Oil Prices and Inequality

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Abstract

This paper studies the effect of oil price changes on income and wealth inequality. Using data on macroeconomic aggregates, oil prices, and inequality metrics, we employ a structural vector autoregressive model and find that an increase in oil prices leads to a persistent and large increase in consumption, income and wealth inequality. To understand these dynamics, we solve an incomplete market model with aggregate oil price shocks, and calibrate the model to the US data. We find that when oil serves as both consumption goods and production input, positive oil price shocks raise inequality through the relative price change of labor and capital. Our numerical results demonstrate that a one standard deviation shock to oil prices raises both income and wealth inequality, peaking at 0.17% and 0.49% respectively from their baseline levels. While the initial increase in inequality is primarily driven by changes in relative prices, the gradual recovery of capital returns and capital stock explains why inequality remains high. The implementation of a carbon tax, coupled with a lump sum transfer, results in higher income and wealth inequality, alongside a decrease in consumption inequality.

Keywords: oil price shocks, inequality, heterogeneous agent, SVAR

JEL Classification Numbers: D31, E10, Q43

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1 Introduction

Energy stands as a vital driver of economic activity in the United States, and is recognized as a critical industry due to its enabling role across various economic sectors. Consequently, fluctuations in oil prices wield significant influence over aggregate economic dynamics. It is widely acknowledged that oil price shocks lead to stagflation, characterized by higher inflation and lower aggregate consumption, investment, and output (Hamilton (2008) and Kilian (2009)). However, the distributional effect of oil price shocks is inadequately explored.

This paper addresses these questions by studying the dynamic responses of inequality to oil price changes since the Great Moderation period, both theoretically and empirically. To offer insights into the empirical correlation between oil prices and income and wealth distribution, we illustrate their relationship in Figure 1 based on the impulse response functions derived from the Structural Vector Auto-regressive (SVAR) analysis using annual data on aggregate variables, oil prices, and various inequality metrics in the U.S. economy from 1985 to 2019. [1] Specifically, we conduct simulations of the economy following a one standard deviation positive shock to oil prices, assessing its dynamic impacts on income and wealth inequality, measured as the gap between the top 1% and bottom 50%. The results show significant inequality spikes over ten years post-shock.

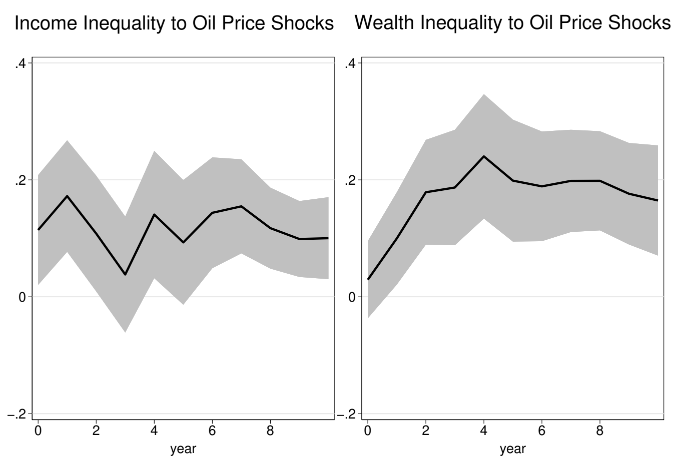

Figure 1: Oil Price Shocks and Inequality (Vertical axis unit is percent. The gray area shows +/- one-standard-deviation confidence interval.)

This raises the question: What underlying factors could drive the relationship between oil prices and inequality? To answer this question, we build and solve a continuous-time heterogeneous agent (HACT) model with aggregate oil price shocks where oil serves as both a consumption good and a production input. This framework enables us to examine the dynamic impact of oil price fluctuations across the entire spectrum of consumption, income, and wealth distribution within

[1] The details of the analysis is presented in Section 3.

a general equilibrium context. The model is calibrated using U.S. economy from 1985 to 2019. Following a one-time positive oil price shock, our simulation outcomes indicate a contraction in aggregate economic activities, including output, consumption, and investment, while the general price level increases, which aligns with the literature that typically views oil price shocks as a negative supply-side shock. Moreover, the Gini coefficients of consumption, income, and wealth exhibit an increase, with its intuition summarized below.

In the short run, the increase in income inequality is primarily driven by the changes in the relative price of capital and labor. Since wealthier households tend to earn more income from interest rates than wages, changes in income inequality become a balancing act between capital and labor income. Following a positive oil price shock, demand for energy inputs diminishes, leading to a decrease in the marginal product of both capital and labor, thus exerting downward pressure on wages and interest rates. However, the reduction in interest rates is less pronounced because there is now less total output available for consumption and saving, resulting in a decreased capital supply. Operating at a lower level of capital supply mitigates some of the downward pressure on interest rates, which then raises income inequality. Second, as income inequality increases, so does consumption inequality. Finally, wealth inequality rises because the increase in income inequality outweighs the rise in consumption inequality. If one fixes the level of income, the elevation of consumption inequality could suggest that the poor are now saving more in response to a positive oil price shock, potentially narrowing the wealth distribution. However, quantitatively, this impact is dominated by the more pronounced increase in income inequality.

Over the medium run, the increase of income and wealth inequality persists, which is attributed to the different rates of recovery between capital demand and capital supply. In the aftermath of an oil price shock, capital demand quickly recovers, while the recovery of capital supply is much slower. This is because the accumulation of capital supply takes time. When capital demand outpaces capital supply recovery, it causes the interest rate to overshoot beyond the equilibrium level for a while before returning to the its medium run equilibrium level, thereby further amplifying income and wealth inequality.

To gain deeper insights into the various factors influencing the dynamics of inequality, we proceed to undertake several counterfactual analyses atop the baseline model. First, by reducing oil intensity used in production, lowering the share of oil consumption among households, and increasing the elasticity of substitution between consumption of oil goods and final goods, we find that the aggregate economy contracts less compared to the baseline results. Furthermore, the adverse impact of oil price shocks on consumption, income and wealth inequality is mitigated as well. Second, we explore the asymmetric impact of oil price shock by comparing the impulse response functions of positive vs. negative oil price changes on the economy. We find that the impact of oil price shock is highly asymmetric, with the negative oil price shock affecting both the aggregate and the distributional variables proportionately more. Lastly, we compare two economies with different borrowing constraints and find that inequality is less affected by higher oil prices when a no-borrowing constraint is imposed.

Finally, we explore the policy effect of the recent widely debated carbon tax proposal on rising oil prices and inequality. We do this by both a steady-state comparison across various carbon tax rates and an analysis of transition dynamics, which features an immediate introduction of the carbon tax followed by incremental increases over time. Our findings reveal that while the implementation of a carbon tax can lead to a contraction in aggregate demand, it paradoxically triggers a short-term consumption surge when the tax revenue is allocated as a lump sum transfer. Given that transfers play a more significant role for lower-income individuals, this results in increased income and wealth inequality alongside a decrease in consumption inequality. Interestingly, if the tax revenue is not transferred, the economy experiences less contraction, and less increase in income and wealth inequality. This is because government transfer financed by carbon tax "crowds out" households' private savings, leading to more reduction in capital accumulation.

Several recent studies are closely related to our work. For instance, Oni (2024) examines the distributional impact of such shocks by comparing steady states outcomes across different oil price levels. Pieroni (2023) and Auclert, Monnery, Rognlie, and Straub (2023) build and solve heterogeneous agent models in oil-importing economies with nominal rigidity, focusing on short-term fluctuations in aggregate demand through nominal channels. In contrast, our study concentrates on the real effects of distributional variables and their long-term dynamics. A key distinction lies in our incorporation of capital in production, which is a major channel through which oil prices influence inequality.

The subsequent sections of this paper are structured as follows: Relevant literature is outlined in Section 2. In Section 3, a structural vector autoregressive analysis examines the empirical effects of oil price shocks on aggregate and distributional variables. Section 4 presents an incomplete market model featuring oil price shocks, characterizing both the steady state and transition dynamics of the economy. The general equilibrium conditions are presented in Section 5. Section 6 solves the model numerically, presenting the impulse response functions of aggregate and distributional variables to oil price shocks, along with comparisons to permanent oil price increases. In Section 7, we conduct several counterfactual analyses exploring the impact of varying degrees of oil contribution on inequality responses to price shifts and investigate state-dependent and asymmetric responses to oil price shocks. A fiscal policy experiment featuring carbon tax is presented in Section 8. The paper concludes in Section 9. The appendix contains data descriptions for the SVAR analysis and includes robustness checks using quarterly data.

2 Literature review

The paper attempts to bridge the gap between two seemingly unrelated pieces of literature. The first is recent literature that focuses on the macroeconomic dynamics of income and wealth inequality. It is widely acknowledged that both income and wealth inequality has been rising significantly worldwide since the 1980s (Piketty (2014)). While the topic of wealth inequality was primarily studied within the field of development economics, it has recently gained attention among macroeconomists (Ahn, Kaplan, Moll, Winberry, and Wolf (2018)). Some focuses on taxes and technology (Kaymak and Poschke (2016)), globalization (Azzimonti, De Francisco, and Quadrini (2014)), entrepreneurship (Jones and Kim (2018)), automation (Moll, Rachel, and Restrepo (2022)), some focus on monetary policy (Kaplan, Moll, and Violante (2018)), others examine the heterogeneous return to wealth (Fagereng, Guiso, Malacrino, and Pistaferri (2020)), etc.

The second literature it relates to is the macroeconomics of energy. It has been documented in the literature that oil price changes serve as one of the most important supply-side disturbances that can generate fluctuations in the aggregate economy. Traditional macroeconomic theory suggests that oil price shocks lead to stagflation, featuring higher price level and lower aggregate demand (Herrera, Karaki, and Rangaraju (2019), Edelstein and Kilian (2009), Koirala and Ma (2020)), Hamilton (1983), Rotemberg and Woodford (1996), Hamilton (2003), Barsky and Kilian (2004), Kilian (2008)).

Few studies have focused on the distributional impact of oil prices. Most existing work focuses on empirical analysis. They either examines the natural resource curse (Sebri and Dachraoui (2021), Parcero and Papyrakis (2016), Brunnschweiler and Bulte (2008)), as well as how oil price shocks affect income inequality (Edmond, Chisadza, Matthew, and Rangan (2021), Kim and Lin (2018). Parcero and Papyrakis (2016)). Bettarelli, Estefania-Flores, Furceri, Loungani, and Pizzuto (2023) recently explores how energy price inflation affects consumption inequality. We contribute to the existing literature by presenting a structured theoretical framework along with empirical analysis, highlighting diverse responses to typical oil price shocks.

3 Empirical Evidence

In this section, we present our empirical results using the structural vector autoregressive analysis (SVAR) by exploring the relationship between oil price, aggregate and distributional variables between 1985 and 2019. In particular, we are interested in a baseline SVAR model with the following variables:

$$\begin{bmatrix} \log(\textit{oil prices}) \\ \log(\textit{consumption}) \\ \log(\textit{real GDP}) \\ \log(\textit{employment}) \\ \textit{hourly wage rate} \\ \textit{federal funds rate} \\ \log(CPI) \\ \textit{saving rate} \\ \textit{inequality} \end{bmatrix}$$

We employ oil price data and macroeconomic data sourced from the FRED databases, along with inequality data obtained from the top income database Saez and Zucman (2016). The baseline model operates at an annual frequency [2], utilizing log differences for non-stationary variables such as oil prices, consumption, GDP, employment, wage rate, and CPI. The income and wealth inequality metrics are formulated as the differences in income/wealth ratios between the top 1% group and the bottom 50% group. The model is identified by Cholesky decomposition, i.e., we order oil prices as the first variable, which implies that oil price shocks can contemporaneously affect all the other variables, whereas other variables can only influence oil prices with a lag.

The estimation results are shown in Figure 2 and Figure 3. A one standard deviation increase in oil prices leads to declines in overall consumption and savings, whereas real GDP slightly rises in first period while subsequently falling below the steady state. At the same time, the wage rate and employment decrease, while the price level rises. The impact on income and wealth inequality is notable and long-lasting, with peak effects reaching 0.17% and 0.23% above the long-run level, respectively. [3] To comprehend these aggregate and distributional dynamics, we need a model.

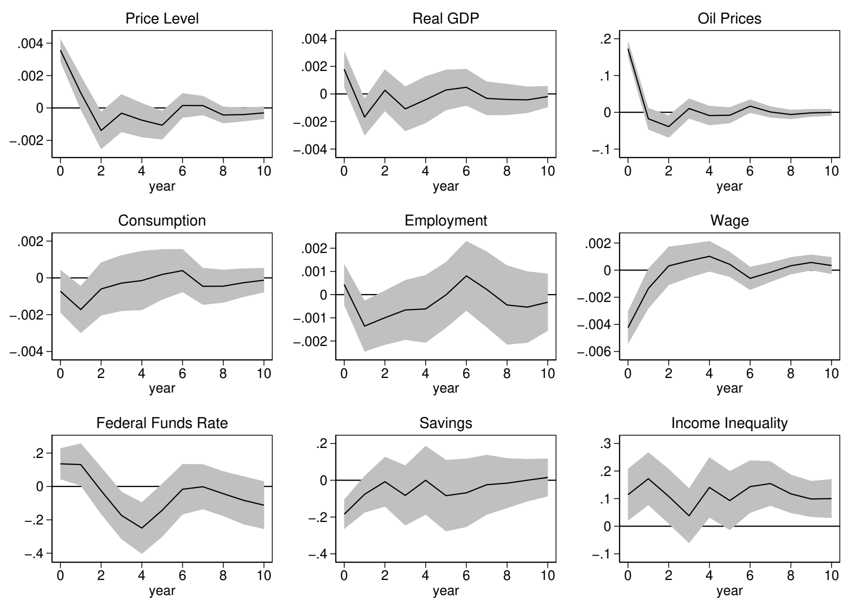

Figure 2: The Impact of Oil Price Changes on Income Inequality. (Vertical axis unit is percent. The gray area shows +/- one-standard-deviation confidence interval.)

4 Model

The model integrates two existing strands of literature. The first strand incorporates oil price shocks in the economy, *a la* Blanchard and Riggi (2013b). Given that the United States was an

[2]The specifics of the variable definitions are elaborated in the appendix A.

[3]We have also conducted robustness checks of the SVAR in the following four scenarios: 1. when oil prices are positioned as the final variables. 2 when levels of those variables are used instead of percentage changes. 3. when quarterly-frequency data is used. 4. when local projection methods are applied.

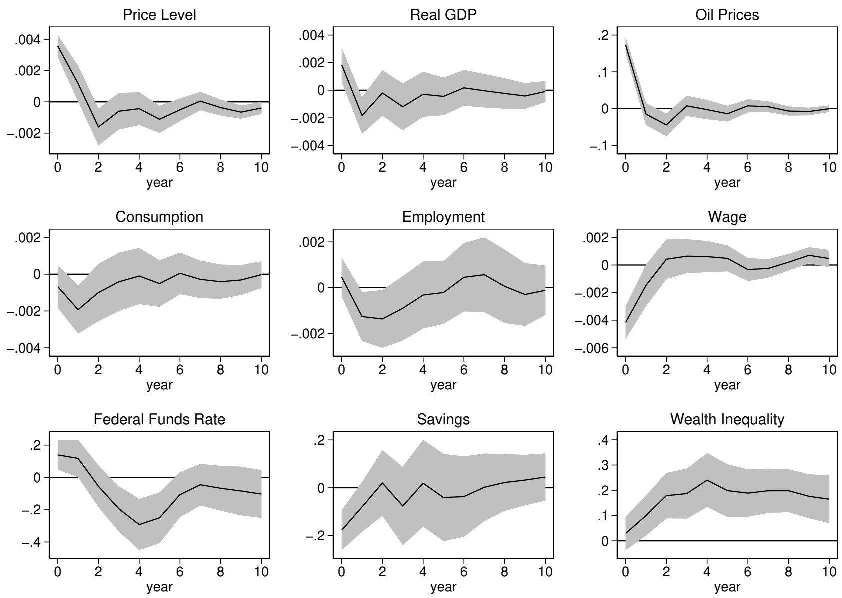

Figure 3: The Impact of Oil Price Changes on Wealth Inequality. (Vertical axis unit is percent. The gray area shows +/- one-standard-deviation confidence interval.)

energy net importer until 2019, we treat oil prices as exogenous and do not explicitly model the supply side of the oil market. [4] Instead, changes in oil prices propel alterations in oil demand. The second strand adopts an incomplete market model featuring idiosyncratic labor income risks as in Aiyagari (1994).

4.1 Households

Time is continuous. The economy consists of a unit mass of infinitely lived households (i.e.:$\bar{N} = 1$). Each household i starts with zero financial wealth. They then work, accumulate capital, and rent their capital out to the firms. They receive labor income and capital income in the form of rental payments. Idiosyncratic labor income shocks contribute to heterogeneity in household income and wealth. Given prices $(p_{E,t}, p_t, w_t, r_t)$, households make consumption/savings decisions continuously to solve the following optimization problem:

$$\max_{c_{i,t}} \mathbb{E} \int_0^{\infty} e^{-\rho t} \frac{c_{i,t}^{1-\phi}}{1-\phi} dt \tag{1}$$

where

$$c_{i,t} \equiv \left((1-\xi)^{1-\sigma} c_{Y,i,,t}^{\sigma} + \xi^{1-\sigma} c_{E,i,t}^{\sigma}\right)^{\frac{1}{\sigma}} \tag{2}$$

[4] According to Bureau of Economic Analysis, the share of oil and gas extraction as a fraction of real GDP in the United States is merely 1.06% in 2019. Therefore, we abstract away from explicitly modeling the production of oil.

Here, ρ denotes the time discount rate. Agents have CRRA preferences over consumption. ϕ is the risk aversion coefficient. $c_{i,t}$ is a consumption bundle that consists of both final goods consumption $c_{Y,i,t}$ and oil-related goods $c_{E,i,t}$. ξ adjusts the weight of oil-related goods in total consumption and $\sigma \in (0,1)$ captures the elasticity of substitution between oil and final goods.

Households maximize the consumption bundle by choosing $c_{E,i,t}$ and $c_{Y,i,t}$, given the prices of oil goods $p_{E,t}$ and final goods $p_{Y,t}$, and a certain level of income. The usage of oil goods are subject to a linear carbon tax rate τ_t. Solving this maximization problem yields

$$c_{E,i,t} = \xi \left((1+\tau_t) \frac{p_{E,t}}{p_t} \right)^{\frac{1}{\sigma-1}} c_{i,t} \qquad \text{and} \qquad c_{Y,i,t} = (1-\xi) \left(\frac{p_{Y,t}}{p_t} \right)^{\frac{1}{\sigma-1}} c_{i,t} \tag{3}$$

where p_t denotes the aggregate price, a combination of $p_{E,t}$ and $p_{Y,t}$ as

$$p_t \equiv \left((1-\xi) p_{Y,t}^{\frac{\sigma}{\sigma-1}} + \xi (1+\tau_t)^{\frac{\sigma}{\sigma-1}} p_{E,t}^{\frac{\sigma}{\sigma-1}} \right)^{\frac{\sigma-1}{\sigma}} \tag{4}$$

To focus on the relative price between oil goods and final goods, we can normalize $p_{Y,t} = p_Y = 1$ so that the aggregate price level is simplified to

$$p_t \equiv \left(1 - \xi + \xi (1+\tau_t)^{\theta} p_{E,t}^{\theta} \right)^{\frac{1}{\theta}} \tag{5}$$

where $\theta = \frac{\sigma}{\sigma-1}$.

Let the agent's (real) labor income follow a two-state Poisson process $z_t = [z_1, z_2]$ where z_1 denotes a low-income state and z_2 a high income state. The process jumps from the low state to the high state with a jump intensity λ_1, and from the high state to the low state with jump intensity λ_2. Therfore, the average labor income amounts to $\bar{z} = \frac{\lambda_1 z_2 + \lambda_2 z_1}{\lambda_1 + \lambda_2}$. Households' budget constraints read

$$da_{i,t} = (r_t a_{i,t} - c_{i,t} + w_t z_{i,t} + T_t) dt \tag{6}$$

where a denotes real asset value, r_t and w_t are real rental rate and real wage, and that T_t denotes the real lump sum transfer from the government, which is the same for everyone in the economy at time t.

In addition, a borrowing constraint states that

$$a_{i,t} \geq a_{min} \tag{7}$$

where $a_{min} \geq -\bar{z}/r^*$, and that r^* denotes the equilibrium interest rate.

Let $V_{i,t}^1$, and $V_{i,t}^2$ denote the value function of the households currently in low and high-income state at time t respectively, the individual Hamilton-Jacobian-Bellman (HJB) equations become

$$\rho V_{i,t}^1 = \max_{c_{i,t}} \left[\frac{c_{i,t}^{1-\phi}}{1-\phi} + \frac{\partial V_{i,t}^1}{\partial a_{i,t}} (r_t a_{i,t} - c_{i,t} + z_1 w_{i,t} + T_t) + \lambda_1 (V_{i,t}^2 - V_{i,t}^1) \right] \tag{8}$$

$$\rho V_{i,t}^{2} = \max_{c_{i,t}} \left[\frac{c_{i,t}^{1-\phi}}{1-\phi} + \frac{\partial V_{i,t}^{2}}{\partial a_{i,t}} (r_t a_{i,t} - c_{i,t} + z_2 w_{i,t} + T_t) + \lambda_2 (V_{i,t}^{1} - V_{i,t}^{2}) \right] \tag{9}$$

When $a_{i,t} > a_{min}$, agents are able to smooth out consumption through the Euler equation, which reads

$$c_{1,i,t}^{*} = \left(\frac{\partial V_{i,t}^{1}}{\partial a_{i,t}} \right)^{-1/\phi} ; \quad c_{2,i,t}^{*} = \left(\frac{\partial V_{i,t}^{2}}{\partial a_{i,t}} \right)^{-1/\phi} \tag{10}$$

However, at the borrowing constraint $a_{i,t} = a_{min}$, agents become hand-to-mouth, and can only consume their current income, i.e.:

$$c_{1,i,t}^{*}(a_{min}) = r_t a_{min} + w_t z_1; \quad c_{2,i,t}^{*}(a_{min}) = r_t a_{min} + w_t z_2 \tag{11}$$

4.2 Final goods firm

The final goods market is competitive. The final goods firm produces final goods Y_t by combining oil, capital, and labor with a constant return to scale production function, i.e.:

$$Y_t = Z_t E_t^{\alpha} K_t^{\beta} N_t^{\gamma} \tag{12}$$

where α, β and γ represent oil, capital and labor input share respectively, and that $\alpha + \beta + \gamma = 1$. This ensures zero profit. Firms take input cost $(p_{E,t}, p_t, w_t, r_t)$ as given, and optimize over real input demand (E_t, K_t, N_t) to maximize profit. Their problems can be stated as

$$\max_{E_t, K_t, N_t} p_{Y,t} Y_t - (1+\tau_t) p_{E,t} E_t - r_t p_t K_t - w_t p_t N_t \tag{13}$$

Optimal input decisions then require the firm to equalize the marginal cost for each input. By normalizing the final goods price $p_{Y,t}$ to 1, the solutions to the above problem read

$$E_t^{D} = \left((1+\tau_t) \frac{p_{E,t}}{\alpha Z_t K_t^{\beta} N_t^{\gamma}} \right)^{\frac{1}{\alpha-1}} \tag{14}$$

$$K_t^{D} = \left(\frac{r_t p_t}{\beta Z_t E_t^{\alpha} N_t^{\gamma}} \right)^{\frac{1}{\beta-1}} \tag{15}$$

$$N_t^{D} = \left(\frac{w_t p_t}{\gamma Z_t E_t^{\alpha} K_t^{\beta}} \right)^{\frac{1}{\gamma-1}} \tag{16}$$

where the superscript D denotes the optimal demand. Intuitively, the economy tends to enter a recession following an increase in oil prices for two primary reasons. Firstly, when holding the general price level p_t constant, a rise in oil prices directly diminishes the demand for energy inputs, thus decreasing the productivity of both capital and labor. Consequently, firms reduce the demand for capital and labor inputs. Secondly, an increase in oil prices also raises the general price level, leading to increased costs for capital and labor. Consequently, this compounds the reduction in demand for capital and labor inputs, further dampening overall output demand.

4.3 Aggregation

To close the model, we impose market-clearing conditions for oil goods, labor as well as capital. First, for the oil importing economy, changes in oil prices determine the oil demand, which consists of demand for oil consumption and demand for oil input in production , i.e.:

$$E_t^* = E_t^D + \int_0^1 c_{E,i,t} di \tag{17}$$

Next, labor market clearing requires that labor demand equals the inelastic labor supply $\bar{N}$, i.e.:

$$N_t^* = N_t^D = \frac{\lambda_1}{\lambda_1 + \lambda_2} \bar{N} = \frac{\lambda_1}{\lambda_1 + \lambda_2} \tag{18}$$

Next, the capital market clearing condition states that total households' savings are equal to total productive capital.

$$K_t^* = K_t^D = \int_0^1 a_{i,t} di \tag{19}$$

Equations (17), (18) and (19), along with equations (14), (15), (16) jointly determine the wage rate, rental rate and equilibrium oil, capital and labor input.

Finally, let G_t denote the real government spending that does not affect households' budget, then the government budget constraint states that

$$0 = \tau \frac{p_{E,t}}{p_t} E_t^D + \tau \frac{p_{E,t}}{p_t} \int_0^1 c_{E,i,t} di - G_t - T_t \tag{20}$$

That is, the total carbon tax revenue from households' oil consumption and firm oil input equals to the total government spending and transfer.

5 Equilibrium

We start by characterizing the equilibrium of this economy with aggregate oil price shocks. The system of equations that characterizes the equilibrium requires coupled Hamilton-Jacobian-Bellman equations and the Kolmogorov-Fokker-Plank equations (HJB-KFP), along with the aggregation conditions. Let $f_t(a, z)$ indicate the joint distribution of income and wealth at time t, we have

$$\rho V_{i,t}^1 = \max_{c_{i,t}} \left[\frac{c_{i,t}^{1-\phi}}{1-\phi} + \frac{\partial V_{i,t}^1}{\partial a_{i,t}} (r_t a_{i,t} - c_{i,t} + z_1 w_{i,t} + T_t) + \lambda_1 (V_{i,t}^2 - V_{i,t}^1) \right] \quad \forall i \tag{21}$$

$$\rho V_{i,t}^2 = \max_{c_{i,t}} \left[\frac{c_{i,t}^{1-\phi}}{1-\phi} + \frac{\partial V_{i,t}^2}{\partial a_{i,t}} (r_t a_{i,t} - c_{i,t} + z_2 w_{i,t} + T_t) + \lambda_2 (V_{i,t}^1 - V_{i,t}^2) \right] \quad \forall i \tag{22}$$

$$\frac{\partial f_t^1}{\partial t} = -\frac{\partial}{\partial a}(f_t^1 (r_t a_t - c_t + z_1 w_t + T_t)) - \lambda_1 f_t^1 + \lambda_2 f_t^2 \tag{23}$$

$$\frac{\partial f_t^2}{\partial t} = -\frac{\partial}{\partial a}(f_2^2 (r_t a_t - c_t + z_2 w_t + T_t)) - \lambda_2 f_t^2 + \lambda_1 f_t^1 \tag{24}$$

$$K_t^* = \int_0^1 a_{i,t} di = \int_{a_{min}}^{\infty} a_t f_t^1 da_t + \int_{a_{min}}^{\infty} a_t f_t^2 da_t \tag{25}$$

$$E_t^* = E_t^D + \int_0^1 c_{i,t}^E di \tag{26}$$

$$N_t^* = \frac{\lambda_1}{\lambda_1 + \lambda_2} \bar{N} = \frac{\lambda_1}{\lambda_1 + \lambda_2} \tag{27}$$

$$0 = \tau \frac{p_{E,t}}{p_t} E_t^D + \tau \frac{p_{E,t}}{p_t} \int_0^1 c_{E,i,t} di - G_t - T_t \tag{28}$$

$$a_{i,t} \geq a_{min} \quad \forall i \tag{29}$$

That is, the equilibrium in this model is given by household decisions $(c_{E,i,t}^*, c_{Y,i,t}^*)$, a set of aggregate variables $(K_t^*, E_t^*, N_t^*, C_t^*)$, and prices $(p_{E,t}, p_t, r_t, w_t)$ such that the HJB, the KFP, and the government budget constraint holds, and that the energy market, labor market, and capital market clear. The above system of equations holds both in the steady state (when $f_t^1 = f_t^2 = 0$) as well as in the transition dynamics. In the following section, we will resort to numerical methods to compute the solution of the model.

6 Numerical Results

6.1 Benchmark parameters

In this section, we begin by presenting the numerical results using calibrated parameters. To do this, we discretize the continuous time model above into annual frequency. We then present the steady state results, and the impulse response functions of the economy in response to a one-time positive and temporary oil price shock.

Table 1 presents the benchmark parameters used for the calibration exercise. We consider the standard value of $\phi = 2$ and $\rho = 0.05$ to be the level of risk aversion and time discount. Labor share γ is also set at a standard 2/3 of total output. For the labor income process, we first normalize the low-income state z_1 to one and then calibrate z_2 such that the steady state level income Gini coefficient matches the average income Gini between 1985-2019 using world income database information, which amounts to 0.55. Next, the average duration of unemployment is 20.3

Table 1: Benchmark Parameter Values

Parameters	Value	Data Source
ϕ	2	Standard value in the literature
ρ	0.05	Standard value in the literature
γ	0.67	Standard value in the literature
z_1	1	Normalized to 1
z_2	50	Match income Gini coefficient
λ_1	0.0747	Match average duration of unemployment
λ_2	2.84	Match the average unemployment rate
ξ	0.023	Match the oil share out of total consumption
θ	0.8	Match the elasticity of substitution
a_{min}	-1/3	Match the maximum debt-to-income ratio
α	0.017	Oil share out of output
ρ_E	0.81	Estimate using real annual crude oil price

week using the BLS data from 1985 to 2019. This gives an annualized job-finding rate of 0.928, which then implies a continuous time job-finding rate of $\lambda_1 = -log(0.928) = 0.0747$. We then use this value to calibrate the average annualized unemployment rate $\frac{e^{-\lambda_2}}{e^{-\lambda_1}+e^{-\lambda_2}}$ [5] to match the average unemployment rate from 1985 to 2019 from BLS data of 5.9%. The implied value of λ_2 equals 2.84. Following Bodenstein, Erceg, and Guerrieri (2011), the share of oil consumption out of total consumption composite ξ is set to 2.3%. In contrast to other parameters within the model, the elasticity of energy substitution exhibits a broader spectrum of estimates, ranging from 0.1 to 0.4 across various studies. Here, the parameter θ is chosen so that the elasticity of substitution between oil goods and final goods equals 0.2, which matches the short-run average elasticity for households found in a meta-analysis in Labandeira, Labeaga, and López-Otero (2017). This then implies that $\sigma = \frac{\theta}{\theta-1} = -4$.[6] The parameter a_{min} governing borrowing constraints is calibrated to match the maximum debt-to-income ratio of 2.06 across various U.S. states, leveraging data from the New York Fed and the BLS from 1999 to 2019. Following the methodology of Blanchard and Riggi (2013a), the income share of oil in total output, denoted by α, is set at 1.7%, which consequently determines the income share of capital, β, at 31.3% through the constant return to scale of production. The persistence parameter of oil price shocks ρ_E equals 0.81, is estimated using annual data on real crude oil prices spanning from 1985 to 2019, sourced from the U.S. Energy Information Administration (EIA). This then implies that the half-life of oil price shocks is determined to be 3.3 years. Lastly, the steady state of real oil prices in the model is calibrated to match the average household energy consumption share, standing at 7.2% based on the NIPA and EIA data, assuming that carbon tax rate $\tau = 0$. Using the calibrated parameters outlined above, the model yields an average marginal propensity to consume (MPC) of 0.22, aligning well

[5] Here, $e^{-\lambda_1}$ is the annualized job finding rate, and $e^{-\lambda_2}$ is the annualized job seperation rate.

[6] In the following section, we will conduct a counterfactual analysis with alternative values of this elasticity parameter.

within the broader spectrum of MPC estimates as observed in a recent meta-analysis conducted by Carroll, Slacalek, Tokuoka, and White (2017). Furthermore, the model generates a steady-state real interest rate of 3.2%, approximately corresponding to the annual real rate derived from the 1-year treasury bill discount basis, adjusted by the annual inflation rate in our sample period.

6.2 Simulation

Based on the calibrated model, we proceed to simulate the economy under a one standard deviation positive oil price shock. Figures 4 and 5 illustrate the impulse response functions of this shock on both aggregate and distributional variables over a span of up to 100 years. The vertical axis denotes the percentage deviation of the variables of interest from their respective steady-state values.

On impact, the increase in oil price increases the general price level and dampens aggregate output. The reduction in aggregate demand prompts firms to scale back production, leading to a decrease in demand for energy and capital, consistent with the effects of negative aggregate supply shocks. Both consumption (including consumption on final goods and oil goods) and investment decline.

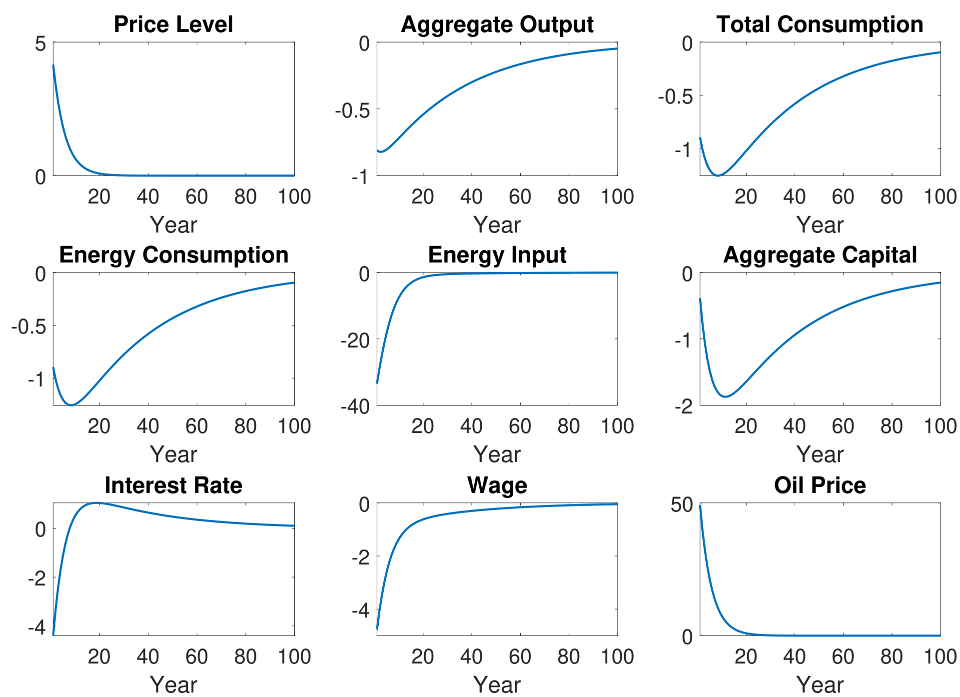

Figure 4: Impulse response functions (Unit: $\Delta\%$ from steady state)

To understand the short-run and medium-run effects on the income inequality responses, notice

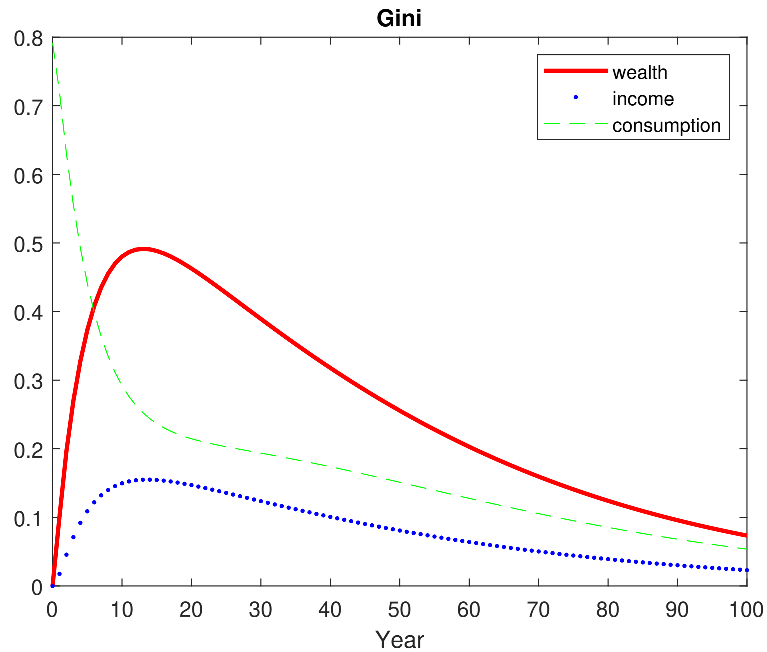

Figure 5: Impulse response functions (Unit: $\Delta\%$ from steady state)

that in the short run, a positive oil price shock results in an immediate reduction in wages as well as interest rate. Even though interest rate reduces slightly less than wages upon the shock due to a decrease in capital supply, the initial difference is quantitatively small. However, with the gradual decline of aggregate capital stock, the marginal product of capital rises overtime, subsequently elevating the interest rate immediately post-shock. Given that income inequality hinges on the horse race between labor and capital income, our findings indicate that, in the short term, declines in labor income outweigh those in capital income, leading to a peak of income Gini at 0.17% above the steady-state level. [7] Transitioning to the medium term, the persistence of inequality responses becomes apparent. Capital stock gradually rebounds while the interest rate surpasses its steady-state level, persisting at an elevated state even after reaching its peak. This persistence stems from the recovery in capital demand post-shock, while capital supply requires time to accumulate. In the medium term, the elevated levels of interest rates overshadow the regained wage levels, leading to sustained increases in income inequality.

Next, notice that the initial consumption inequality response is much larger than the increase in income and wealth inequality. Two opposite forces contribute to the changes in consumption inequality. On one hand, rising oil prices diminish real income, prompting individuals to shift

[7] The gap between income from capital and income from labor would widen further with endogenous labor supply. Empirical evidence suggests that the substitution effect outweighs the income effect in labor supply response to changes in wages. Therefore, a decrease in wages would result in a decrease in labor supply. With sticky wages, this could potentially escalate unemployment rates, exacerbating income inequality even more.

towards regions with higher MPCs. This encourages poorer individuals to reduce consumption to a lesser extent relative to their wealth, potentially decreasing consumption inequality. On the other hand, many agents who were previously operating on the Euler equation now find themselves living hand-to-mouth, eroding their capacity to smooth consumption altogether, thus exacerbating consumption inequality. Quantitatively, the latter effect proves to be more significant, and the consumption Gini index rises more than the increase in income inequality, with its initial rise peaking at 0.79% relative to its steady state value. It also decreases rapidly as the economy rebounds, when the poor become less borrowing constrained.

Lastly, the evolution of wealth inequality results from a combination of changes in income and wealth inequality. To observe shifts in wealth inequality, variations in wealth growth rates among individuals are necessary. Recall that the flow budget constraint for an individual with wealth $a_{i,t}$ can be written as:

$$\frac{da_{i,t}}{a_{i,t}} = r_t + \frac{w_t z_{i,t}}{a_{i,t}} - \frac{c_{i,t}}{a_{i,t}} \tag{30}$$

Here, the uniform decrease in r_t for all does not influence wealth growth rates. However, since labor income constitutes a smaller fraction of wealthier individuals' income, the second term exacerbates inequality by reducing wealth growth more for the poor. The third term, linked to the consumption-to-wealth ratio, hinges on whether individuals live hand-to-mouth. After the oil price shock, everyone becomes poor. On one hand, poor households who are on the Euler equation experience a less reduction in consumption relative to their wealth, since they have a higher MPC. On the other hand, those hand-to-mouth households must disproportionately scale back their consumption compared to those adhering to their Euler equation. The former effect dominates the latter as one travels further into the right tail of the wealth distribution. Quantitatively, the net effect of the above three channels results in a dramatic rise in wealth inequality, peaking at 0.49% above the steady-state level, and it gradually declines only when the interest rate starts to decrease.

While examining the impulse response of Gini coefficients offers a broad understanding of inequality shifts, it is important to note that this is merely one metric. Studying the Gini coefficient does not specify whether inequality rises due to the poor getting poorer, the rich getting richer, or the middle class shifting towards the distribution extremes. To gain deeper insights into winners and losers, we next focus on the change of various quantiles of the distribution.

Figure 6 illustrates the impact of the oil price shock on each 20% percentile of the distribution, measured in percentage changes at their peaks. [8] The graph reveals that the bottom 60% experience losses, while the top 40% gains. However, the extent of change varies across income, consumption, and wealth. Firstly, changes in income share follow a monotonic trend, with the bottom 20% witnessing a 0.04% reduction in share, while the top 20% observe a 0.07% increase. Secondly, changes in consumption share do not mirror those in income share, particularly evident

[8] It is worth noting that these three inequality measures don't reach their peaks simultaneously, with the consumption Gini peaking first, followed by income and wealth Gini.

at the bottom. Despite the bottom 20% losing 0.29% in consumption share, the $20 - 40\%$ group experiences an even greater loss of 0.34%. This disparity arises because many households in this second group become borrowing constrained, leading to a sharper decline in consumption share compared to income share, unlike the bottom 20%, many of whom were already hand-to-mouth before the shock.

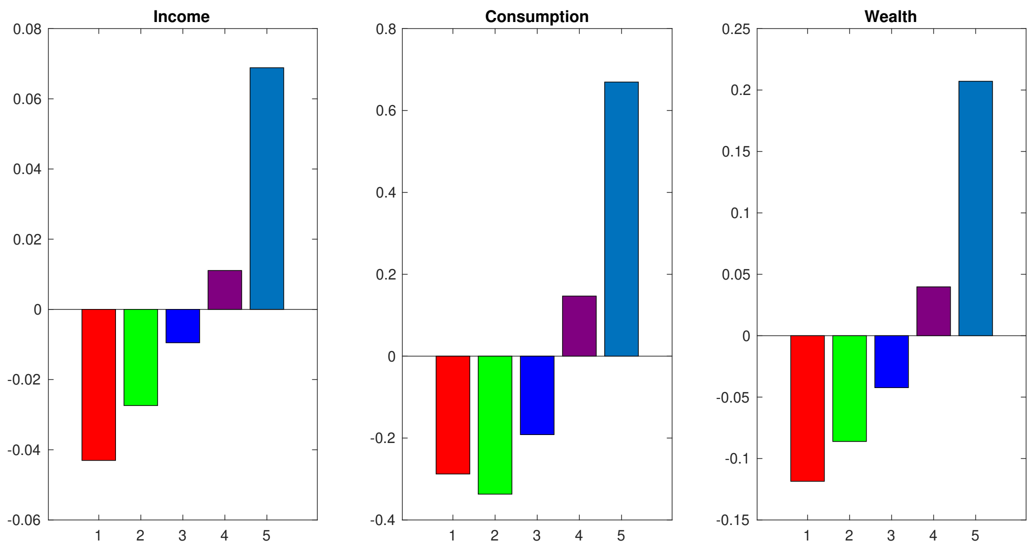

Figure 6: Changes in shares in response to one std.oil price increase ($\Delta\%$)
Group 1: bottom 20%, Group 2: bottom $20 - 40\%$, Group 3: middle $40 - 60\%$, Group 4: middle $60 - 80\%$, Group 5: Top 20%

7 Counterfactual analysis

The baseline simulation results suggest that a temporary increase in oil prices can cause an increase in income, consumption, and wealth inequality. One may wonder how these effects on inequality may depend on oil intensity in consumption and production, the elasticity of substitution between oil and final goods consumption, and the direction of the oil price shock shock. To provide insight into these questions, we conduct several counterfactual analyses based on the baseline model.

7.1 Varying oil share

We first explore a counterfactual scenario where energy input share out of production is reduced by 50%. This requires a change of α to 0.85% from its baseline of 1.7%, while holding all other parameters constant at their baseline levels. The results are shown in Figures 7 and 8. As displayed, the impact of oil price shocks on various aggregate variables, such as capital, output, and consumption, is mitigated in the scenario where energy input is halved. This is because firms experience lesser adverse effects from heightened oil prices when the intensity of oil usage in production is reduced. Notably, the relative reduction of wage to interest rate is less pronounced. Consequently, the effects on income, consumption, and wealth inequality are dampened.

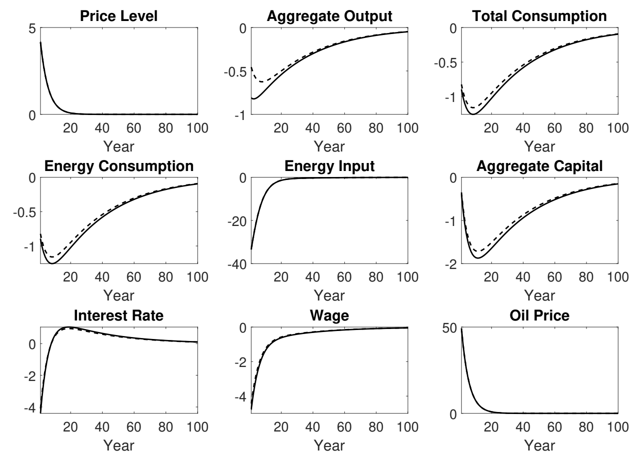

Figure 7: Impulse response functions when $\alpha = 0.85\%$. Solid (dashed) lines represent the impulse responses estimated from the baseline (counterfactual) scenario.(Unit: $\Delta\%$ from steady state)

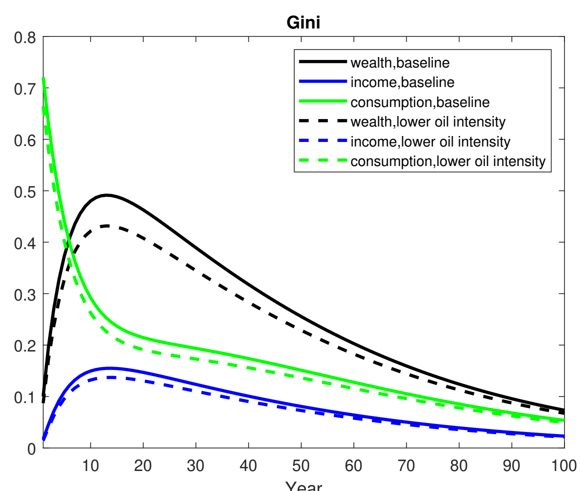

Figure 8: Impulse response functions when $\alpha = 0.85\%$ (Unit: $\Delta\%$ from steady state)

Secondly, we look into an alternative scenario where households' oil consumption share is reduced by 50%, i.e.: $\xi = 1.15\%$. The outcomes of this simulation are presented in Figures 9 and 10. As the share of oil consumption diminishes within the consumption bundle, the impact of oil prices on the overall price level, as well as aggregate demand are notably less noticeable. Consequently, the oil price shock effect on aggregate variables, as well as income, consumption, and wealth inequality are muted.

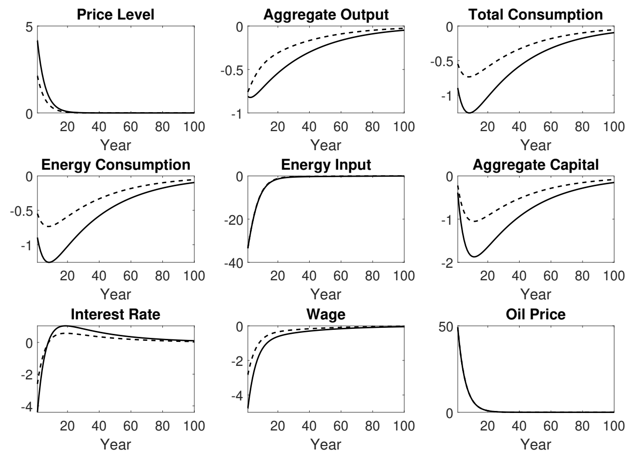

Figure 9: Impulse response functions when $\xi = 1.15\%$. Solid (dashed) lines represent the impulse responses estimated from the baseline (counterfactual) scenario.(Unit: $\Delta\%$ from steady state)

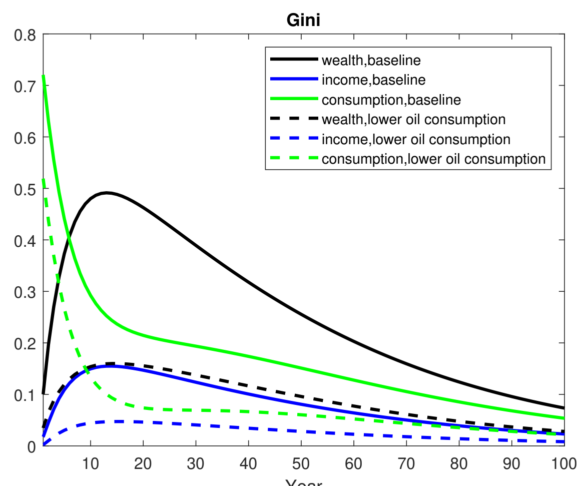

Figure 10: Impulse response functions when $\xi = 1.15\%$ (Unit: $\Delta\%$ from steady state)

7.2 Varying oil elasticity

Lastly, we conduct a simulation experiment wherein we increase the elasticity of substitution between oil and final goods by 50%, denoted as a shift from $\sigma = -4$ to $\sigma = -2.33$. The comparison outcomes are depicted in Figures 11 and 12. When households can easily switch from using oil to using other goods when oil prices go up, they are less bothered by the oil price increases. This flexibility helps cushion the effects on things like overall economic activity and income and wealth inequality.

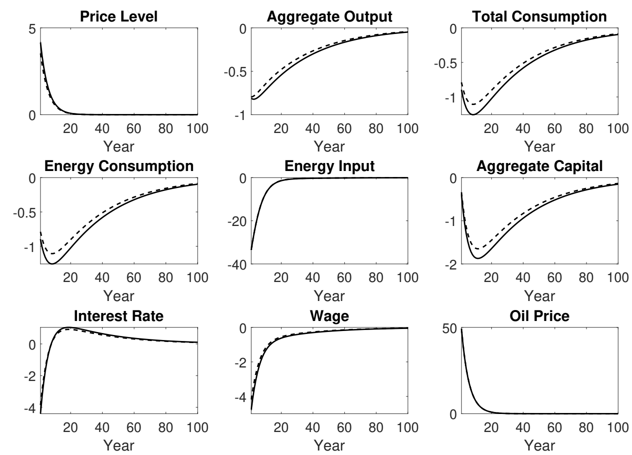

Figure 11: Impulse response functions when $\sigma = -2.33$. Solid (dashed) lines represent the impulse responses estimated from the baseline (counterfactual) scenario. (Unit: $\Delta\%$ from steady state)

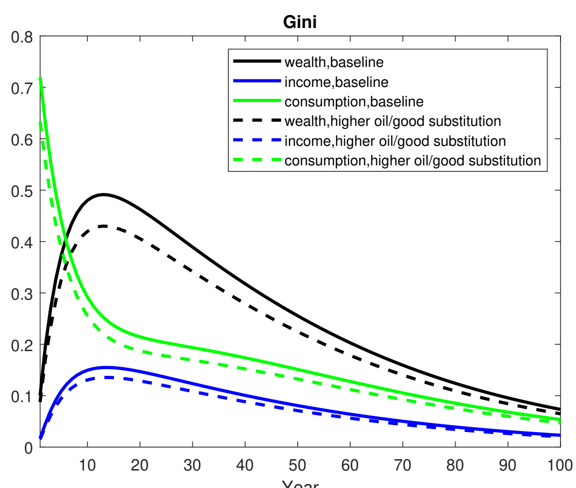

Figure 12: Impulse response functions when $\sigma = -2.33$. Solid (dashed) lines represent the impulse responses estimated from the baseline (counterfactual) scenario. (Unit: $\Delta\%$ from steady state)

7.3 Asymmetric oil price shocks

In the next counterfactual analysis, we study the asymmetric response of the same oil price shock. Specifically, we ask ourselves: does inequality decrease with the same magnitude and persistence in response to a negative vs. positive oil price shock? The shocking answer is: no, and it differs by a large margin. Figure 13 and Figure 14 show the responses of macro variables and Gini coefficients by comparing a one standard deviation positive shock vs a one standard deviation negative shock to oil prices under benchmark parameters.

Following a negative oil price shock, the economy experiences an expansion, marked by a decline in the price level and an expansion across various metrics including energy demand, capital stock, wages, interest rates, consumption, and output. This response of aggregate dynamics is more pronounced compared with the case of a positive shock, which is primarily due to the complementarity between oil and final goods in households' consumption bundles. With oil goods and final goods acting as complements, a decrease in oil prices results in increased consumption of both oil goods and final goods. However, the rise in oil goods consumption exceeds that of final goods consumption, thereby increasing the weight of oil goods in the consumption bundle. Thus, the aggregate price level becomes more sensitive to changes in oil prices following a negative shock compared to a positive shock. This heightened sensitivity leads to a disproportionately higher surge in consumption demand, subsequently driving up aggregate capital demand and output. Furthermore, the reduction in income, consumption, and wealth inequality outweighs their increase in the case of a positive oil price shock. This is attributed to the asymmetric response of aggregate demand, which results in a far less significant increase in the interest rate to wage ratio following a negative shock.

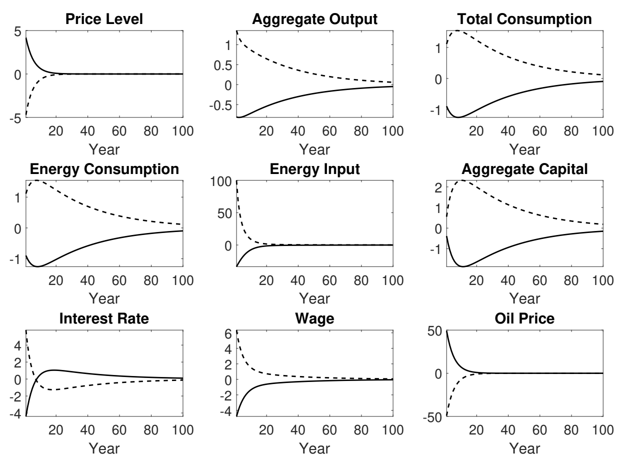

Figure 13: Impulse response functions to positive (solid lines) and negative (dashed lines) oil price shocks (Unit: Δ% from steady state)

7.4 Borrowing constraints

Last but not least, we illustrate the influence of borrowing constraints on the correlation between oil prices and inequality. Figures 15 and 16 show responses of aggregate variables and inequality to an equally sized oil price shock in both the baseline economy and one with a no-borrowing constraint, i.e., $a_{min} = 0$. Our findings indicate that while borrowing constraints insignificantly

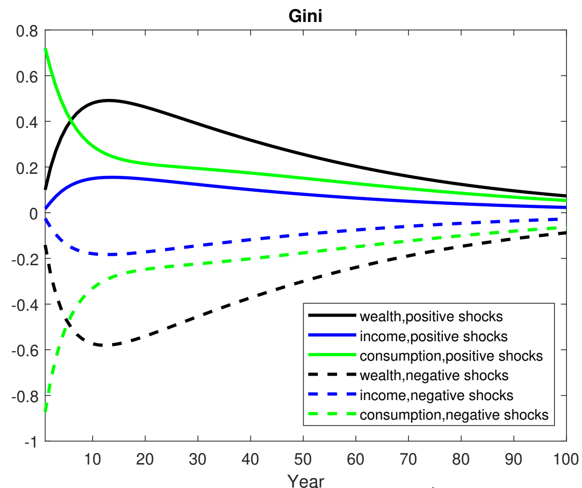

Figure 14: Impulse response functions to positive (solid lines) and negative (dashed lines) oil price shocks (Unit: $\Delta\%$ from steady state)

impact aggregate variables, they do influence the response of inequality to a great extent. When borrowing is not allowed, an increase in oil prices exhibits weaker effects on both income and wealth inequality since the poor households are now forced to save rather than to borrow, which then compresses the income and wealth distribution. The increase of consumption inequality is amplified initially due to that there are now more hand-to-mouth households. However, it quickly diminishes and follows the pattern of income and wealth inequality in subsequent periods, as the influence of income and wealth inequality starts to dominate the dynamics of consumption inequality.

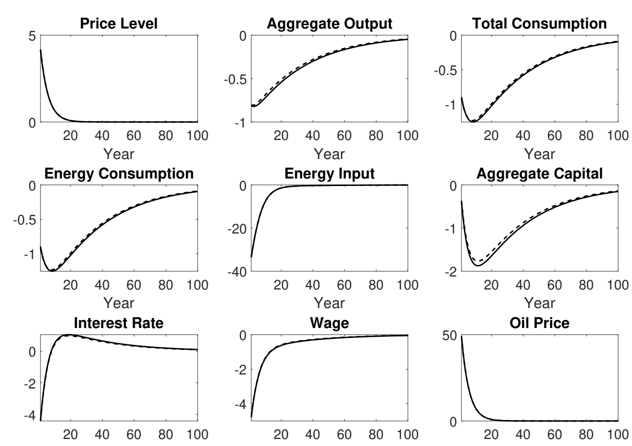

Figure 15: Impulse response functions when $a_{min} = -0.33$ (solid lines) and when $a_{min} = 0$ (dashed lines). (Unit: $\Delta\%$ from steady state)

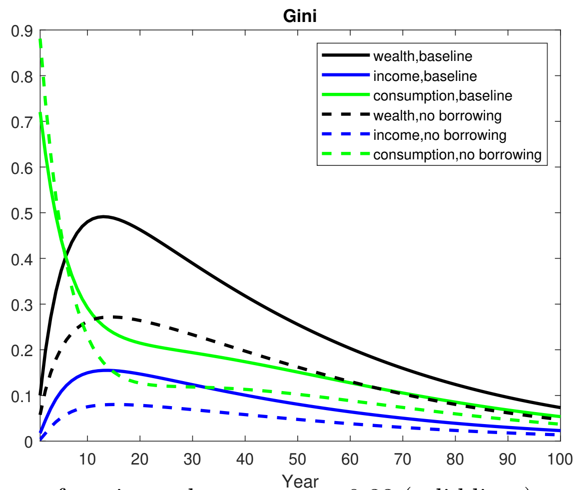

Figure 16: Impulse response functions when $a_{min} = -0.33$ (solid lines) and when $a_{min} = 0$ (dashed lines). (Unit: $\Delta\%$ from steady state)

8 Fiscal policy: A carbon tax experiment

In this section, we explore the effects of fiscal policy, specifically a carbon tax, on macro aggregates and distributional variables. We first contrast the steady-state outcomes under different levels of carbon tax rates, where the revenue generated from the tax is distributed to households as a lump sum transfer. We then analyze an alternative scenario where the tax revenue is directed towards government spending, thus not directly impacting households' budget constraints. Finally, we examine the transitional dynamics of inequality under a typical proposed carbon fee in Congress, which entails the sudden increase of a carbon tax followed by a gradual increase in the tax rate, aimed at reducing fossil fuel consumption over time.

8.1 Steady state comparison

We start by comparing the steady state outcomes of three economies with varying tax rate and transfers. Carbon tax rate can be either low ($\tau = 10\%$), or high ($\tau = 50\%$). The first two columns in Table 2 depict scenarios where carbon tax revenue is allocated as a lump sum transfer to households, while the last column illustrates outcomes where the revenue is channeled into government spending, thus not directly enhancing household welfare. All values are expressed as percentage deviations from baseline results without any carbon tax ($\tau = 0\%$).

The first two columns demonstrate that as the carbon tax rate increases, we observe a greater contractionary impact on aggregate variables. The economy witnessed a rise in interest rate due to a decline of capital stock. Additionally, income and wealth inequality tend to rise, while consumption inequality declines. This can be attributed to the dual effects of the carbon tax rate. On one hand, the introduction of the tax elevates oil prices, leading to stagflation and an exacerbation of income

Table 2: Comparing economies with different τ(Δ% w.r.t baseline)

	$\tau = 10\%(T > 0)$	$\tau = 50\%(T > 0)$	$\tau = 50\%(T = 0)$
C^*	-0.61	-2.98	-5.88
E^*	-9.80	-35.65	-35.10
K^*	-1.92	-8.53	-6.04
r^*	$+0.63$	$+2.21$	$+0.24$
w^*	-1.41	-6.65	-5.88
Y^*	-0.79	-3.48	-2.66
Consumption Gini	-0.48	-2.20	$+0.26$
Income Gini	$+0.20$	$+0.86$	$+0.69$
Wealth Gini	$+0.60$	$+2.75$	$+0.62$

and wealth inequality, as evidenced by the baseline results. On the other hand, a higher tax rate entails more substantial lump sum fiscal transfers, which disproportionately benefit lower-income individuals, consequently reducing consumption inequality.

The comparison between columns 2 and 3 is particularly interesting. Strikingly, aside from aggregate consumption, the economy where tax revenue serves as a lump sum transfer experiences more aggregate contraction. At a glance, this outcome might seem counterintuitive, given that after transfer, the economy in column 2 has access to more aggregate resources. However, when tax revenue is directly transferred to households' budgets, it disincentivizes them from capital accumulation. This effect is particularly pronounced among poorer households, leading to a decrease in the consumption Gini coefficient. Consequently, aggregate capital accumulation is diminished under the transfer scenario, ultimately resulting in greater economic contraction and increased income and wealth inequality.

8.2 The case of a gradual carbon tax increase

In the last policy experiment, we follow the approach suggested by the 10 carbon pricing proposal in the 116th Congress, in which a carbon tax ("carbon fee") would be first introduced, then gradually rise over time until certain fossil fuel emission goals are achieved. Each proposal differs in terms of the emissions covered. As a result, they differ in the starting level of the tax, and how quickly it increases over time. Here, we take a typical American Opportunity Carbon Fee Act (i.e.: Whitehouse-Schatz proposal), for example, which suggests setting a \$52 fee per metric ton of Co2 emission from 2020, which then rises at 6 percent over inflation annually until emissions are 80 percent below 2005 levels. This then translates into an equivalent initial carbon tax rate $\tau = 39\%$. [9] Further, since changes in the aggregate price level is driven by changes in oil prices,

[9] According to EPA, carbon dioxide emissions per barrel of crude oil are calculated by multiplying heat content with the carbon coefficient, which is again multiplied by the fraction oxidized, and the ratio of the molecular weight of carbon dioxide to that of carbon (44/12). Since the average heat content of crude oil is 5.80 mmbtu per barrel (EPA 2023), the average carbon coefficient of crude oil is 20.31 kg carbon per mmbtu (EPA 2023), the fraction oxidized is assumed to be 100 percent (IPCC 2006), therefore, the emission of one barrel of crude oil amounts to

inflation then solely stems from increases in then carbon tax, which increases at 6% annually from 2020 onwards. We therefore conduct a policy experiment as such by allowing a 30-year transition towards the maximum carbon tax rate of almost 200% in 2050, where carbon tax is used as lump sum transfers.

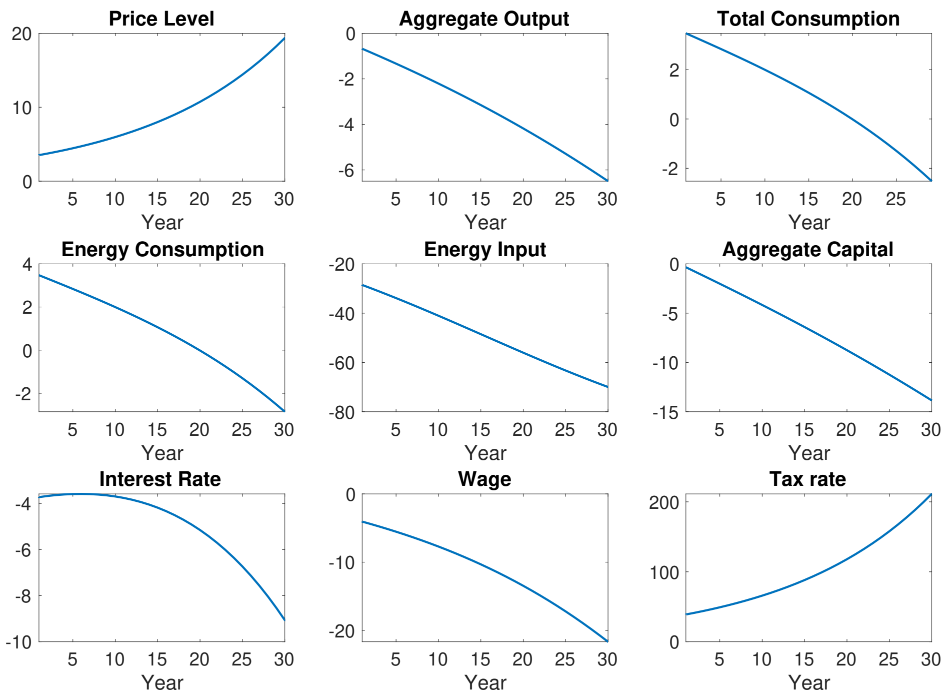

Figure 17: Transition dynamics of aggregate variables (Unit: Δ% from steady state)

Figure 17 and Figure 18 show the transition dynamics of the macro aggregates and Gini coefficients from 2020 to 2050. The results show that the aggregate economy contracts in response to the introduction of the tax, featuring an immediate increase in price level and reduction in aggregate output, wages and interest rate, followed by further gradual decline. The only exception is the consumption variable, which witnesses an increase above the steady state value for roughly 20 years before dipping down. Income and wealth Gini coefficients increase by 1.89% and 6.22% respectively at the end of the 2050, while consumption inequality immediately decreases by 4.27% upon the initial introduction of the carbon tax, and continues to decline to 7.91% below the baseline level in 2050.

Two channels contribute to the short-term increase in consumption. Firstly, the transfer channel: with a higher after-transfer income, the economy experiences a temporary consumption surge.

0.43 metric tons. At \$52 per ton of carbon fee, this implies an equivalent of \$22.36 per barrel. At the 2019 average annual crude oil price (West Texas Intermediate) of \$57, the effective carbon tax rate is therefore \$22.36/\$57 = 39%.

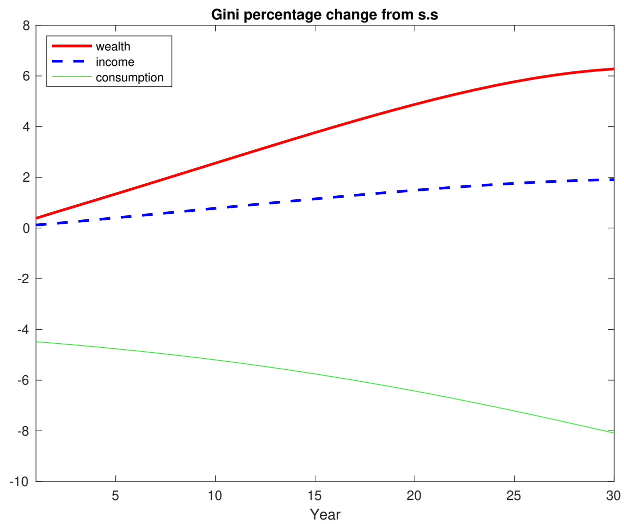

Figure 18: Gini change from 2019 level (Unit: Δ% from steady state)

This occurs because not only has after-transfer income risen, but also because the transfer acts as an insurance mechanism, allowing agents to afford to dissave and consume. Secondly, the inflation channel: as households anticipate future tax hikes that are embedded in an anticipated increase in future price levels, this boosts current consumption demand. [10] However, this consumption surge is transient. After approximately 15 years, aggregate consumption must decline due to output reductions. It is important to note that this does not alter the fact that consumption inequality continues to decrease, while income and wealth inequality continue to rise. The former is predominantly driven by transfers, whereas the latter is primarily influenced by the relative price changes of capital and labor during economic contraction

9 Conclusion

This is the first paper that systematically examines the impact of oil price fluctuations on the dynamics of consumption, income and wealth inequality in an oil-importing country. By analyzing data of macroeconomic aggregates, oil prices, and inequality, our study shows that a rise in oil prices triggers a sustained surge in inequality. To decompose the channels at which oil price shocks affect distributional variables, we delve into a continuous-time heterogeneous agent model where oil serves as both a consumption good and a production input. We then calibrate the model to the U.S. data during the Great moderation period. Our findings reveal that temporary positive oil price shocks yield substantial and enduring increases in consumption, income, and wealth inequality.

[10] Quantitatively, the first channel holds greater significance in explaining the short-term consumption boom, as evidenced by the counterfactual analysis without transfers (additional results available upon request).

The dynamics of the inequality response suggest that while the short-run increase in inequality stems from the rise in the relative price of capital and labor, the persistent elevation of inequality, in the medium run, is propelled by the sluggish recovery of capital supply.

The framework presented in our study lays the groundwork for several compelling extensions and future explorations. For instance, incorporating oil production and enabling endogenous fluctuations of oil prices could offer insights into how the distributional effects of oil price shocks hinge upon the market power of oil production. Additionally, it could shed light on the ramifications of oil price shocks on oil-exporting economies, particularly as domestic oil production gains higher market share in the international oil market. Another intriguing avenue for investigation would involve introducing stochastic shocks in oil prices, which can potentially yield more nuanced implications for inequality as agents adapt their behavior in response to varying levels of uncertainty surrounding future oil price shocks.

Lastly, the analysis in this paper operates under the assumption that crude oil is the sole energy source in the economy. However, the implementation of a carbon tax is likely to incentivize households and businesses to gradually transition towards cleaner alternative energy sources. After all, that is why the carbon tax is proposed at the first place. Therefore, it would be worthwhile to investigate how carbon fiscal policies impact inequality when alternative energy options are available during the transition period. In this case, the recessionary effects of the carbon tax may not be as pronounced. At the same time, transitioning to clean energy involves substantial initial costs, which could again potentially disproportionally benefit the rich.

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Appendices

A Data Description

Variable	Source	Definition
Real GDP	Bureau of Economic Analysis	The inflation adjusted value of the goods and services produced by labor and property located in the United States
CPI	Bureau of Labour Statistics	The price of a weighted average market basket of consumer goods and services purchased by households.
Hours Worked	Bureau of Labour Statistics	Hours worked for all workers in the Non-Farm Sector.
Federal Funds Rate	Federal Reserve Board	The nominal interest rate at which depository institutions lend reserve balances to other depository institutions overnight on an uncollateralized basis.
Crude Oil Prices	Energy Information Administration	Crude oil spot prices (dollars per barrel) deflated by CPI
T. Employment	Bureau of Labour Statistics	The number of U.S. workers in the economy that excludes proprietors, private household employees, unpaid volunteers, farm employees, and the unincorporated self-employed.
Real Pers. Expend.	Bureau of Economic Analysis	The nominal change in goods and services consumed by all households, and nonprofit institutions serving households, deflated by CPI
Investments	Bureau of Economic Analysis	Measure of the amount of money that domestic businesses invest within the U.S.
Wages	Bureau of Labour Statistics	Median usual weekly real earnings for full time workers 16 years and older.
Savings	Bureau of Economic Analysis	Calculated as the ratio of personal saving to disposable income.
Top 1% Wealth	Federal Reserve Board	Percentage of wealth held by the top 1% of U.S. households
Bottom 50% Wealth	Federal Reserve Board	Percentage of wealth held by the top 50% of U.S. households

Table 3: Data definition: all variables (1985 - 2019)