***	0.42*	19.42	-0.55	-6.44*** (a)	I(0): break-stationary
Second difference	-7.11***	-15.91***	0.10	1.10***	-0.37		I(0): stationary
Share of information rents in Kua							
Level	-0.38	-1.62	1.72***	992.31	2.70		I(1): non-stationary
First difference	-4.56***	-7.60***	0.15	7.87	-0.78	-5.79*** (b)	I(0): break-stationary
Kua / Kpa							
Level	-1.19	-1.80	0.80***	21.73	-1.63*		I(1): non-stationary
First difference	-6.09***	-5.48***	0.42*	20.28	-0.50	-6.45*** (c)	I(0): break-stationary
Second difference	-7.13***	-11.36***	0.22	0.73***	-5.74***		I(0): stationary

Note: Significance levels: 10% (*), 5% (**), and 1% (***). Variables in levels are in logs. Regression results are for the entire postwar period (1947-2011). ZA unit root test with one endogenous break point, using both intercept and trend shifts: (a) with 3 lags, structural break in 1989; with 1 lag, structural break in 1983; (b) with 3 lags, structural break in 1997; with 1 lag, structural break in 1950; (c) with 3 lags, structural break in 1981; with 1 lag, structural break in 1981.

A.4 Simulation of Economic Effects

To compute the ARDL specifications, PSS bounds F-tests, and model simulations with bootstrapped intervals, I use the approach from Jordan and Philips (2018) and Philips (2018) and their open-source package "dynamac" for R. Jordan and Philips (2018) and Philips (2018) compute the ARDL simulations as follows. The ARDL coefficients are simulated through 20,000 draws from a multivariate normal distribution with mean and variance from the estimated variance-covariance matrix from equation A.1. A stochastic component is added to the predicted value of each simulation by computing the standard deviations scaled by random draws from the chi-squared distribution. The independent variables in levels are held at their means and other variables in differences are held at 0. A "burn in" period of 10 years allows equation A.1 to equilibrate before the independent variables are shocked. The 20,000 simulated draws do not lower uncertainty as they do not decrease the underlying variance from equation A.1. More simulations just improve and smooth the estimates within each time period. Simulation plots of all models are available in appendix 2.

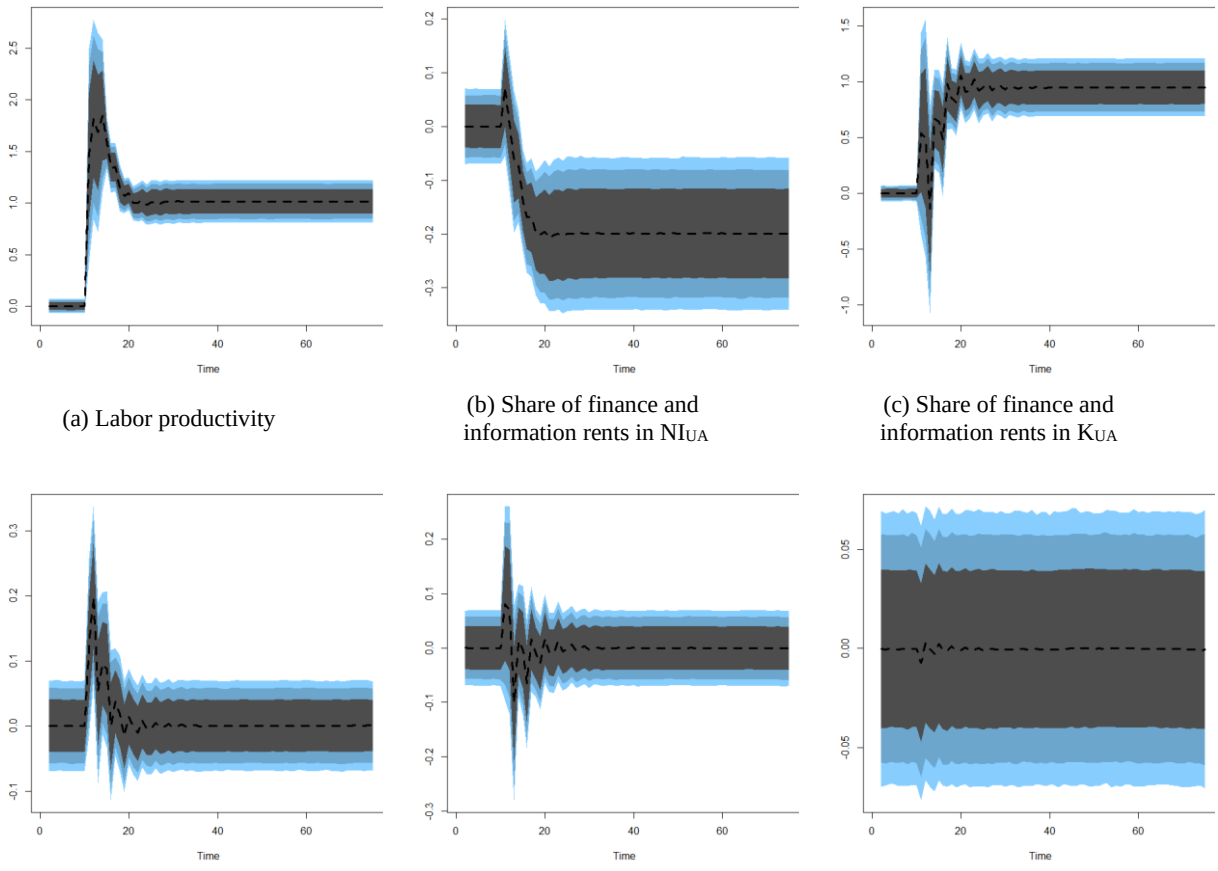
In this paper I simulate the ARDL models using impulses that replicate the actual cumulative changes in the underlying variables from 1947 to 2011. For the variables in lagged differences, the respective temporary responses of the dependent variables will decay to zero over time. For the variables in lagged levels, the responses of the dependent variables will converge to their long-run economic effect. The economic effect of a regressor is equal to its long-run elasticity times the actual cumulative change in the underlying variable. Tables 5 and 6 in the main text present the long-run elasticities, cumulative changes, and economic effects of the regressors in each model. The '--' symbol indicates that the regressor is included only in lagged differences.

Appendix 2

In this appendix I present the simulations of the ARDL models in Tables 3 and 4. The simulations show the temporary short-run effects as well as the permanent long-run economic effects. Regressors receive an impulse equal to the actual cumulative change in the respective variables as reported in Tables 5 and 6.

Figure A1: Economic Effect on Value Added (Model 1a)

Cumulative change in the **value added** of productive activities from the actual cumulative change in:



(a) Labor productivity

(b) Share of finance and information rents in NI_{UA}

(c) Share of finance and information rents in K_{UA}

(d) Rate of exploitation

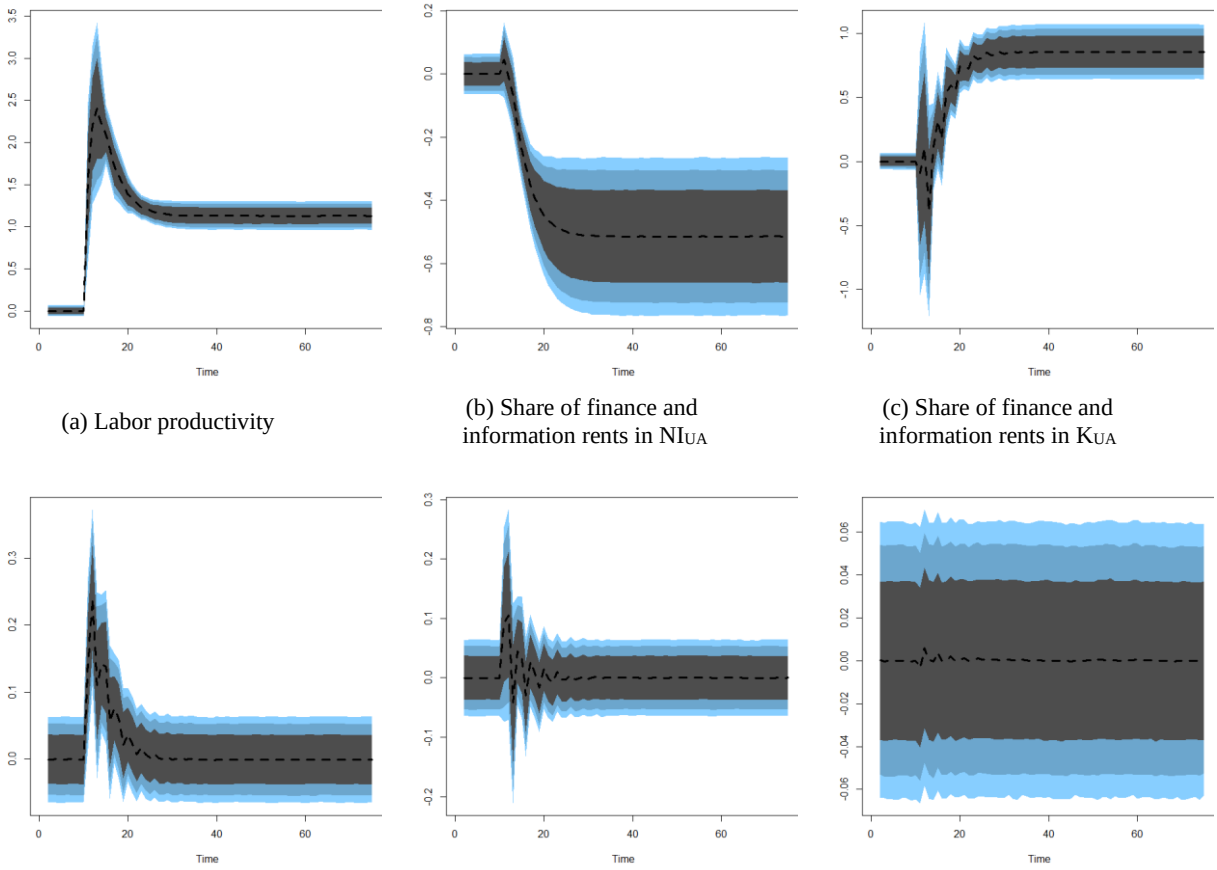
(e) NI_{UA} / Value Added

(f) K_{UA} / K_{PA}

Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A2: Economic Effect on Value Added (Model 1b)

Cumulative change in the **value added** of productive activities from the actual cumulative change in:



(a) Labor productivity

(b) Share of finance and information rents in NI_{UA}

(c) Share of finance and information rents in K_{UA}

(d) Rate of exploitation

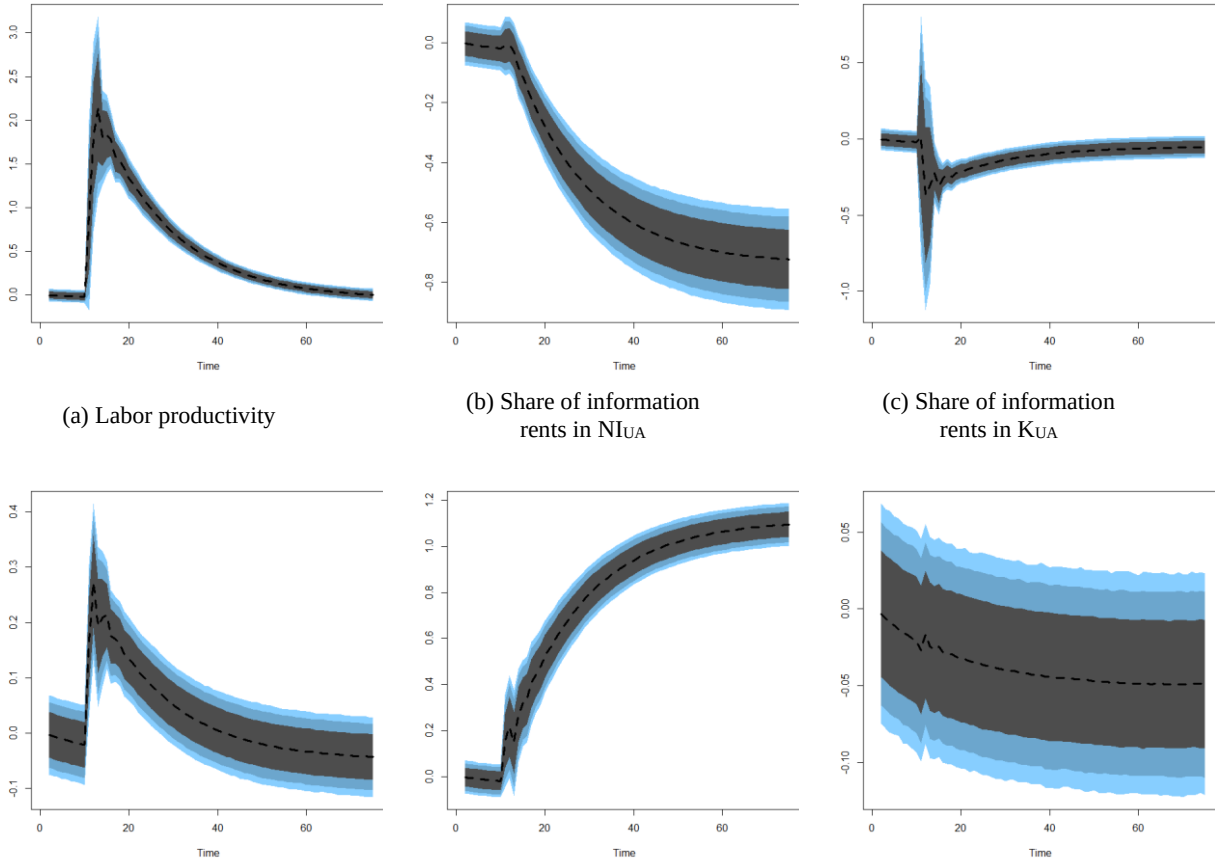
(e) NI_{UA} / Value Added

(f) K_{UA} / K_{PA}

Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A3: Economic Effect on Value Added (Model 1c)

Cumulative change in the **value added** of productive activities from the actual cumulative change in:



(a) Labor productivity

(b) Share of information rents in NI_{UA}

(c) Share of information rents in K_{UA}

(d) Rate of exploitation

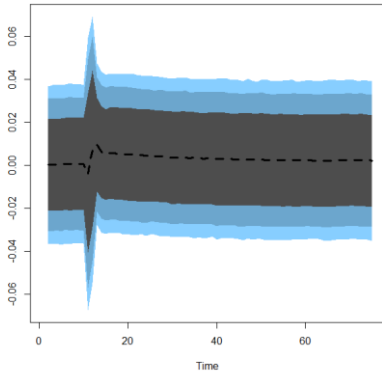
(e) NI_{UA} / Value Added

(f) K_{UA} / K_{PA}

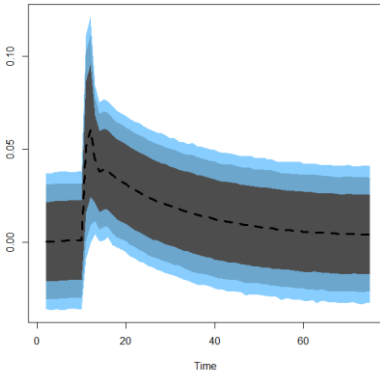
Note: ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A4: Economic Effect on Labor Productivity (Model 2a)

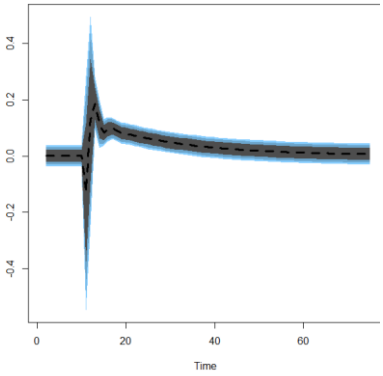
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



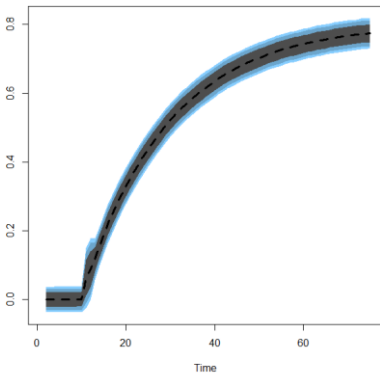
(a) Rate of exploitation



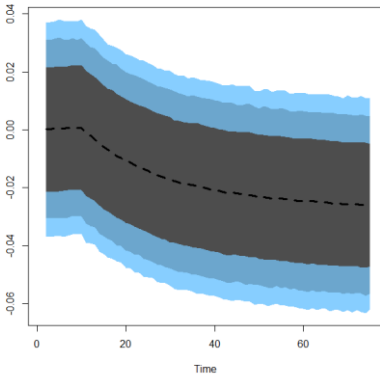
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

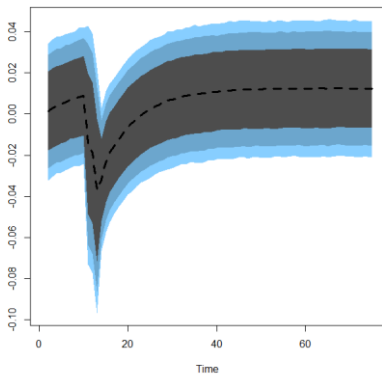


(e) K_{UA} / K_{PA}

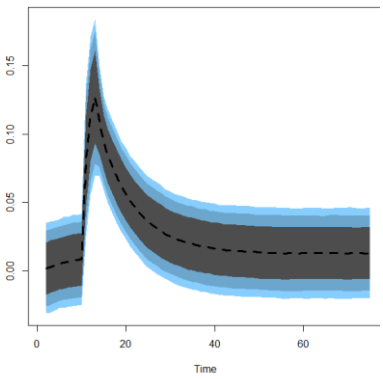
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A5: Economic Effect on Labor Productivity (Model 2b)

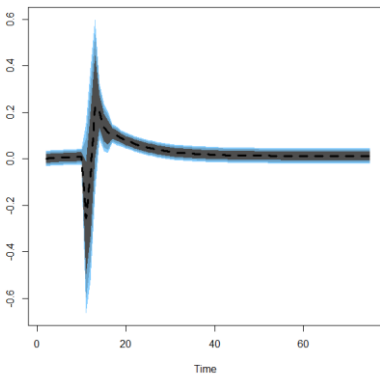
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



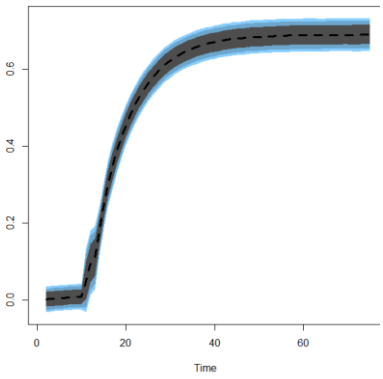
(a) Rate of exploitation



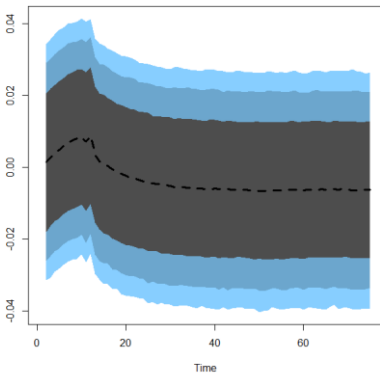
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

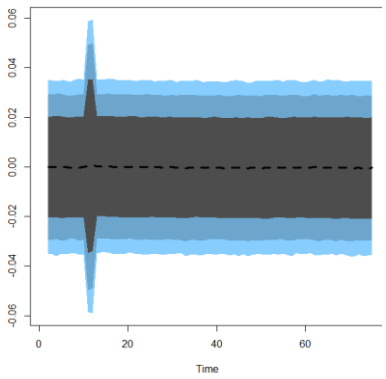


(e) K_{UA} / K_{PA}

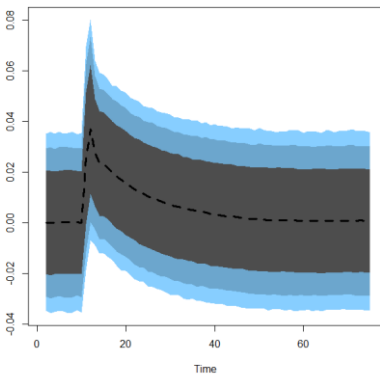
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A6: Economic Effect on Labor Productivity (Model 2c)

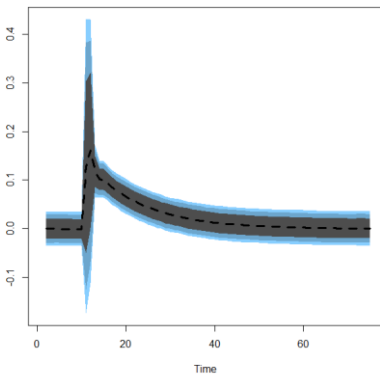
Cumulative change in the economy-wide **labor productivity** from the actual cumulative change in:



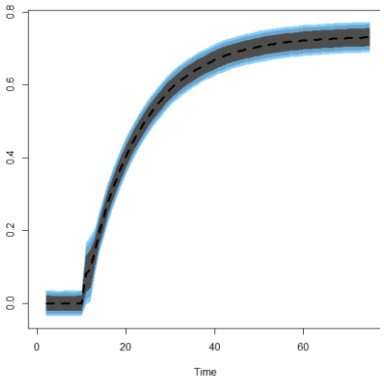
(a) Rate of exploitation



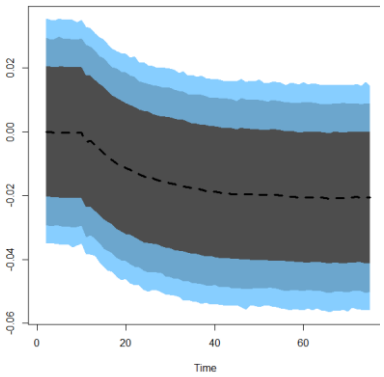
(b) Share of information rents in NI_{UA}



(c) Share of information rents in K_{UA}



(d) NI_{UA} / Value Added

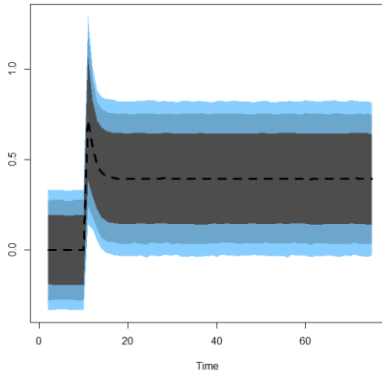


(e) K_{UA} / K_{PA}

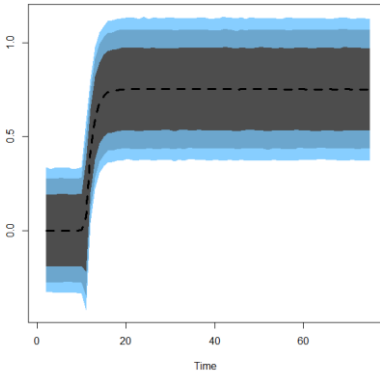
Note: ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A7: Economic Effect on Inequality (Model 3a)

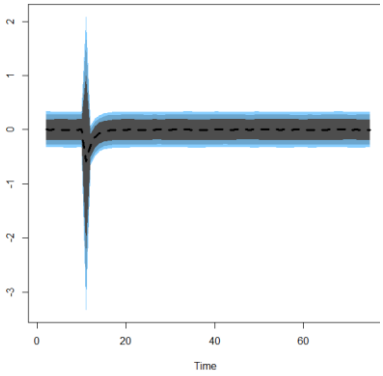
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



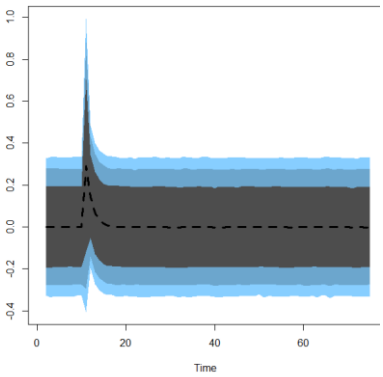
(a) Rate of exploitation



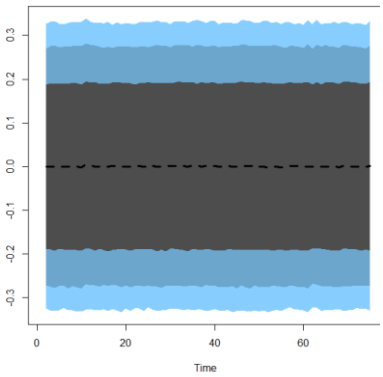
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

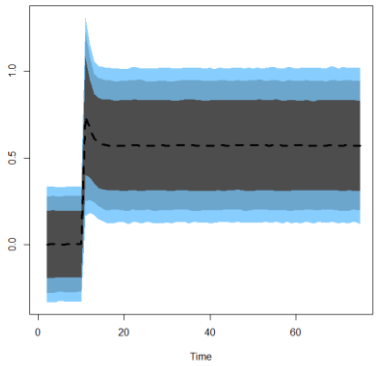


(e) K_{UA} / K_{PA}

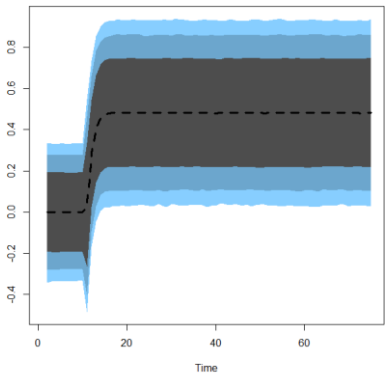
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A8: Economic Effect on Inequality (Model 3b)

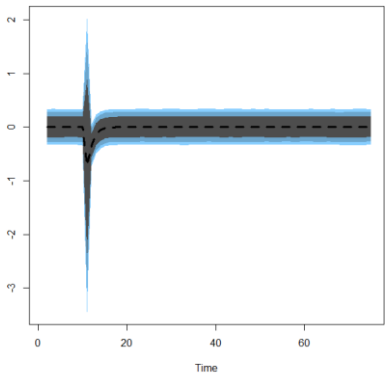
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



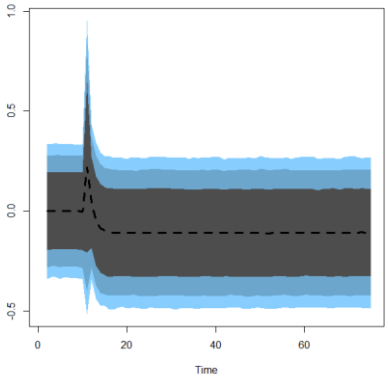
(a) Rate of exploitation



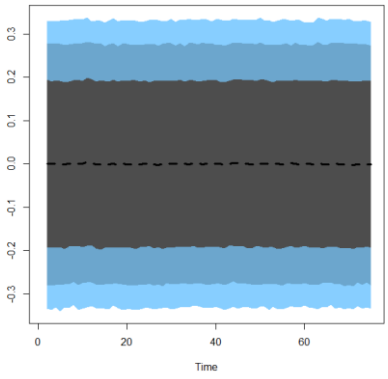
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

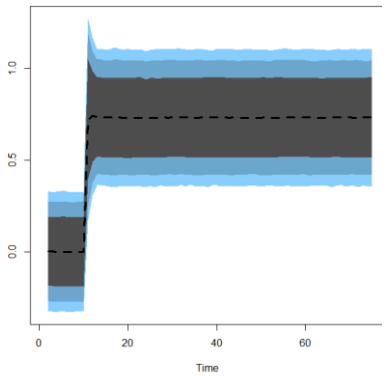


(e) K_{UA} / K_{PA}

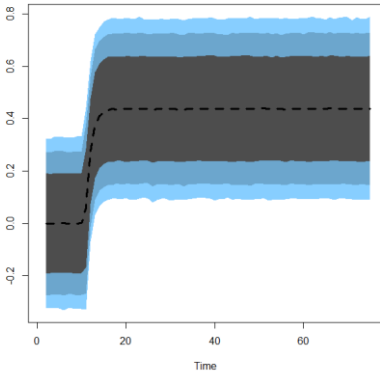
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A9: Economic Effect on Inequality (Model 3c)

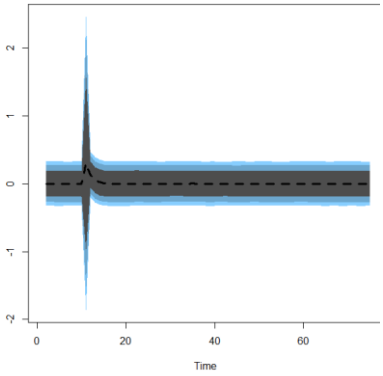
Cumulative change in the **income share of the top 0.1%** from the actual cumulative change in:



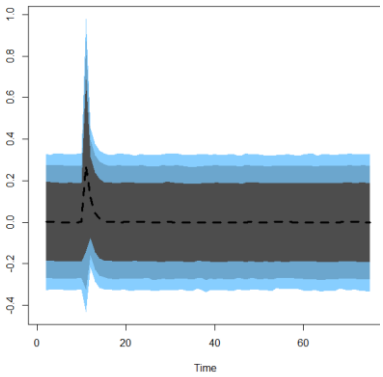
(a) Rate of exploitation



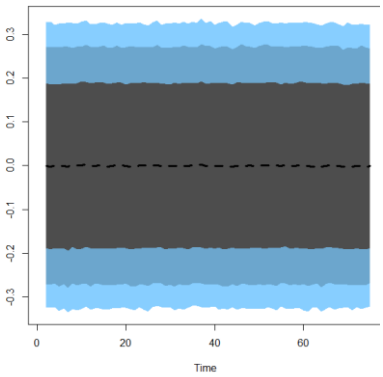
(b) Share of information rents in NI_{UA}



(c) Share of information rents in K_{UA}



(d) NI_{UA} / Value Added

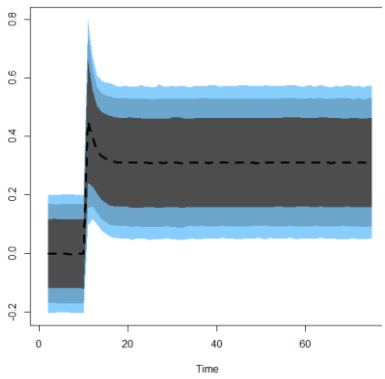


(e) K_{UA} / K_{PA}

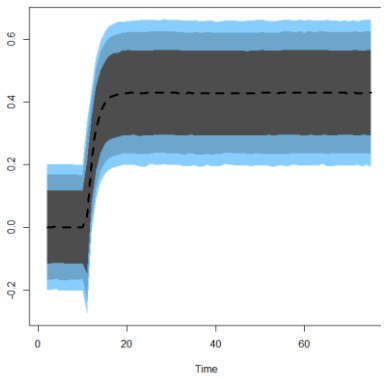
Note: ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A10: Economic Effect on Inequality (Model 4a)

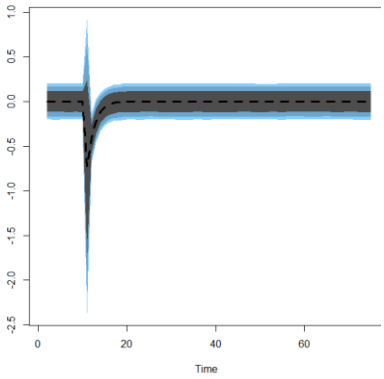
Cumulative change in the **income share of the top 1%** from the actual cumulative change in:



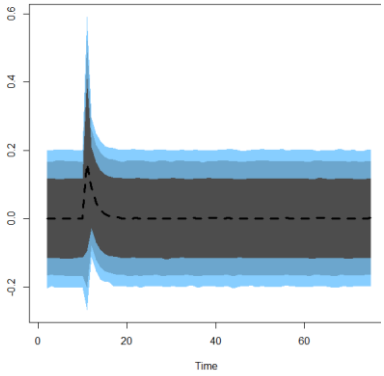
(a) Rate of exploitation



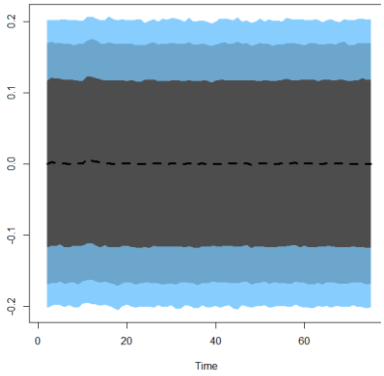
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

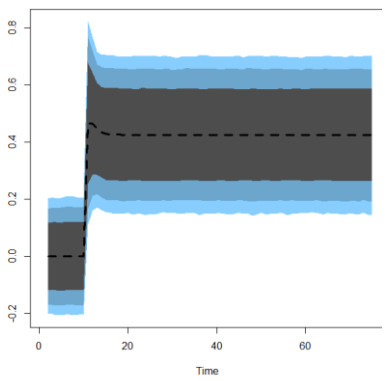


(e) K_{UA} / K_{PA}

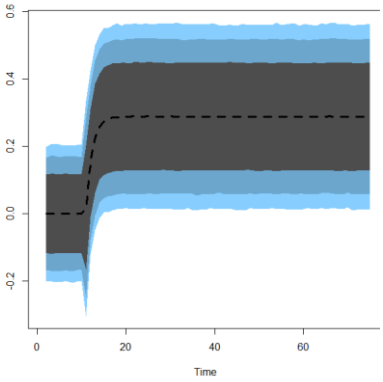
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A11: Economic Effect on Inequality (Model 4b)

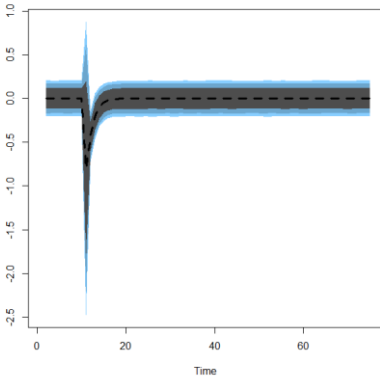
Cumulative change in the **income share of the top 1%** from the actual cumulative change in:



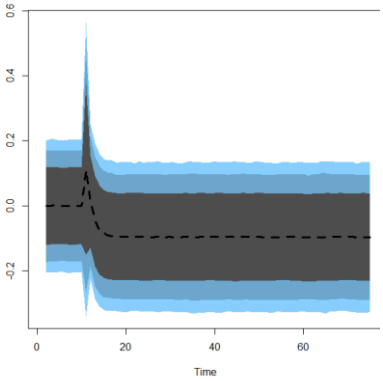
(a) Rate of exploitation



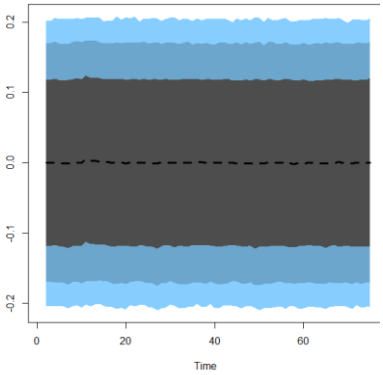
(b) Share of finance and information rents in NI_{UA}



(c) Share of finance and information rents in K_{UA}



(d) NI_{UA} / Value Added

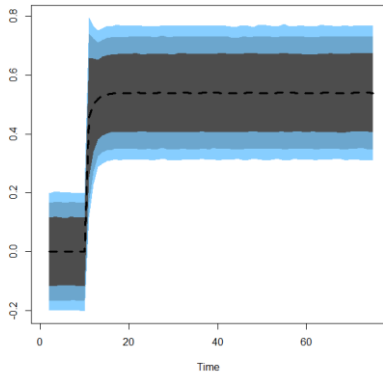


(e) K_{UA} / K_{PA}

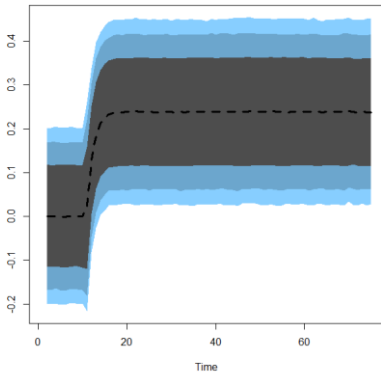
Note: ARDL model from Table 3. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Figure A12: Economic Effect on Inequality (Model 4c)

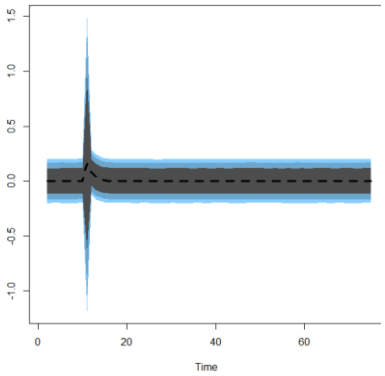
Cumulative change in the **income share of the top 1%** from the actual cumulative change in:



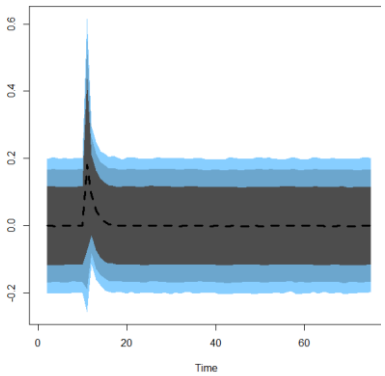
(a) Rate of exploitation



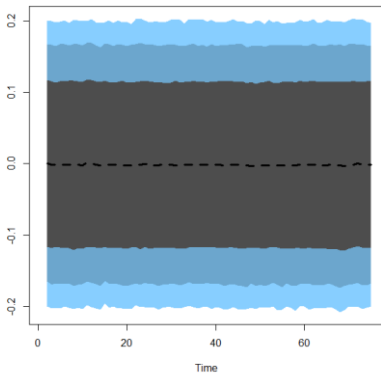
(b) Share of information rents in NI_{UA}



(c) Share of information rents in K_{UA}



(d) NI_{UA} / Value Added



(e) K_{UA} / K_{PA}

Note: ARDL model from Table 4. Shaded areas around the dotted line represent the 75%, 90%, and 95% bootstrapped intervals with 20,000 simulations. The economic effect is the dependent variable's response to an impulse equal to the actual cumulative change in each regressor from 1947 to 2011, plotted over the entire time frame of 65 years. All variables in logs.

Appendix 3

In this appendix I present the classification of productive and unproductive activities using the 2002 BEA modified benchmark input-output table. Table A.2 shows the classification that I maintain throughout the paper. The methodology employed follows the approach developed in Rotta (2018). For a detailed explanation of the construction of all series from 1947 to 2011 for the United States, see the long appendix of Rotta (2018).

There are, evidently, some specific activities that are difficult to classify in practice. But from an empirical perspective, borderline sectors are not big enough to modify the aggregate measures in any significant way. Even if we modify the classification of certain particular sectors, the aggregate measures at the national level will change only slightly.

The paper focuses on the 1947-2011 period because the available data and the most recent methodology (from Rotta 2018) to transform the BEA input-output matrices and the NIPA accounts into Marxist categories relate to that time frame. At the time of writing, the BEA has released two newer benchmark input-out matrices, one for 2007 and another for 2012. But the more recent period requires a different estimation methodology, given that in the years from 1997 to 2019 the BEA has released both the benchmark input-output matrices (with 405 industries) and also the aggregate annual input-output matrices (with 71 industries). The estimation of Marxist categories from the combination of benchmark input-output matrices and aggregate annual input-output matrices requires a proper estimation technique that is not yet available in the literature. The main difference in terms of estimation techniques is that the current methodology from Rotta (2018) interpolates the benchmark input-output matrices with the NIPA accounts, while a newer technique must be developed to interpolate the benchmark input-output matrices with the annual aggregate input-output matrices between 1997 and 2019.

Table A.2: 2002 BEA Modified Benchmark Input-Output Matrix

Productive Activities	code	Productive Activities (continued)	code
Oilseed farming	**1111A0**	Rolling mill and other metalworking machinery manufacturing	**33351B**
Grain farming	**1111B0**	Turbine and turbine generator set units manufacturing	**333611**
Vegetable and melon farming	**111200**	Speed changer, industrial high-speed drive, and gear manufacturing	**333612**
Tree nut farming	**111335**	Mechanical power transmission equipment manufacturing	**333613**
Fruit farming	**1113A0**	Other engine equipment manufacturing	**333618**
Greenhouse, nursery, and floriculture production	**111400**	Pump and pumping equipment manufacturing	**333911**
Tobacco farming	**111910**	Air and gas compressor manufacturing	**333912**
Cotton farming	**111920**	Material handling equipment manufacturing	**333920**
Sugarcane and sugar beet farming	**1119A0**	Power-driven handtool manufacturing	**333991**
All other crop farming	**1119B0**	Packaging machinery manufacturing	**333993**
Dairy cattle and milk production	**112120**	Industrial process furnace and oven manufacturing	**333994**
Cattle ranching and farming	**1121A0**	Other general purpose machinery manufacturing	**33399A**
Poultry and egg production	**112300**	Fluid power process machinery	**33399B**
Animal production, except cattle and poultry and eggs	**112A00**	Electronic computer manufacturing	**334111**
Logging	**113300**	Computer storage device manufacturing	**334112**
Forest nurseries, forest products, and timber tracts	**113A00**	Computer terminals and other computer peripheral equipment manufacturing	**33411A**
Fishing	**114100**	Telephone apparatus manufacturing	**334210**
Hunting and trapping	**114200**	Broadcast and wireless communications equipment	**334220**
Support activities for agriculture and forestry	**115000**	Other communications equipment manufacturing	**334290**
Oil and gas extraction	**211000**	Audio and video equipment manufacturing	**334300**
Coal mining	**212100**	Electron tube manufacturing	**334411**
Iron ore mining	**212210**	Bare printed circuit board manufacturing	**334412**
Copper, nickel, lead, and zinc mining	**212230**	Semiconductor and related device manufacturing	**334413**
Gold, silver, and other metal ore mining	**2122A0**	Electronic connector manufacturing	**334417**
Stone mining and quarrying	**212310**	Printed circuit assembly (electronic assembly) manufacturing	**334418**
Sand, gravel, clay, and ceramic and refractory minerals mining and quarrying	**212320**	Other electronic component manufacturing	**334419**
Other nonmetallic mineral mining and quarrying	**212390**	Electronic capacitor, resistor, coil, transformer, and other inductor manufacturing	**33441A**
Drilling oil and gas wells	**213111**	Electromedical and electrotherapeutic apparatus manufacturing	**334510**
Support activities for oil and gas operations	**213112**	Search, detection, and navigation instruments manufacturing	**334511**
Support activities for other mining	**21311A**	Automatic environmental control manufacturing	**334512**
Electric power generation, transmission, and distribution	**221100**	Industrial process variable instruments manufacturing	**334513**
Natural gas distribution	**221200**	Totalizing fluid meters and counting devices manufacturing	**334514**
Water, sewage and other systems	**221300**	Electricity and signal testing instruments manufacturing	**334515**
Nonresidential commercial and health care structures	**230101**	Analytical laboratory instrument manufacturing	**334516**
Nonresidential manufacturing structures	**230102**	Irradiation apparatus manufacturing	**334517**
Other nonresidential structures	**230103**	Watch, clock, and other measuring and controlling device manufacturing	**33451A**
Residential permanent site single- and multi-family structures	**230201**	Magnetic and optical recording media manufacturing	**334613**
Other residential structures	**230202**	Electric lamp bulb and part manufacturing	**335110**
Nonresidential maintenance and repair	**230301**	Lighting fixture manufacturing	**335120**
Residential maintenance and repair	**230302**	Small electrical appliance manufacturing	**335210**
Dog and cat food manufacturing	**311111**	Household cooking appliance manufacturing	**335221**
Other animal food manufacturing	**311119**	Household refrigerator and home freezer manufacturing	**335222**
Flour milling and malt manufacturing	**311210**	Household laundry equipment manufacturing	**335224**
Wet corn milling	**311221**	Other major household appliance manufacturing	**335228**
Fats and oils refining and blending	**311225**	Power, distribution, and specialty transformer manufacturing	**335311**
Soybean and other oilseed processing	**31122A**	Motor and generator manufacturing	**335312**
Breakfast cereal manufacturing	**311230**	Switchgear and switchboard apparatus manufacturing	**335313**
Beet sugar manufacturing	**311313**	Relay and industrial control manufacturing	**335314**

Sugar cane mills and refining	**31131A**
Chocolate and confectionery manufacturing from cacao beans	**311320**
Confectionery manufacturing from purchased chocolate	**311330**
Nonchocolate confectionery manufacturing	**311340**
Frozen food manufacturing	**311410**
Fruit and vegetable canning, pickling, and drying	**311420**
Cheese manufacturing	**311513**
Dry, condensed, and evaporated dairy product manufacturing	**311514**
Fluid milk and butter manufacturing	**31151A**
Ice cream and frozen dessert manufacturing	**311520**
Poultry processing	**311615**
Animal (except poultry) slaughtering, rendering, and processing	**31161A**
Seafood product preparation and packaging	**311700**
Bread and bakery product manufacturing	**311810**
Cookie, cracker, and pasta manufacturing	**311820**
Tortilla manufacturing	**311830**
Snack food manufacturing	**311910**
Coffee and tea manufacturing	**311920**
Flavoring syrup and concentrate manufacturing	**311930**
Seasoning and dressing manufacturing	**311940**
All other food manufacturing	**311990**
Soft drink and ice manufacturing	**312110**
Breweries	**312120**
Wineries	**312130**
Distilleries	**312140**
Tobacco product manufacturing	**3122A0**
Fiber, yarn, and thread mills	**313100**
Broadwoven fabric mills	**313210**
Narrow fabric mills and schiffli machine embroidery	**313220**
Nonwoven fabric mills	**313230**
Knit fabric mills	**313240**
Textile and fabric finishing mills	**313310**
Fabric coating mills	**313320**
Carpet and rug mills	**314110**
Curtain and linen mills	**314120**
Textile bag and canvas mills	**314910**
All other textile product mills	**314990**
Apparel knitting mills	**315100**
Cut and sew apparel contractors	**315210**
Men's and boys' cut and sew apparel manufacturing	**315220**
Women's and girls' cut and sew apparel manufacturing	**315230**
Other cut and sew apparel manufacturing	**315290**
Apparel accessories and other apparel manufacturing	**315900**
Leather and hide tanning and finishing	**316100**
Footwear manufacturing	**316200**
Other leather and allied product manufacturing	**316900**
Sawmills and wood preservation	**321100**
Reconstituted wood product manufacturing	**321219**
Veneer and plywood manufacturing	**32121A**
Engineered wood member and truss manufacturing	**32121B**
Wood windows and doors and millwork	**321910**
Wood container and pallet manufacturing	**321920**
Manufactured home (mobile home) manufacturing	**321991**
Prefabricated wood building manufacturing	**321992**
Storage battery manufacturing	**335911**
Primary battery manufacturing	**335912**
Communication and energy wire and cable manufacturing	**335920**
Wiring device manufacturing	**335930**
Carbon and graphite product manufacturing	**335991**
All other miscellaneous electrical equipment and component manufacturing	**335999**
Automobile manufacturing	**336111**
Light truck and utility vehicle manufacturing	**336112**
Heavy duty truck manufacturing	**336120**
Motor vehicle body manufacturing	**336211**
Truck trailer manufacturing	**336212**
Motor home manufacturing	**336213**
Travel trailer and camper manufacturing	**336214**
Motor vehicle parts manufacturing	**336300**
Aircraft manufacturing	**336411**
Aircraft engine and engine parts manufacturing	**336412**
Other aircraft parts and auxiliary equipment manufacturing	**336413**
Guided missile and space vehicle manufacturing	**336414**
Railroad rolling stock manufacturing	**336500**
Ship building and repairing	**336611**
Boat building	**336612**
Motorcycle, bicycle, and parts manufacturing	**336991**
Military armored vehicle, tank, and tank component manufacturing	**336992**
All other transportation equipment manufacturing	**336999**
Wood kitchen cabinet and countertop manufacturing	**337110**
Upholstered household furniture manufacturing	**337121**
Nonupholstered wood household furniture manufacturing	**337122**
Institutional furniture manufacturing	**337127**
Propulsion units and parts for space vehicle and guided missiles	**33641A**
Metal and other household furniture (except wood) manufacturing	**33712A**
Office furniture and custom architectural woodwork and millwork manufacturing	**337212**
Showcase, partition, shelving, and locker manufacturing	**337215**
Wood television, radio, and sewing machine cabinet manufacturing	**33721A**
Mattress manufacturing	**337910**
Blind and shade manufacturing	**337920**
Laboratory apparatus and furniture manufacturing	**339111**
Surgical and medical instrument manufacturing	**339112**
Surgical appliance and supplies manufacturing	**339113**
Dental equipment and supplies manufacturing	**339114**
Ophthalmic goods manufacturing	**339115**
Dental laboratories	**339116**
Jewelry and silverware manufacturing	**339910**
Sporting and athletic goods manufacturing	**339920**
Doll, toy, and game manufacturing	**339930**
Office supplies (except paper) manufacturing	**339940**
Sign manufacturing	**339950**
Gasket, packing, and sealing device manufacturing	**339991**
Musical instrument manufacturing	**339992**
Broom, brush, and mop manufacturing	**339994**
All other miscellaneous manufacturing	**33999A**
Air transportation	**481000**
Rail transportation	**482000**
Water transportation	**483000**
Truck transportation	**484000**

All other miscellaneous wood product manufacturing	**321999**
Pulp mills	**322110**
Paper mills	**322120**
Paperboard mills	**322130**
Paperboard container manufacturing	**322210**
Coated and laminated paper, packaging paper and plastics film manufacturing	**32222A**
All other paper bag and coated and treated paper manufacturing	**32222B**
Stationery product manufacturing	**322230**
Sanitary paper product manufacturing	**322291**
All other converted paper product manufacturing	**322299**
Printing	**323110**
Support activities for printing	**323120**
Petroleum refineries	**324110**
Asphalt paving mixture and block manufacturing	**324121**
Asphalt shingle and coating materials manufacturing	**324122**
Petroleum lubricating oil and grease manufacturing	**324191**
All other petroleum and coal products manufacturing	**324199**
Petrochemical manufacturing	**325110**
Industrial gas manufacturing	**325120**
Synthetic dye and pigment manufacturing	**325130**
Alkalies and chlorine manufacturing	**325181**
Carbon black manufacturing	**325182**
All other basic inorganic chemical manufacturing	**325188**
Other basic organic chemical manufacturing	**325190**
Plastics material and resin manufacturing	**325211**
Synthetic rubber manufacturing	**325212**
Artificial and synthetic fibers and filaments manufacturing	**325220**
Fertilizer manufacturing	**325310**
Pesticide and other agricultural chemical manufacturing	**325320**
Paint and coating manufacturing	**325510**
Adhesive manufacturing	**325520**
Soap and cleaning compound manufacturing	**325610**
Toilet preparation manufacturing	**325620**
Printing ink manufacturing	**325910**
All other chemical product and preparation manufacturing	**3259A0**
Plastics packaging materials and unlaminated film and sheet manufacturing	**326110**
Unlaminated plastics profile shape manufacturing	**326121**
Plastics pipe and pipe fitting manufacturing	**326122**
Laminated plastics plate, sheet (except packaging), and shape manufacturing	**326130**
Polystyrene foam product manufacturing	**326140**
Urethane and other foam product (except polystyrene) manufacturing	**326150**
Plastics bottle manufacturing	**326160**
Other plastics product manufacturing	**32619A**
Tire manufacturing	**326210**
Rubber and plastics hoses and belting manufacturing	**326220**
Other rubber product manufacturing	**326290**
Pottery, ceramics, and plumbing fixture manufacturing	**32711A**
Brick, tile, and other structural clay product manufacturing	**32712A**
Clay and nonclay refractory manufacturing	**32712B**
Flat glass manufacturing	**327211**

Transit and ground passenger transportation	**485000**
Pipeline transportation	**486000**
Scenic and sightseeing transportation and support activities for transportation	**48A000**
Postal service	**491000**
Couriers and messengers	**492000**
Warehousing and storage	**493000**
Radio and television broadcasting	**515100**
Cable and other subscription programming	**515200**
Telecommunications	**517000**
Accounting, tax preparation, bookkeeping, and payroll services	**541200**
Architectural, engineering, and related services	**541300**
Specialized design services	**541400**
Other computer related services, including facilities management	**54151A**
Management, scientific, and technical consulting services	**541610**
Environmental and other technical consulting services	**5416A0**
All other miscellaneous professional, scientific, and technical services	**5419A0**
Photographic services	**541920**
Veterinary services	**541940**
Office administrative services	**561100**
Facilities support services	**561200**
Employment services	**561300**
Business support services	**561400**
Travel arrangement and reservation services	**561500**
Investigation and security services	**561600**
Services to buildings and dwellings	**561700**
Other support services	**561900**
Waste management and remediation services	**562000**
Elementary and secondary schools	**611100**
Junior colleges, colleges, universities, and professional schools	**611A00**
Other educational services	**611B00**
Home health care services	**621600**
Offices of physicians, dentists, and other health practitioners	**621A00**
Medical and diagnostic labs and outpatient and other ambulatory care services	**621B00**
Hospitals	**622000**
Nursing and residential care facilities	**623000**
Community food, housing, and other relief services, including rehabilitation services	**624200**
Child day care services	**624400**
Individual and family services	**624A00**
Performing arts companies	**711100**
Spectator sports	**711200**
Independent artists, writers, and performers	**711500**
Promoters of performing arts and sports and agents for public figures	**711A00**
Museums, historical sites, zoos, and parks	**712000**
Fitness and recreational sports centers	**713940**
Bowling centers	**713950**
Amusement parks, arcades, and gambling industries	**713A00**
Other amusement and recreation industries	**713B00**
Hotels and motels, including casino hotels	**7211A0**
Other accommodations	**721A00**
Food services and drinking places	**722000**

Other pressed and blown glass and glassware manufacturing	**327212**
Glass container manufacturing	**327213**
Glass product manufacturing made of purchased glass	**327215**
Cement manufacturing	**327310**
Ready-mix concrete manufacturing	**327320**
Concrete pipe, brick, and block manufacturing	**327330**
Other concrete product manufacturing	**327390**
Lime and gypsum product manufacturing	**3274A0**
Abrasive product manufacturing	**327910**
Cut stone and stone product manufacturing	**327991**
Ground or treated mineral and earth manufacturing	**327992**
Mineral wool manufacturing	**327993**
Miscellaneous nonmetallic mineral products	**327999**
Iron and steel mills and ferroalloy manufacturing	**331110**
Steel product manufacturing from purchased steel	**331200**
Secondary smelting and alloying of aluminum	**331314**
Alumina refining and primary aluminum production	**33131A**
Aluminum product manufacturing from purchased aluminum	**33131B**
Primary smelting and refining of copper	**331411**
Primary smelting and refining of nonferrous metal (except copper and aluminum)	**331419**
Copper rolling, drawing, extruding and alloying	**331420**
Nonferrous metal (except copper and aluminum) rolling, drawing, extruding and alloying	**331490**
Ferrous metal foundries	**331510**
Nonferrous metal foundries	**331520**
Custom roll forming	**332114**
All other forging, stamping, and sintering	**33211A**
Crown and closure manufacturing and metal stamping	**33211B**
Cutlery, utensil, pot, and pan manufacturing	**33221A**
Handtool manufacturing	**33221B**
Plate work and fabricated structural product manufacturing	**332310**
Ornamental and architectural metal products manufacturing	**332320**
Power boiler and heat exchanger manufacturing	**332410**
Metal tank (heavy gauge) manufacturing	**332420**
Metal can, box, and other metal container (light gauge) manufacturing	**332430**
Hardware manufacturing	**332500**
Spring and wire product manufacturing	**332600**
Machine shops	**332710**
Turned product and screw, nut, and bolt manufacturing	**332720**
Coating, engraving, heat treating and allied activities	**332800**
Plumbing fixture fitting and trim manufacturing	**332913**
Valve and fittings other than plumbing	**33291A**
Ball and roller bearing manufacturing	**332991**
Fabricated pipe and pipe fitting manufacturing	**332996**
Ammunition manufacturing	**33299A**
Arms, ordnance, and accessories manufacturing	**33299B**
Other fabricated metal manufacturing	**33299C**
Farm machinery and equipment manufacturing	**333111**
Lawn and garden equipment manufacturing	**333112**
Construction machinery manufacturing	**333120**
Mining and oil and gas field machinery manufacturing	**333130**
Plastics and rubber industry machinery manufacturing	**333220**
Semiconductor machinery manufacturing	**333295**
Other industrial machinery manufacturing	**33329A**
Optical instrument and lens manufacturing	**333314**
Car washes	**811192**
Automotive repair and maintenance, except car washes	**8111A0**
Electronic and precision equipment repair and maintenance	**811200**
Commercial and industrial machinery and equipment repair and maintenance	**811300**
Personal and household goods repair and maintenance	**811400**
Personal care services	**812100**
Death care services	**812200**
Dry-cleaning and laundry services	**812300**
Other personal services	**812900**
Federal electric utilities	**S00101**
Other state and local government enterprises	**S00203**
Noncomparable imports	**S00300**
Scrap	**S00401**
Used and secondhand goods	**S00402**

Trade, Rental, Leasing	**code**
Wholesale trade	**420000**
Retail trade	**4A0000**
Automotive equipment rental and leasing	**532100**
Commercial and industrial machinery and equipment rental and leasing	**532400**
General and consumer goods rental except video tapes and discs	**532A00**

Unproductive Activities	**code**
Medicinal and botanical manufacturing	**325411**
Pharmaceutical preparation manufacturing	**325412**
In-vitro diagnostic substance manufacturing	**325413**
Biological product (except diagnostic) manufacturing	**325414**
Software, audio, and video media reproducing	**33461A**
Newspaper publishers	**511110**
Periodical publishers	**511120**
Book publishers	**511130**
Directory, mailing list, and other publishers	**5111A0**
Software publishers	**511200**
Motion picture and video industries	**512100**
Sound recording industries	**512200**
Internet publishing and broadcasting	**516110**
Internet service providers and web search portals	**518100**
Data processing, hosting, and related services	**518200**
Other information services	**519100**
Nondepository credit intermediation and related activities	**522A00**
Securities, commodity contracts, investments, and related activities	**523000**
Insurance carriers	**524100**
Insurance agencies, brokerages, and related activities	**524200**
Funds, trusts, and other financial vehicles	**525000**
Monetary authorities and depository credit intermediation	**52A000**
Real estate	**531000**
Video tape and disc rental	**532230**
Lessors of nonfinancial intangible assets	**533000**
Custom computer programming services	**541511**
Computer systems design services	**541512**
Legal services	**541100**

Photographic and photocopying equipment manufacturing	**333315**	Scientific research and development services	**541700**
Other commercial and service industry machinery manufacturing	**333319**	Advertising and related services	**541800**
Vending, commercial, industrial, and office machinery manufacturing	**33331A**	Management of companies and enterprises	**550000**
Heating equipment (except warm air furnaces) manufacturing	**333414**	Religious organizations	**813100**
Air conditioning, refrigeration, and warm air heating equipment manufacturing	**333415**	Grantmaking, giving, and social advocacy organizations	**813A00**
Air purification and ventilation equipment manufacturing	**33341A**	Civic, social, professional, and similar organizations	**813B00**
Industrial mold manufacturing	**333511**	Other Federal Government enterprises	**S00102**
Special tool, die, jig, and fixture manufacturing	**333514**	General Federal defense government services	**S00500**
Cutting tool and machine tool accessory manufacturing	**333515**	General Federal nondefense government services	**S00600**
Metal cutting and forming machine tool manufacturing	**33351A**	General state and local government services	**S00700**

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