

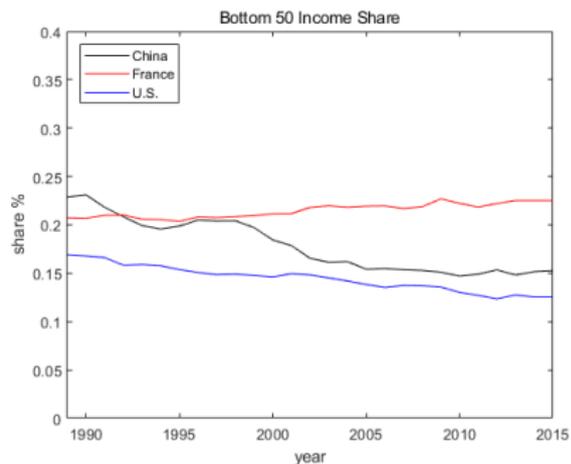
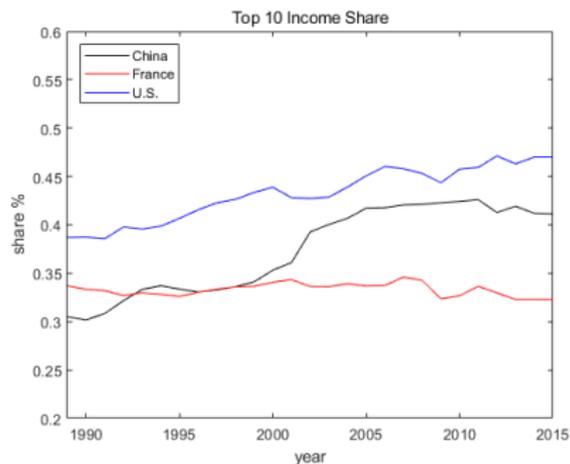
The Evolution of Income and Wealth Inequality in China

Yan Wang
Beijing Normal University

Juan Carlos Conesa
Stony Brook University

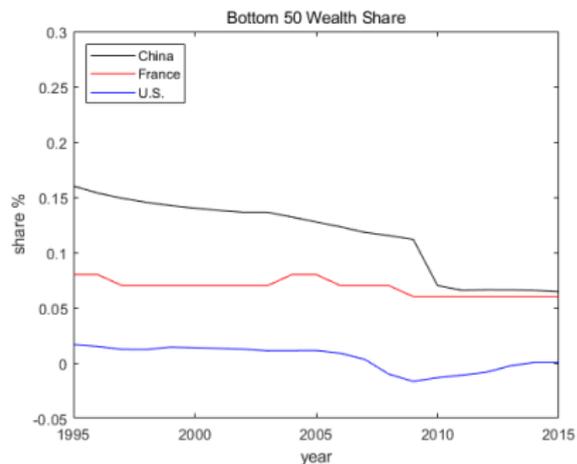
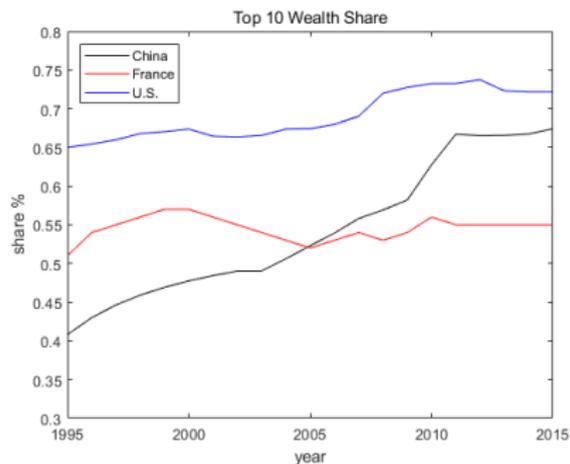
INTRODUCTION

Inequality among Countries



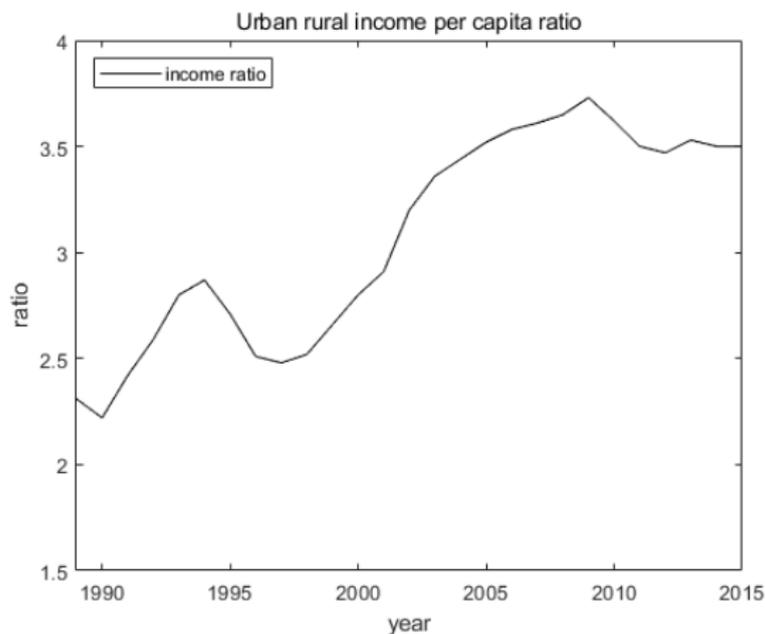
Data Source: Piketty, Yang, and Zucman (2019).

Inequality among Countries



Data Source: Piketty, Yang, and Zucman (2019).

Rural Urban Income Gap



Data Source: Piketty, Yang, and Zucman (2019).

What We Do

- Explain the evolution of income and wealth inequality in China from 1990 to 2015.
- Quantify the impact of:
 - 1. Rural-urban migration
 - 2. Growth of the private sector (economic reforms early 1990s)
- Project the income and wealth inequality, and study the effects of conceived labor market and financial market reforms on the evolution of inequality.

What We Find

- Rural-urban migration has alleviated the increase in inequality by narrowing the rural-urban income gap.
- The emergence and growth of the private sector is both a fundamental engine of growth and the key driving force behind the increasing inequality
- Our quantitative exercise suggests that income concentration will keep increasing until the 2050s.
- Implementing reforms in labor market and financial markets could result in a significant decrease in income and wealth concentration.

Related literature I

- **Income:** Storesletten et al. (2004), Piketty et al. (2014), Haskel et al (2012), Aghion et al (2019)
- **Wealth:** De Nardi et al. (2016), Quadrini (2000), Cagetti and De Nardi (2008), Castaneda et al. (2003), Krusell and Smith (1998)
- **Transition:** Xavier et al. (2016), Jones and Kim (2018), Hubmer et al. (2019)

Related literature II

- **Data:** Piketty et al. (2019), Luo et al. (2018)
- **Aging population:** Zhong (2010)
- **Housing price:** Knight et al. (2017, 2018)
- **Rural urban gap:** Yang (1999)
- **Human capital gap:** Heckman and Yi (2012)
- **Labor mobility restriction:** Whalley and Zhang (2009)
- **Uninsurable Permanent Income Shocks:** Ding and He (2018)

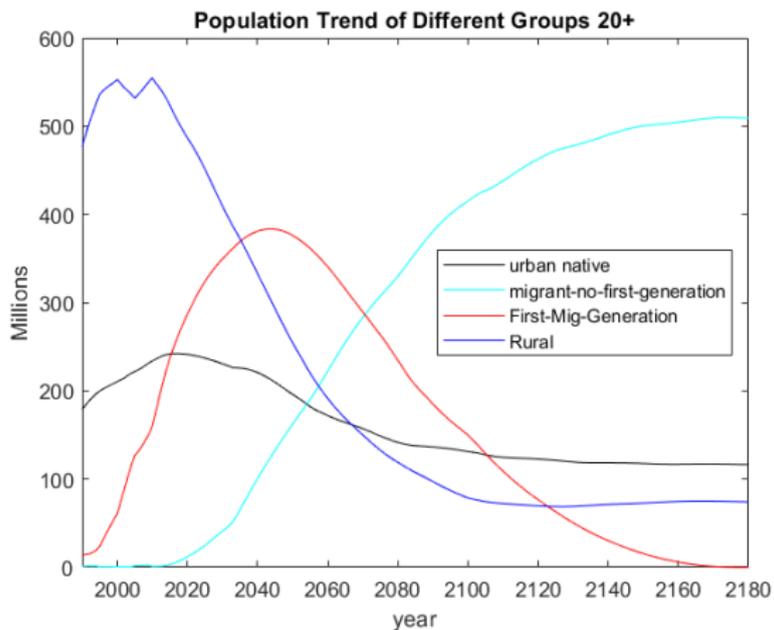
Institutional Features and Empirical Evidence

Rural and Urban

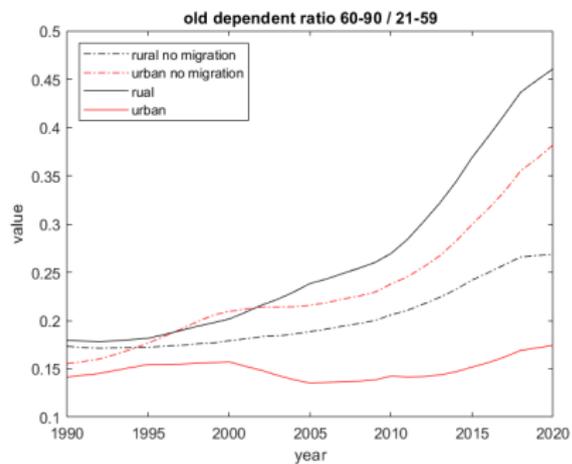
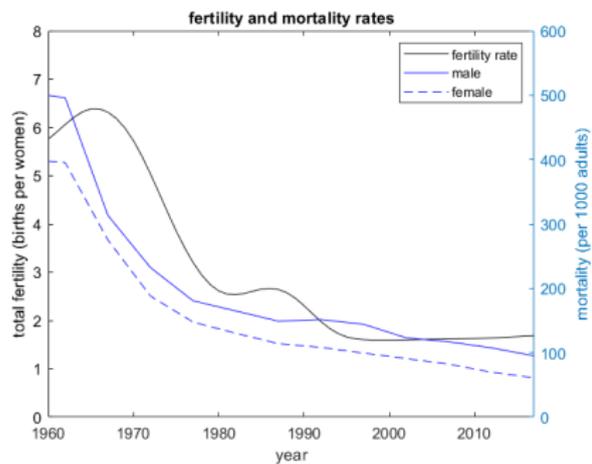
Name		Scope
Urban	City	City jurisdiction and city without district, residents committee and other areas connected to the actual construction of the city and the city government.
	Town	County people's government resident and other towns outside the city, residents committee and other areas connected to the actual construction of the county government. Mining areas, development zones, research institutes, universities, and other special areas with permanent population of more than 3,000 people and farms and forest farms.
Rural		Areas except city and town.

Table: Division of City, Town, and Rural in Statistics (NBS 2008)

Population Dynamics of Different Groups



Aging Population



Private and Non-Private Sectors

Name	Scope
Private	Privately Owned Firms
	Collective-Owned Enterprises
	Jointly-Owned Enterprises
	Firms with Founds from HMT
	Foreign Funded Firms
	Self-Employed
Non-Private	State-Owned Entreprises
	Share-Holding Corporations Ltd

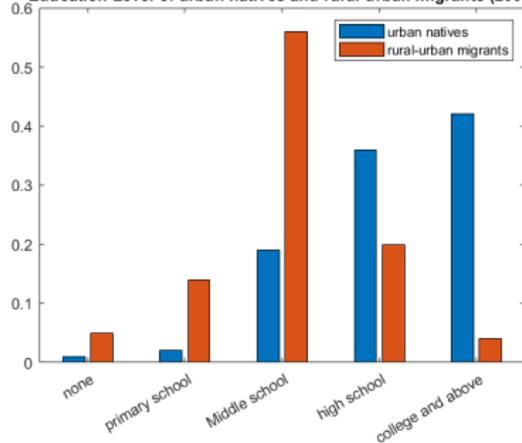
Table: Private Sector and Non-Private Sectors in Urban China

Financial Constraint in Private Sector

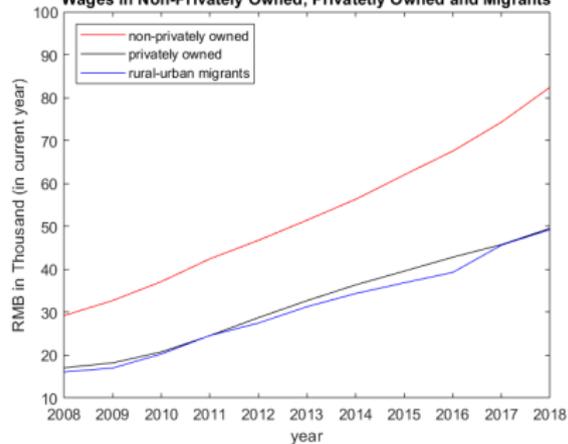
- Allen, Franklin, Jun Qian, and Meijun Qian. "Law, finance, and economic growth in China." (2005).
- Song, Zheng, Kjetil Storesletten, and Fabrizio Zilibotti. "Growing like China." (2011).
- Imrohorglu, Ayse, and Kai Zhao. "The chinese saving rate: Long-term care risks, family insurance, and demographics." (2018)

Labor Market Segmentation

Education Level of urban natives and rural-urban migrants (2007)



Wages in Non-Privately Owned, Privately Owned and Migrants



Model

Technology

Rural sector uses labor to produce agricultural goods:

$$F_{A,t}(N_{A,t}) = A_t \chi_t N_{A,t}$$

Urban sector:

- Firm F (non-private sector) is financially integrated, has access to credit and hires urban workers

$$F_{F,t}(K_{F,t}, N_{F,t}) = K_{F,t}^{\alpha_F} (A_t N_{F,t})^{1-\alpha_F}$$

- Firm I (private sector) is privately owned, faces tight financial constraints and hires rural migrants. Defined later.

Urban Natives

Born with zero asset and choose career path with commitment.

$$V_{U,t} = \max \{ V_{F,t}, V_{E,t} \}$$

- **Worker.** Works in the non-private firms.
- **Entrepreneur.** Works in the non-private firms until age J_e , and then runs the private firms with accumulated savings and bank loan.

Urban Natives

$$V_{F,t}(a,j,\varepsilon_{F,t}) = \max_{c_a, c_n} \left\{ u_F(c_a, c_n) + \beta \phi_{U,j} EV_{F,t+1}(a', j+1, \varepsilon'_{F,t}) \right\}$$

$$s.t. \begin{cases} pc_a + c_n + a' = (1+r_t)(a + TR_{F,t}) + \varepsilon_{F,t} \omega_{F,j} w_{F,t} & \text{for } j=1 \dots J_r - 1 \\ pc_a + c_n + a' = (1+r_t)(a + TR_{F,t}) & \text{for } j=J_r \dots J \end{cases}$$

$$a' \geq 0, c_a \geq \bar{c}_a, c_n \geq 0$$

Urban Natives

$$V_{E,t}(a,j,\varepsilon_{F,t},\xi_t) = \max_{c_a, c_n} \left\{ u_F(c_a, c_n) + \beta \phi_{U,j} EV_{E,t+1}(a', j+1, \varepsilon'_{F,t}, \xi'_t) \right\}$$

$$\text{s. t. } \begin{cases} p_t c_a + c_n + a' = (1+r_t)(a + TR_{E,t}) + \varepsilon_{F,t} \omega_{F,j} w_{F,t} & \text{for } j=1 \dots J_e - 1 \\ p_t c_a + c_n + a' = \pi(a + TR_{E,t}, \xi_t, loan, n) + a + TR_{E,t} & \text{for } j=J_e \dots J \end{cases}$$

$$a' \geq 0, c_a \geq \bar{c}_a, c_n \geq 0$$

Private Firm

$$\pi(a + TR_{E,t}, \xi_t) = \max_{loan, n} \{ k_{I,t}^{\alpha_I} ((\xi_t A_t)^{\frac{1-\alpha_I}{\theta}} n_{I,t})^\theta - \delta k_{I,t} - w_{I,t} n_I - \tilde{r}_t loan \}$$

$$k_{I,t} = a + TR_{E,t} + loan$$

$$(1 + \tilde{r}_t) loan \leq \eta [k_{I,t}^{\alpha_I} ((\xi_t A_t)^{\frac{1-\alpha_I}{\theta}} n_{I,t})^\theta + (1 - \delta) k_{I,t} - w_{I,t} n_I]$$

$$0 < \alpha_I + \theta < 1$$

$$\tilde{r}_t = \begin{cases} r_t & \text{if } loan \leq 0 \\ r_t + spd_t & \text{if } loan > 0 \end{cases}$$

Rural Residents

Rural residents work on the rural sector. Abstract from the migration decision, computed directly from data.

$$V_{R,t}(a,j,\varepsilon_{R,t}) = \max_{c_a, c_n} \left\{ u_R(c_a, c_n) + \beta \phi_{R,j} [(1 - \kappa_{t,j}) EV_{R,t+1}(a'_{j+1}, \varepsilon'_{R,t}) + \kappa_{t,j} EV_{I,t+1}(a'_{j+1}, \varepsilon'_{I,t})] \right\}$$

$$s.t. \quad p_t c_a + c_n + a' = (1 + r_t)(a + TR_{R,t}) + \varepsilon_{R,t} \omega_{R,j} w_{R,t}$$

$$a' \geq 0, \quad c_a \geq \bar{c}_a, \quad c_n \geq 0$$

Rural Urban Migrants

Migrants move to urban with asset accumulated from rural and work in the private sector.

$$V_{l,t}(a,j,\varepsilon_{l,t}) = \max_{c_a, c_n} \left\{ u_l(c_a, c_n) + \beta \phi_{U,j} EV_{l,t+1}(a', j+1, \varepsilon'_{l,t}) \right\}$$

$$s.t. \begin{cases} p_t c_a + c_n + a' = (1+r_t)(a + TR_{l,t}) + \varepsilon_{l,t} \omega_{l,j} w_{l,t} & \text{for } j=1 \dots J_r - 1 \\ p_t c_a + c_n + a' = (1+r_t)(a + TR_{l,t}) & \text{for } j=J_r \dots J \end{cases}$$

$$a' \geq 0, c_a \geq \bar{c}_a, c_n \geq 0$$

Labor Markets

$$N_A = \sum_{a,j,\varepsilon_r} X_r(a,j,\varepsilon_r)$$

$$N_F = \sum_{a,j,\varepsilon_F} X_F(a,j,\varepsilon_F) + \sum_{a,1:jE-1,\varepsilon_F} X_E(a,j,\varepsilon_F)$$

$$\sum_{a,j,\xi} n_l(a,j,\varepsilon_F,\xi) X_e(a,j,\varepsilon_F,\xi) = \sum_{a,j,\varepsilon_l} X_l(a,j,\varepsilon_l) + \sum_{a,j,p,\varepsilon_l} X_{lf}(a,j,p,\varepsilon_l)$$

Capital Market

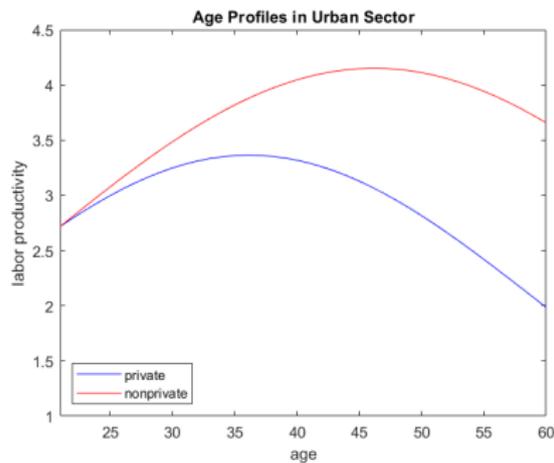
$$\begin{aligned}
 \sum_{a,j,\xi} loan_t(a,j,\xi) X_{E,t}(a,j,\xi \mid j \geq j_E) = & \sum_{a,j,\varepsilon_F} a_{F,t}(a,j,\varepsilon_F) X_{F,t}(a,j,\varepsilon_F) \\
 & + \sum_{a,j,\varepsilon_R} a_{R,t}(a,j,\varepsilon_R) X_{R,t}(a,j,\varepsilon_R) \\
 & + \sum_{a,j,\varepsilon_F} a_{E,t}(a,j,\varepsilon_F,\xi) X_{E,t}(a,j < j_E, \varepsilon_F, \xi) \\
 & + \sum_{a,j,\varepsilon_I} a_{I,t}(a,j,\varepsilon_I) X_{I,t}(a,j,\varepsilon_I)
 \end{aligned}$$

Equilibrium

- Given demographic trends, prices and bequests, individuals solve utility maximization problem.
- Prices clear goods, labor and capital markets.

Calibration

Age profiles



Idiosyncratic Labor Income Shocks

Let the residual log income y_t be composed of a persistent component and a transitory component

$$y_t = z_t + v_t$$

where the persistent component:

$$z_t = \rho z_{t-1} + \eta_t$$

with $v_t \sim N(0, \sigma_{v,t}^2)$, and $\eta_t \sim N(0, \sigma_{\eta,t}^2)$, both *i.i.d* and serially uncorrelated.

Idiosyncratic Productivity Shocks

	Rural	Non-Private	Private
persistent shocks $\sigma_{\tau,t}^2$			
1991-2000	0.257	0.128	0.171
2004-9	0.250	0.064	0.282
2011-5	0.191	0.031	0.115
transitory shocks $\sigma_{\nu,t}^2$			
1989-2000	0.313	0.056	0.432
2004-9	0.441	0.083	0.268
2011-15	0.326	0.109	0.235
persistent parameter ρ			
	0.848	0.821	0.946

Table: Worker's Idiosyncratic Shocks

Idiosyncratic Productivity Shocks

Private Firms	
persistent shock $\sigma_{\tau,t}^2$	0.164
transitory shock $\sigma_{v,t}^2$	0.732
persistent parameter ρ	0.544

Table: Productivity Shocks in the Private Sector

Parameters determined outside model

para.	value	definition
J	70	maximum age 90
J_e	21	age to run the private firm 40
E_{bound}	0.05	fraction of population with idea and entrepreneur skill (NBS)
α	0.24	fraction of consumption for agriculture good (CHNS)
α_F	0.5	capital income share 50% (Bai et al. 2006)
α_I & θ	0.4	capital income share 50% and residuals 20% (NBS)
δ	0.1	10 percents depreciation rate (Bai et al. 2006)
spd	0.026	avg. difference between loans and deposits rates 1990-2019 (IMF)

Table: Parameters determined outside model

Parameter determined within the equilibrium

	para.	value	target
Ini.SS	\bar{c}_a	1.537	rural GDP share is 38% in 1989
	χ	0.810	relative price is normalized to 1
	$disp$	2.956	real interest rate is 0.025 in 1989
Tran.	$\bar{\xi}$	6.750	avg. wage ratio is 0.606, 2008/2015
	η	0.448	avg. 10% asset financed by loan, 1994/2002
	g	0.057	avg. 9% annual GDP growth, 1999/2019
	β	0.951	avg. capital-output ratio 2.20, 1992 – 2007

Table: Parameters determined within the equilibrium

Initial Steady State

Initial Steady State			
	Income		
	Top 10%	Middle 40%	Bottom 50%
Data	0.307	0.469	0.224
Model	0.240	0.483	0.277
	Wealth		
	Top 10%	Middle 40%	Bottom 50%
Data	--	--	--
Model	0.412	0.507	0.081
	Urban-Rural Income per Capita Ratio		
Data	2.310		
Model	2.110		

Table: Model Validation–Initial Steady State

Transition

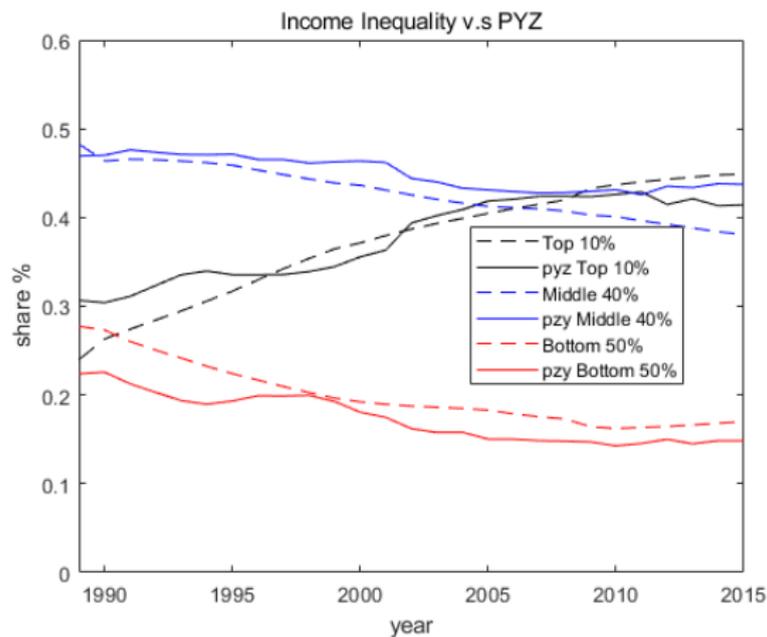


Figure: Model Validation–Transition

Transition

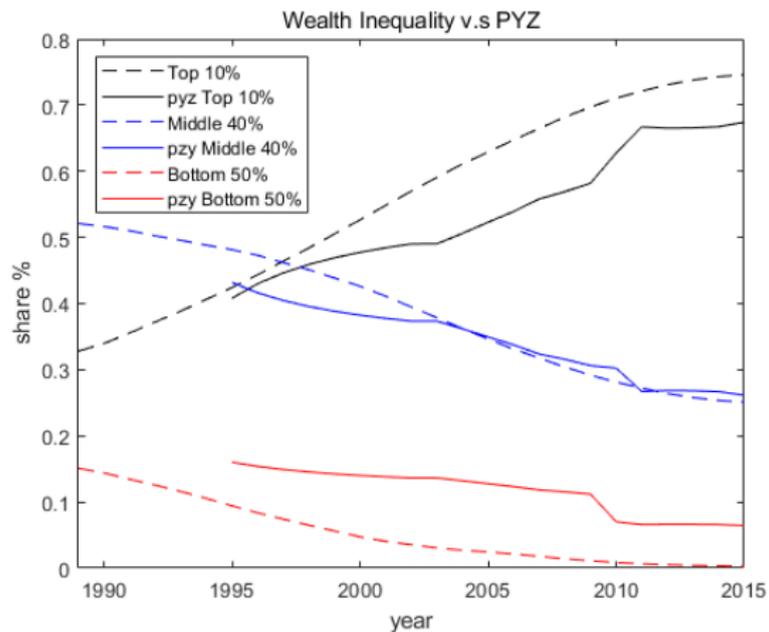


Figure: Model Validation–Transition

Transition

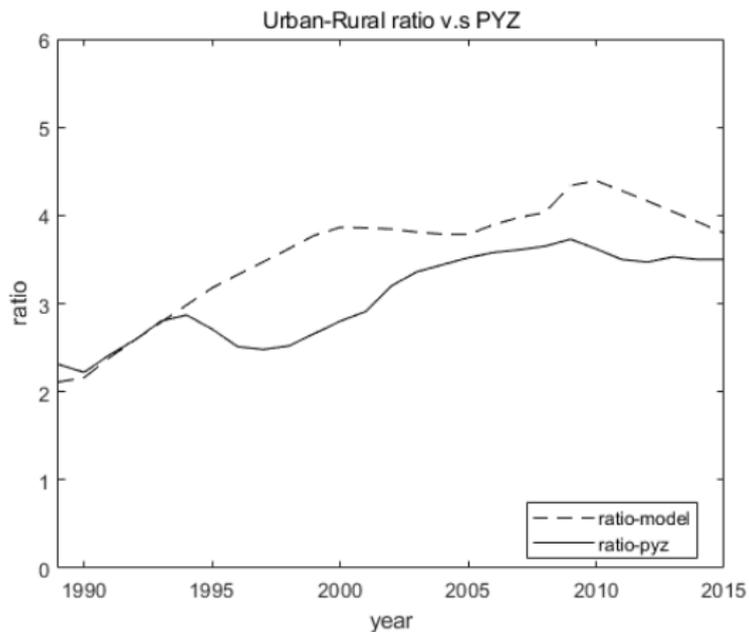
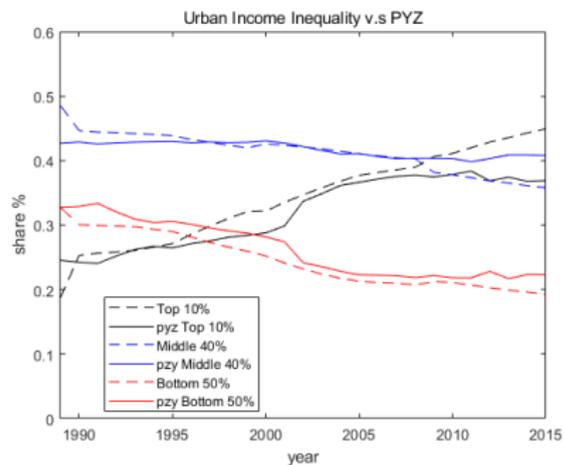
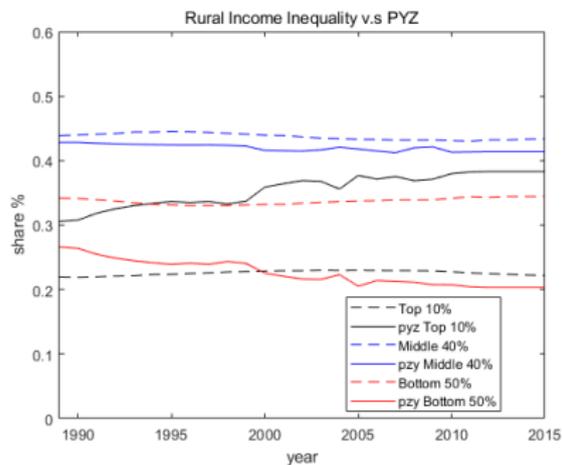


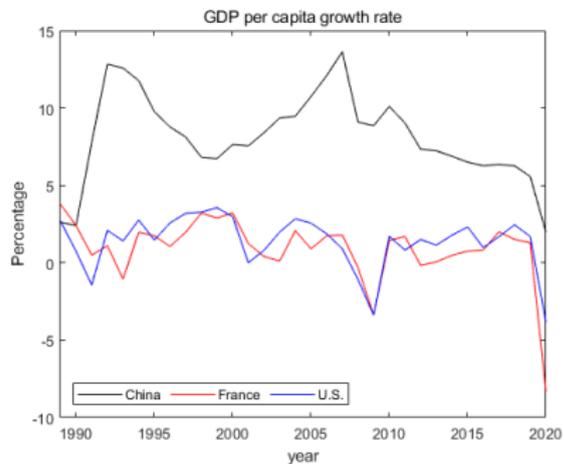
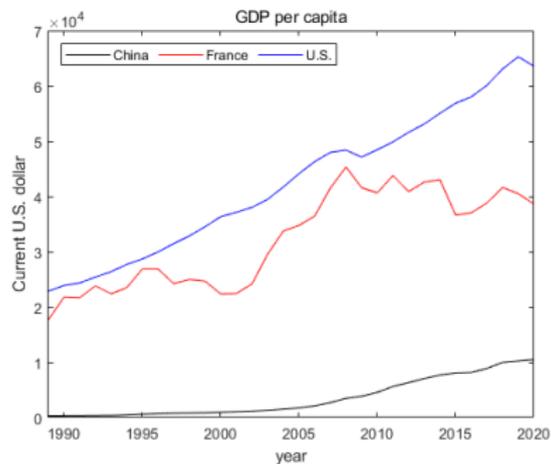
Figure: Model Validation–Transition

Transition-Rural v.s. Urban

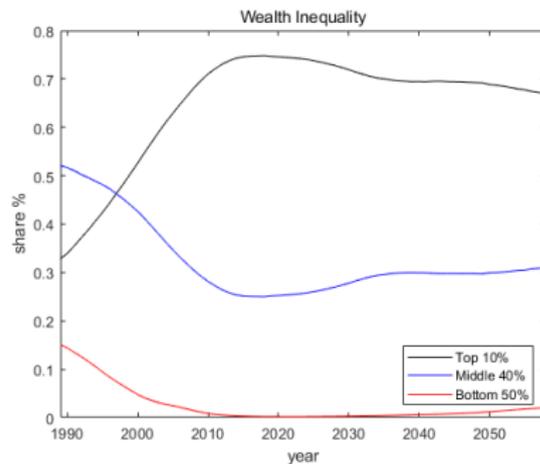
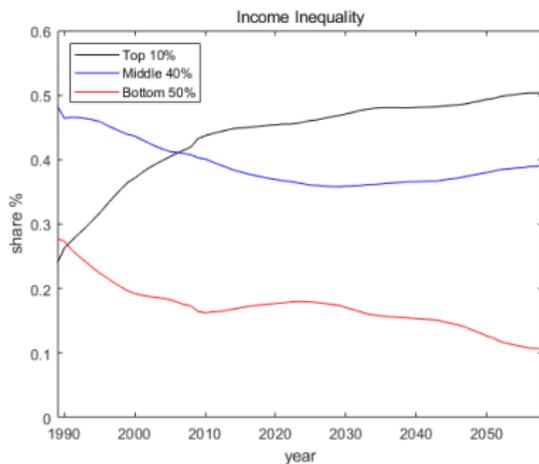


Projection

The future of inequality in China (1989-2058)

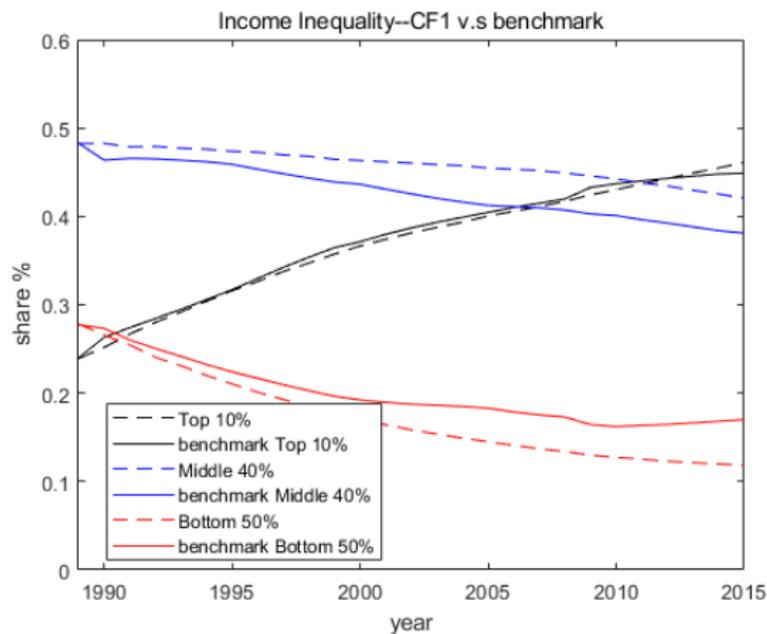


The future of inequality in China (1989-2058)

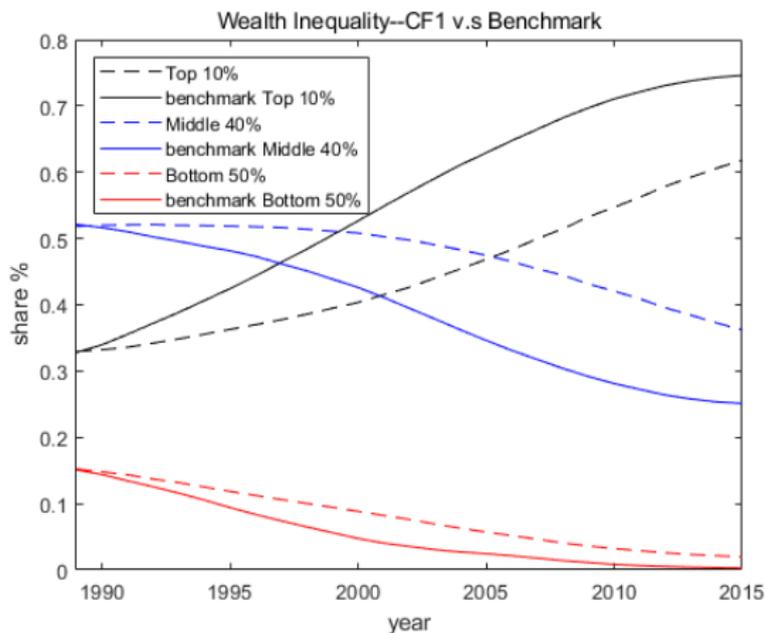


Counterfactual

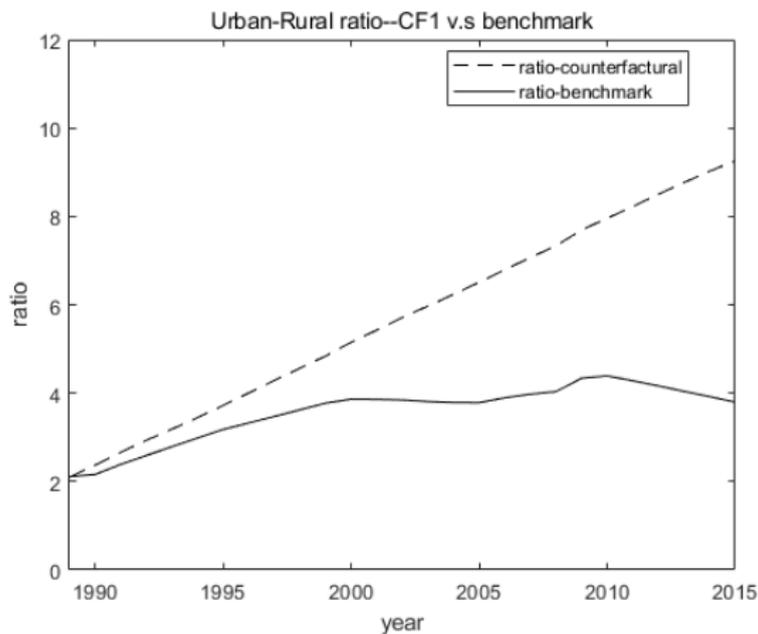
No migration and no private economy



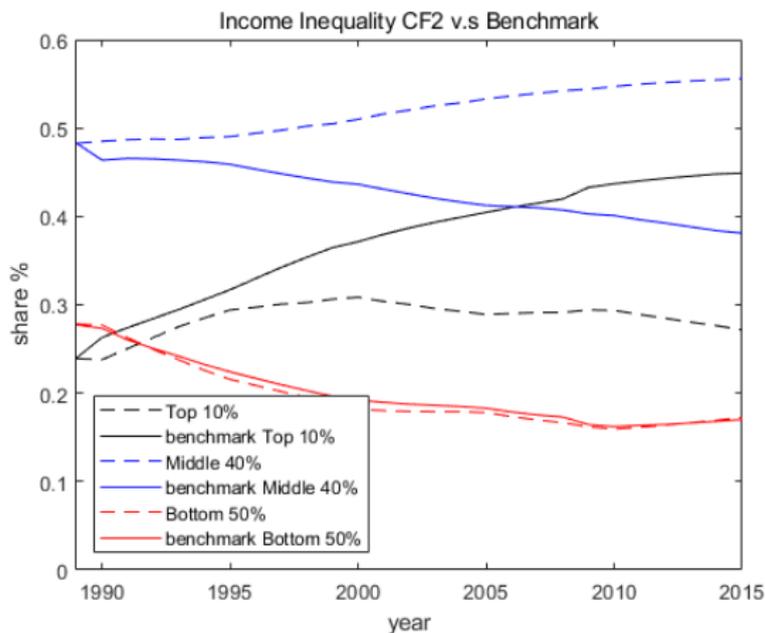
No migration and no private economy



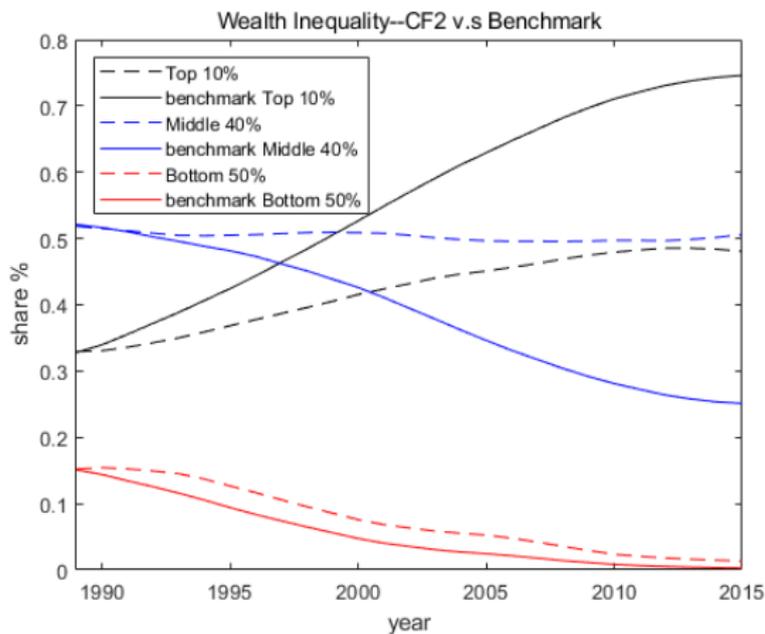
No migration and no private economy



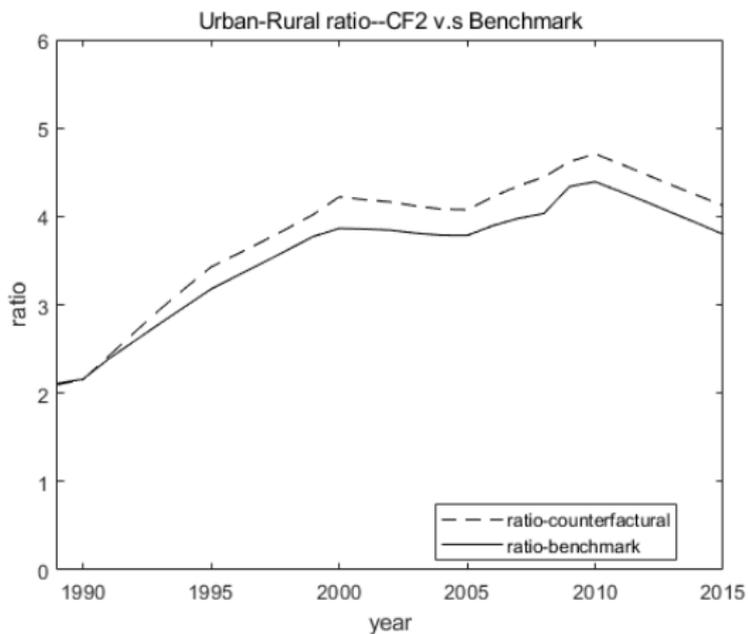
No private economy



No private economy

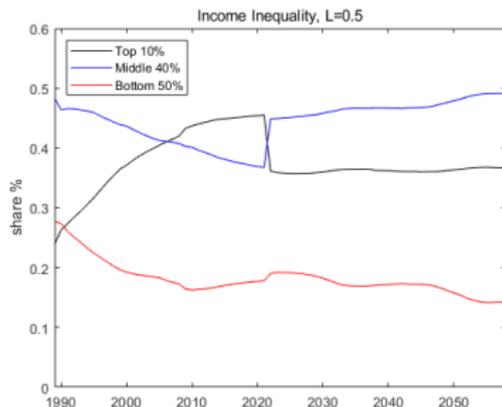
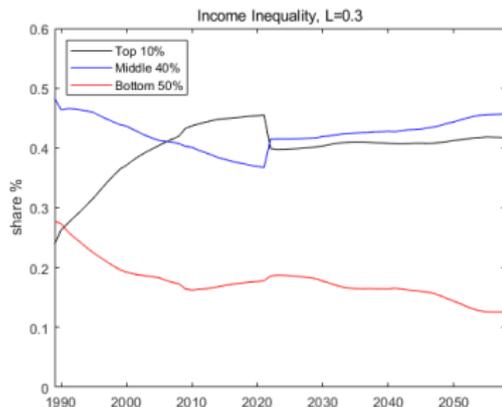
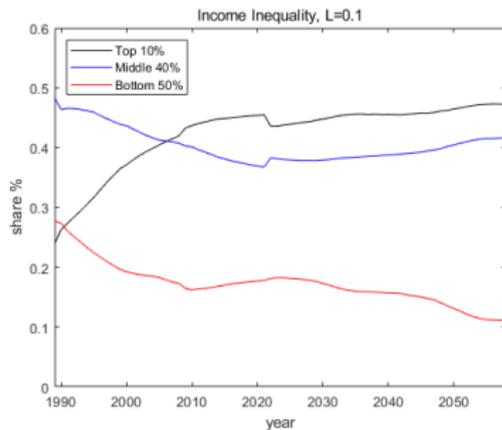
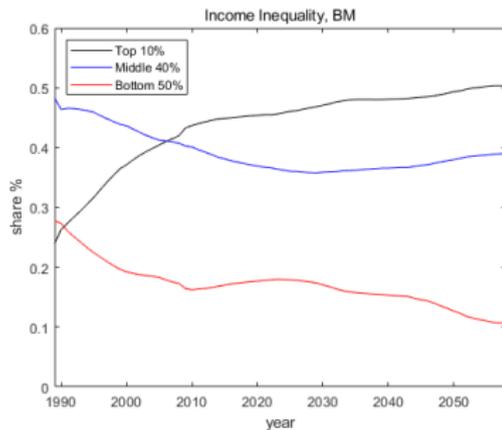


No private economy

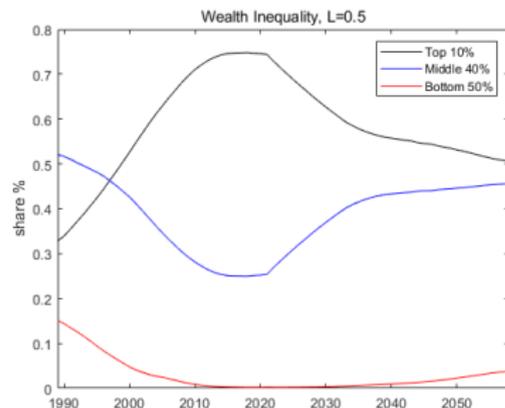
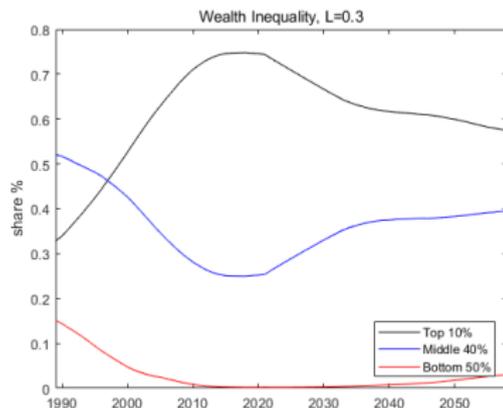
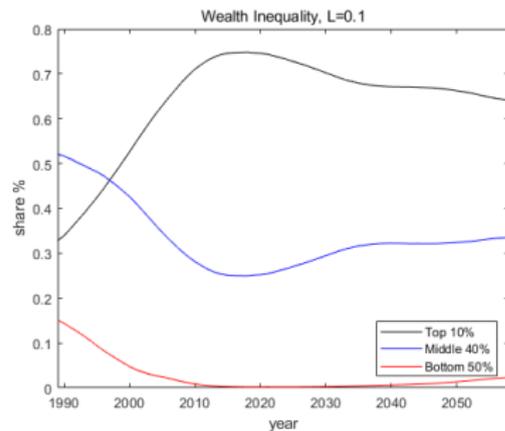
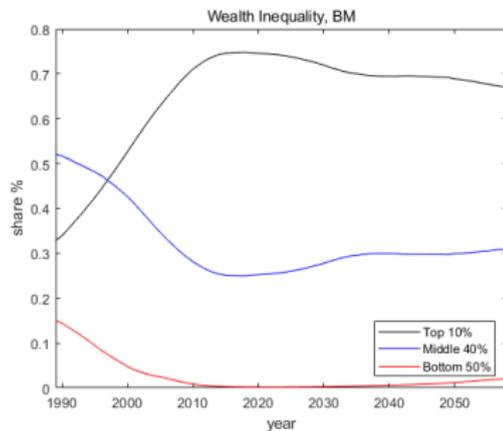


Labor Market Reforms

Income

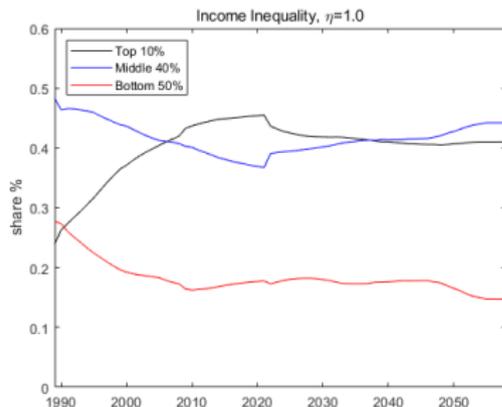
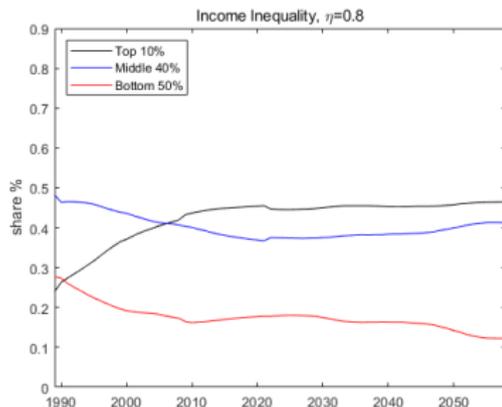
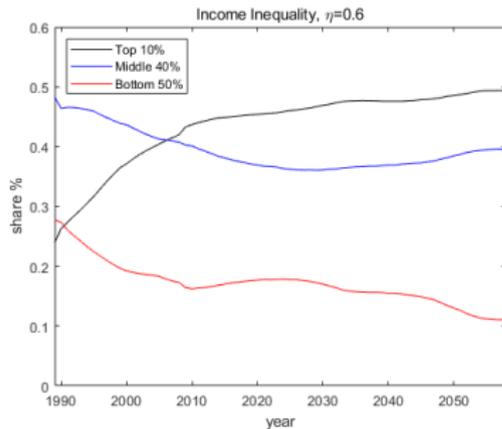
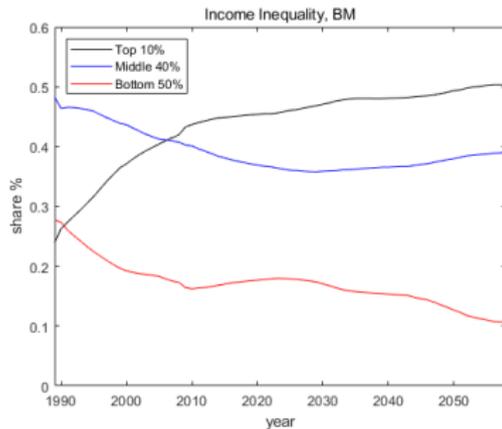


Wealth

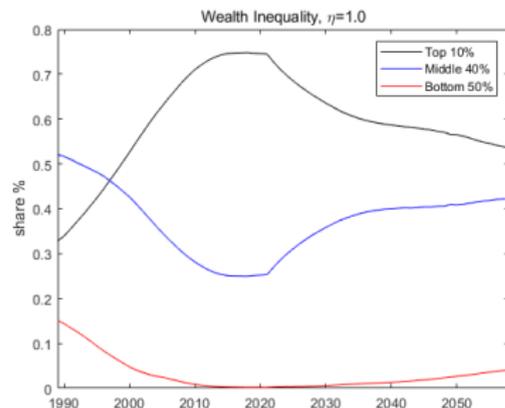
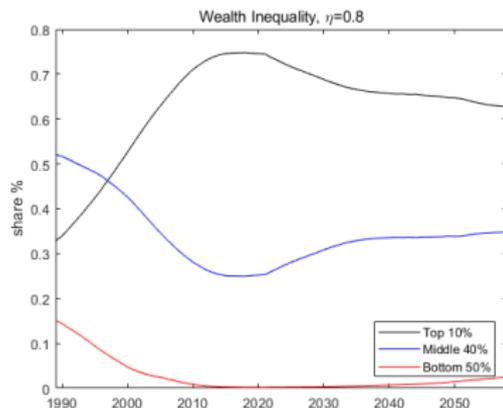
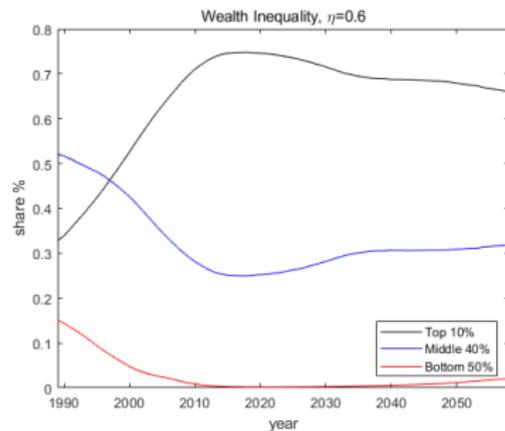
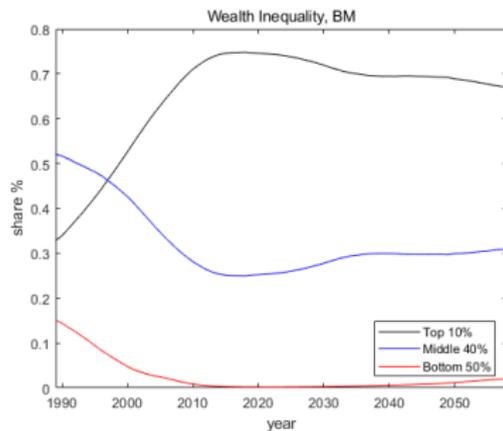


Financial Market Reforms

Income

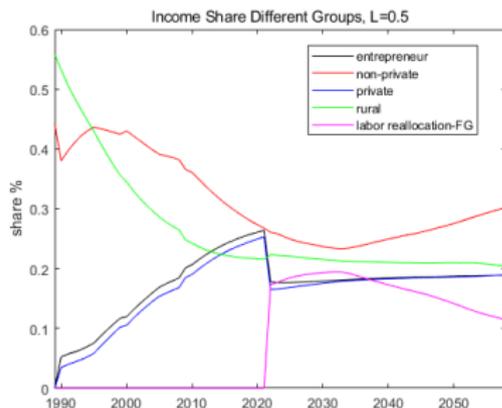
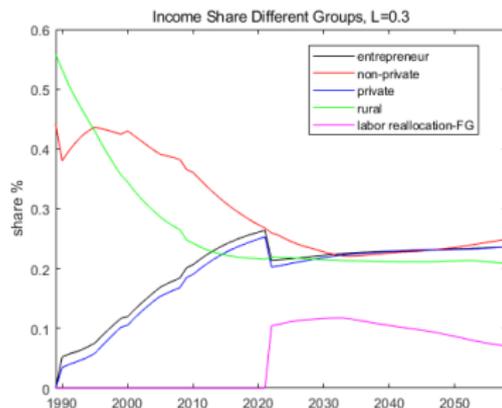
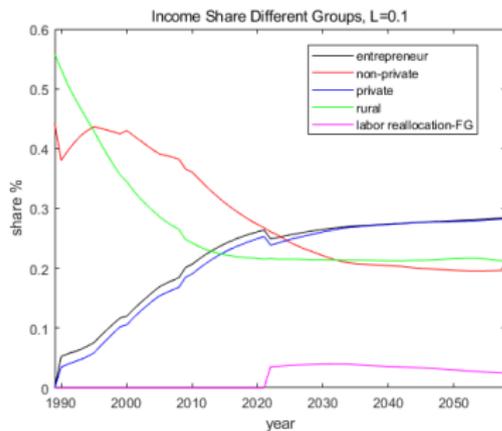
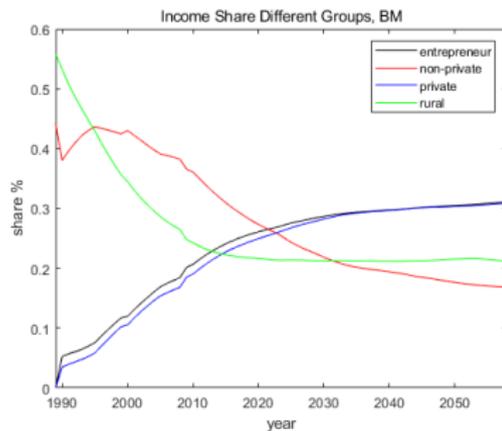


Wealth

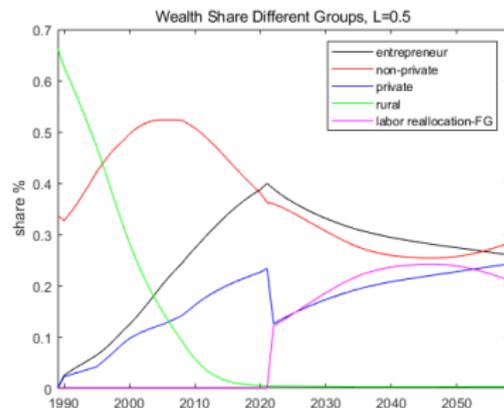
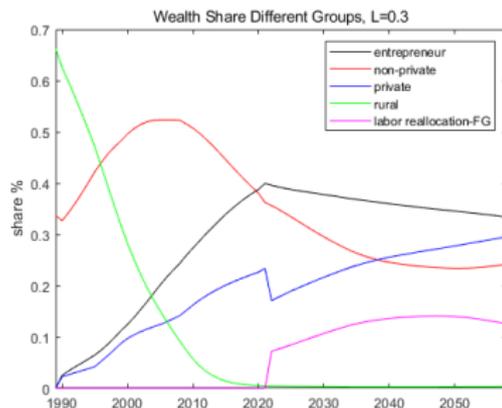
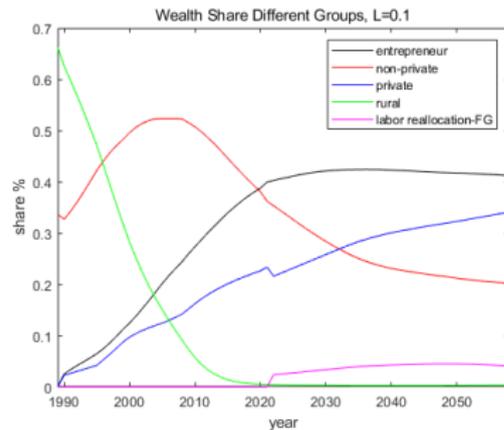
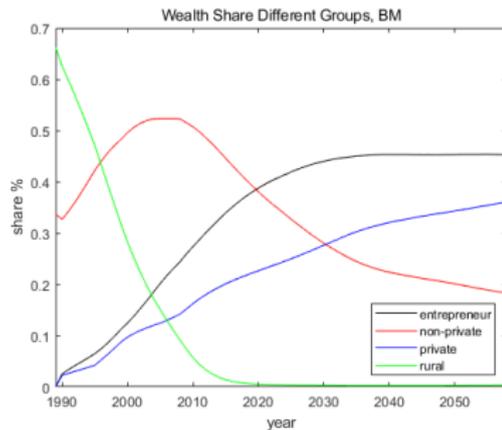


Income and wealth shares in reforms.

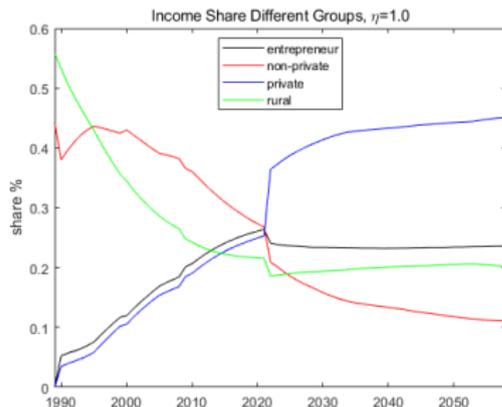
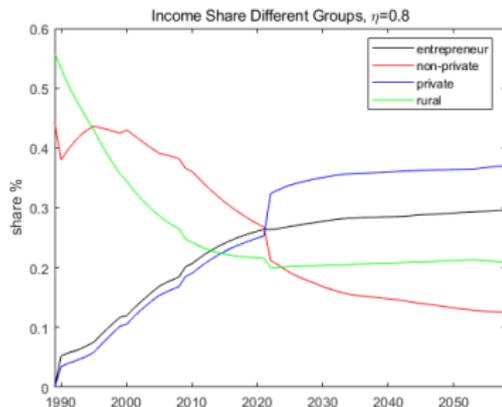
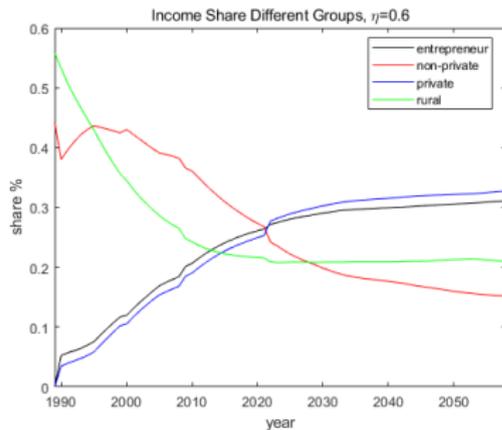
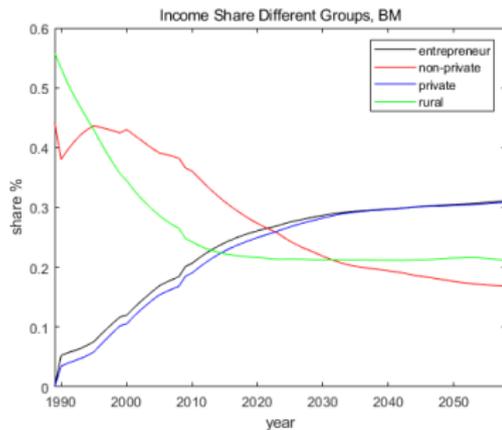
Income share



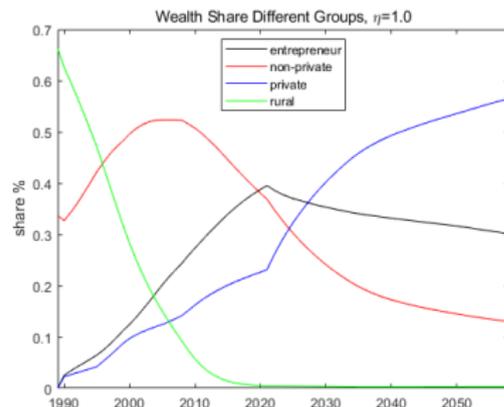
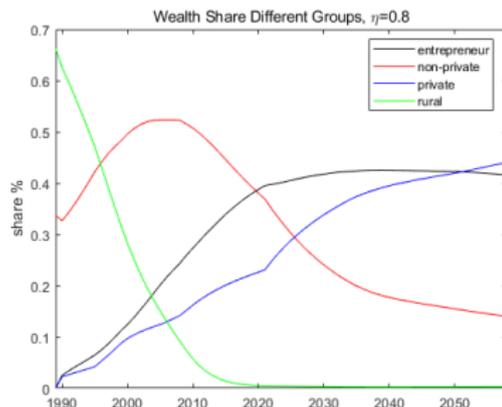
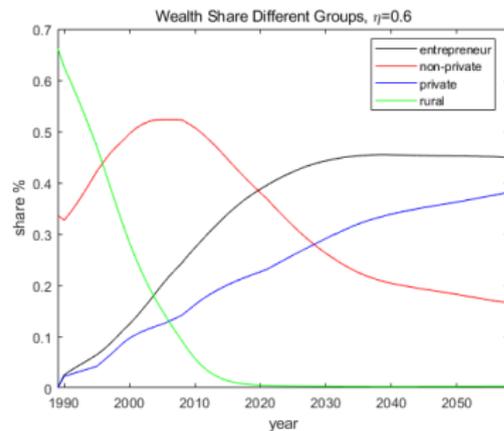
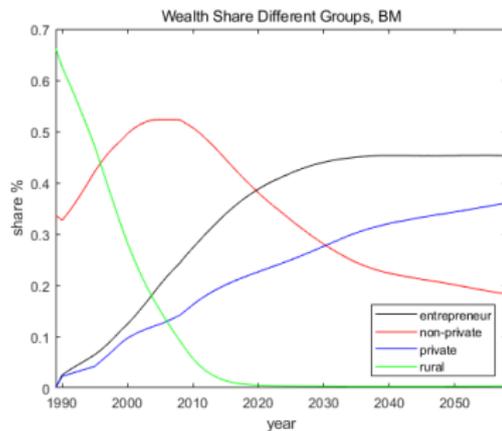
Wealth share



Income share



Wealth share



THANK YOU!