Inequality Assignment 2

Question 2 – Paths of Major Variables

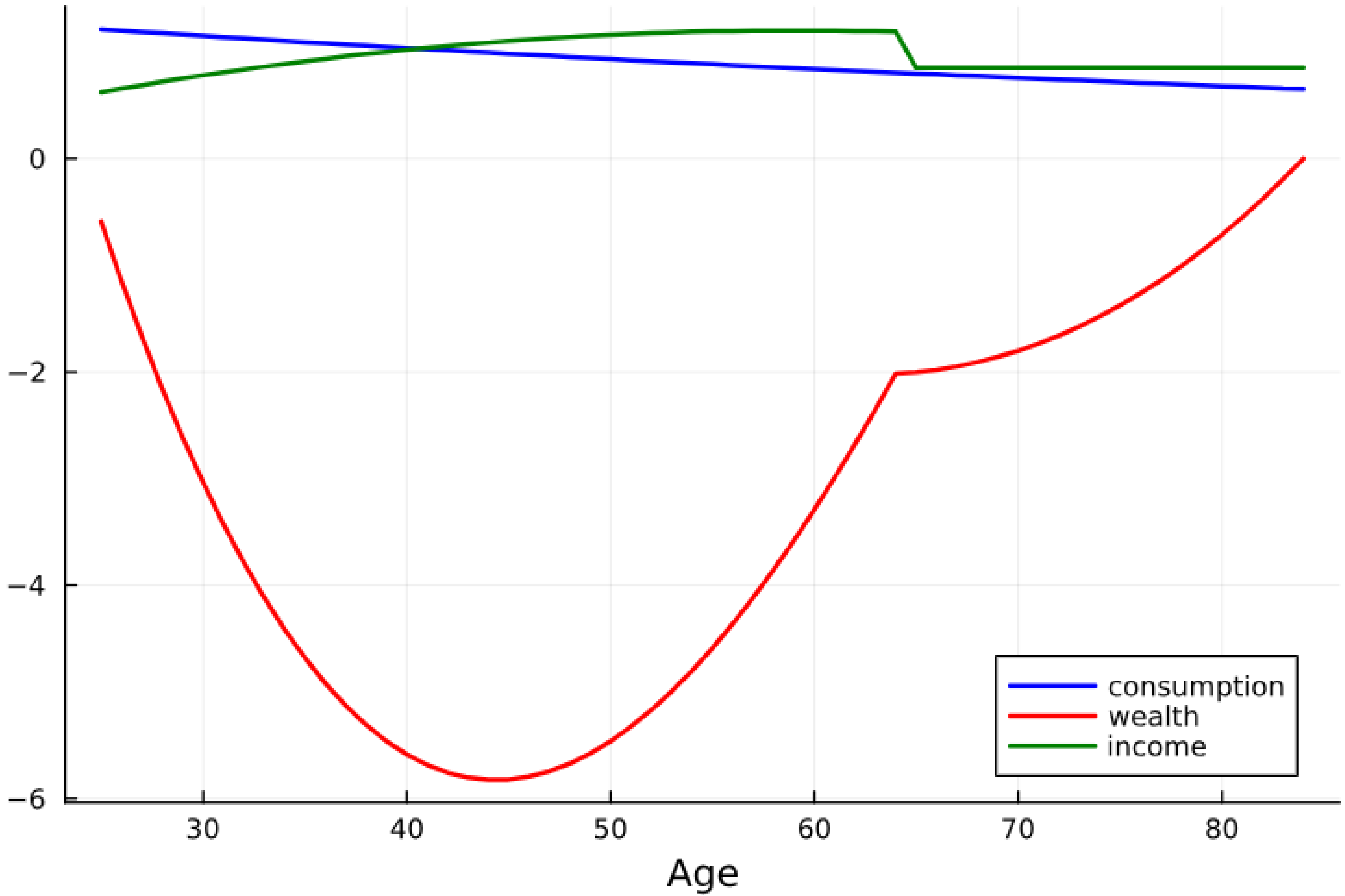
Consider the file 30_$ageprofile.jl$. It contains the same code as 21_$borrowinglimits.$ but now we introduce a semi-realistic age-profile for income, i.e. for individual i when of age t, income equals $f_t \cdot y_{it}$ where f_t is a deterministic age-dependent component and y_{it} is the random component. From now on we interpret timing in the following way: First period corresponds to age 25 individuals, while $T = 60$ corresponds to 84-year-old individuals. As in the data, the age-profile of income grows for the young, flattens out around age 50 and drops at retirement (age 65), after which it stays constant. If you want to see where the code changed due to the income profile, you should simply ctrl/command+f for fs. I also included the $solve\_simul$ function from Monday's class in the script.

Throughout this exercise, we consider the following three parameter combinations:

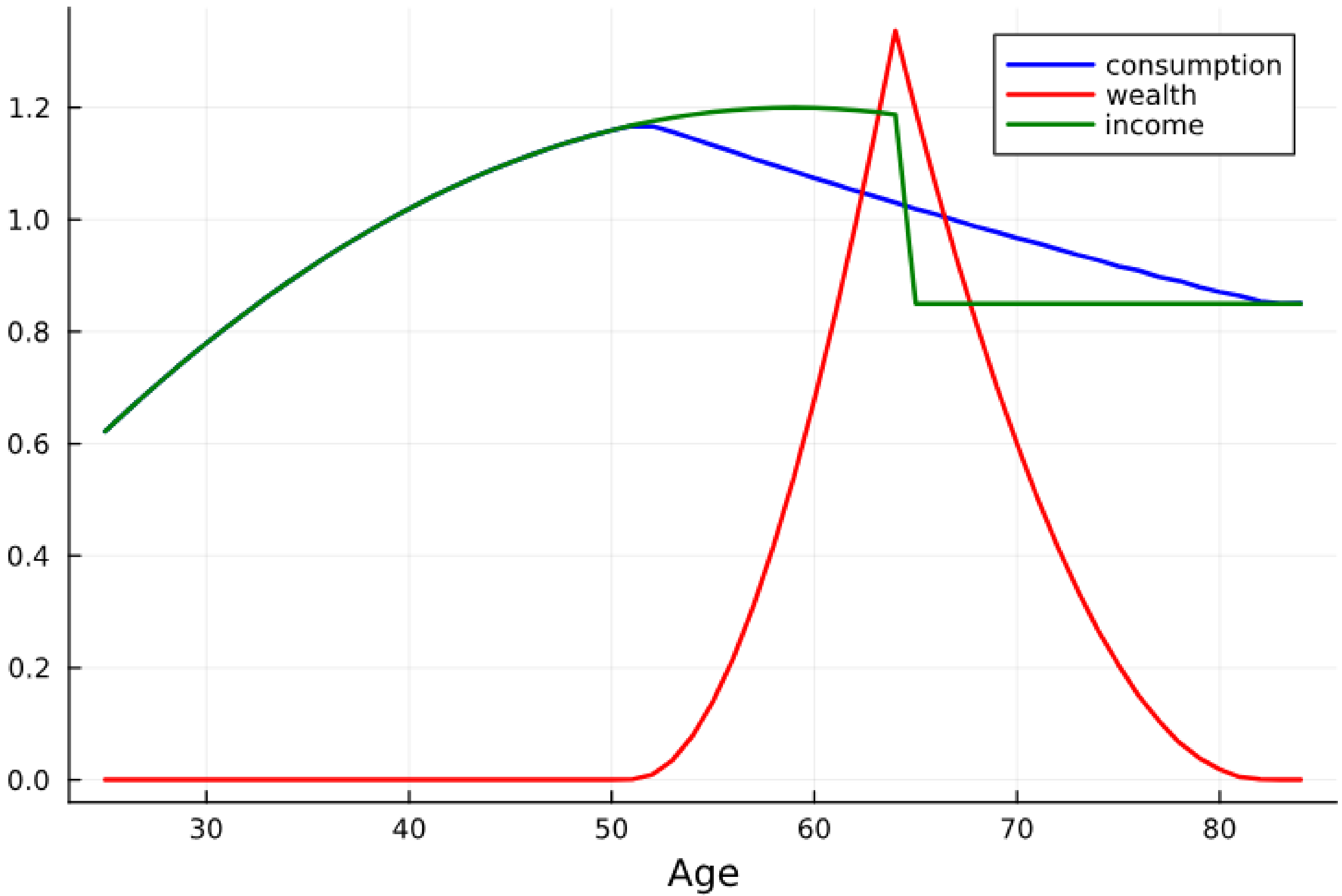
- Model A: $EconPars(ys = [1.0], pys = [1.0], bl = 7.0, \beta = 0.96)$
- Model B: $EconPars(ys = [1.0], pys = [1.0], bl = 0.0, \beta = 0.96)$
- Model C: $EconPars(ys = [0.8, 1.2], pys = [0.5, 0.5], bl = 0.0, \beta = 0.96)$

and I recommended solving the models with $NumPars(max\_coh = 10.0, N\_coh = 500)$.

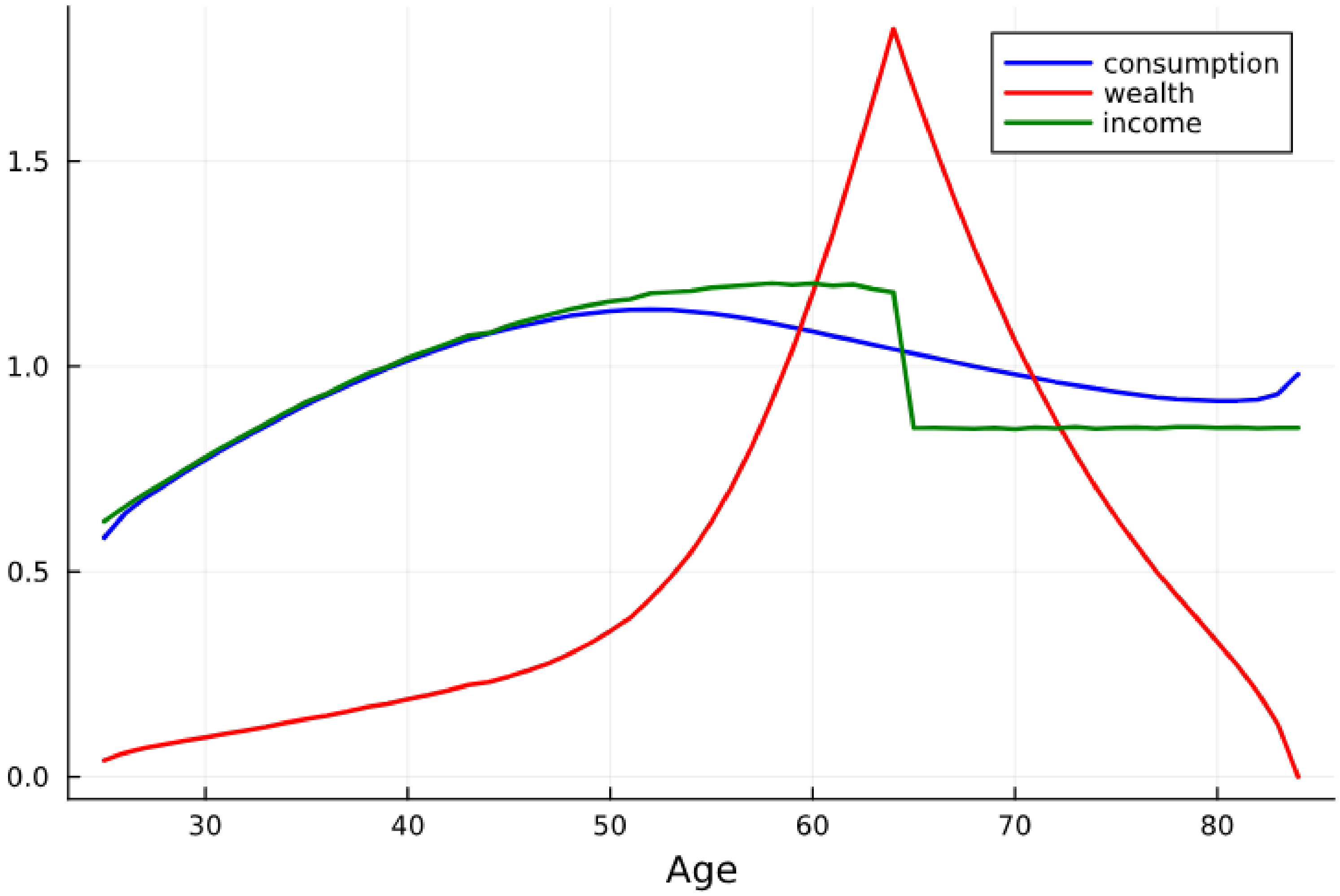
Simulation A



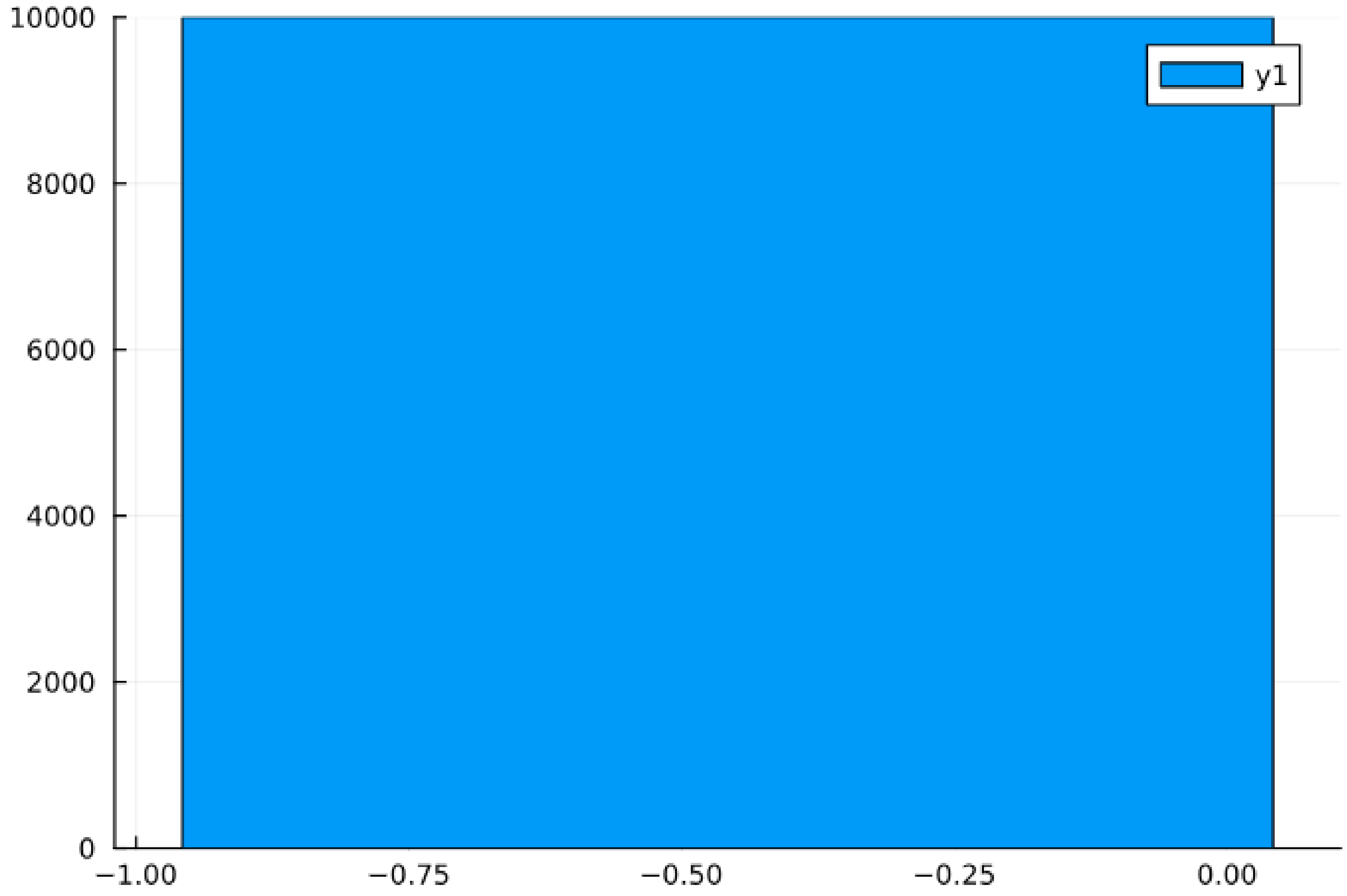
Simulation B



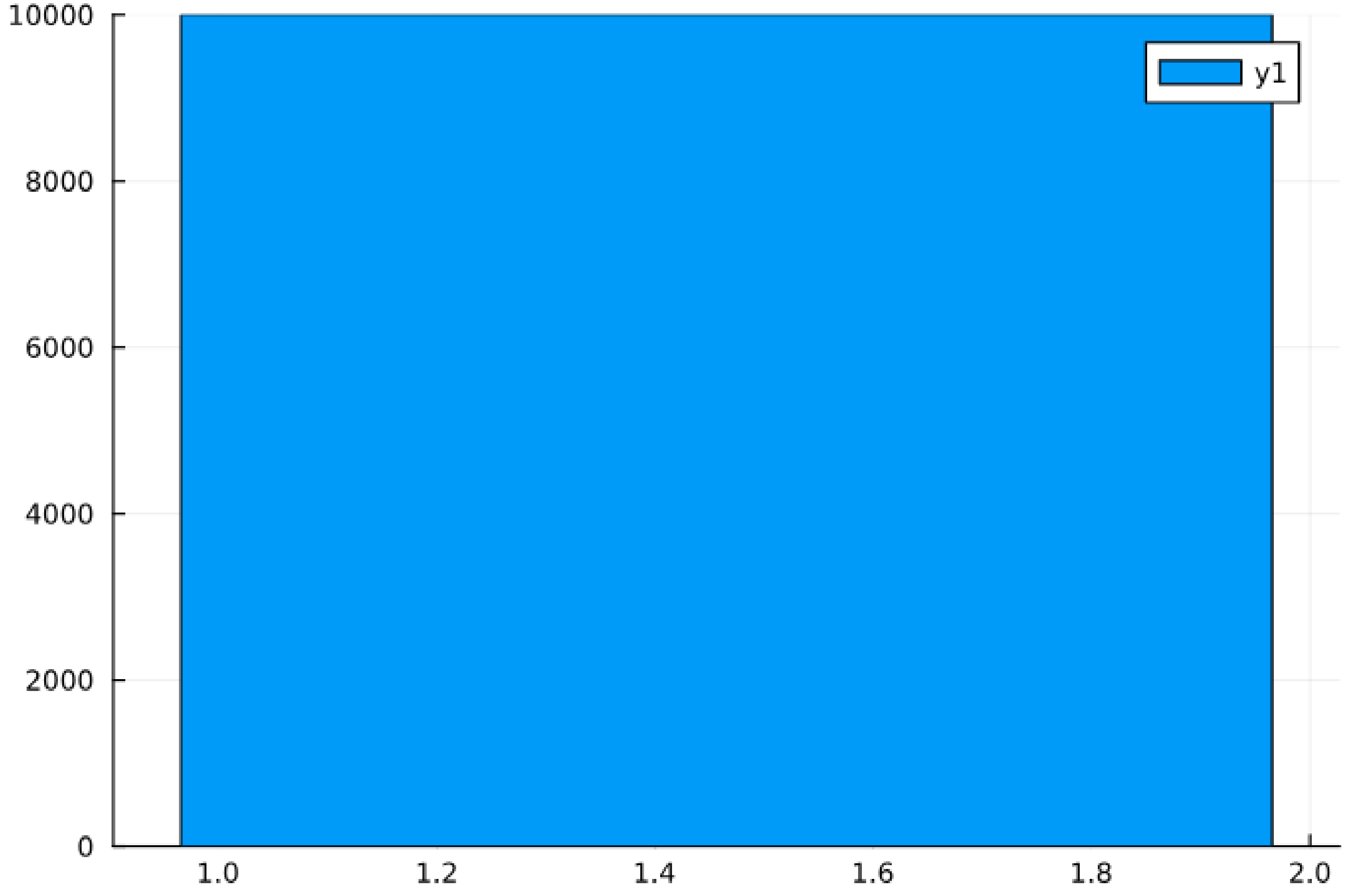
Simulation C

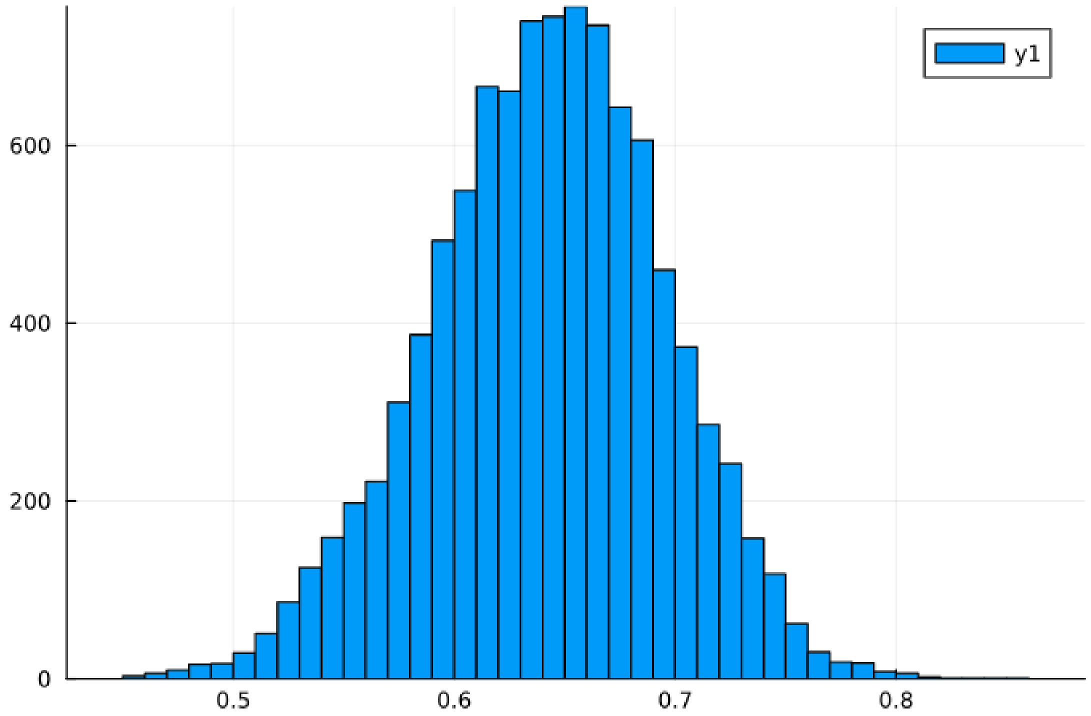


Correlations A



Correlations B





y1
600
400
200
0
0.5
0.6
0.7
0.8

Discuss

3. Comparing the three models regarding
   - the relation between average income and consumption paths over age;
   - and the individual-specific correlations you computed in point 2,

   which of the three models seems to fit best the stylized facts in the data?

Question 3 – A Wealth Tax

3 Wealth tax and inequality

Consider the following modification of the infinite-horizon model considered during the Wednesday lecture:

$$\mathbb{E}\Big[\sum_{t=0}^{\infty} \beta^t u(c_{i,t})\Big]$$

subject to

$$a_{i,t} = (1+r)(1-\tau)a_{i,t-1} + b + y_{i,t} - c_{i,t}$$
$$a_{i,t} \geq 0$$

where τ is a tax rate on wealth and b is a benefit. The idea is that the state collects tax from taxing savings that it distributes back to the population. This of course makes sense only if the budget is balanced, i.e.

$$\sum_{i=1}^{N} \tau(1+r)a_{i,t-1} = Nb$$

The benefit (b) – HH choices

In the HH's decisions:

```
function solve(ep::EconPars, np::NumPars, b::Real; conv_tol = 10^-5, maxiter = 500)
```

The benefit goes into the solving function. The agent must consider this as a potential source of income.

```
coh_future = (1 + r) * a * (1-τ) + ys[yi] + b
```

Here it is as a consideration of future cash on hand, in the value function.

```
coh_future = (1 + r) * saves[i] * (1-τ) + ys[yi] + b
```

Again, in cash on hand, for the savings grid. The savings grid is also known as the asset grid, it gives all the possible values that assets can take (we have to round). The use here is to, for each value in the grid, give the expected value for next period, which includes (typically) our assets plus their return, the expected income and (in this case) the consideration of taxes on assets and the payment of the benefit.

```
y = rand(y_dist) + b
```

Shows up in every income draw from the simulate function.

The benefit (b) – Budget Balance

In the budget balancing function:

```
sol = solve(ep,np,b)
```

Simulating the economy.

```
(coh_sim, y_sim) = simulate(ep, sol, N, T, b)
```

In the draws of the cash on hand/income.

```
return mean_wealth*(1+ep.r)*τ - b
```

This gives us the budget. The mean wealth by the tax take subtracting the benefit.

```
return find_zero( b-> budget_balance(τ,b), (0,1), atol = 0.001)
```

Using the find_zero function to balance this budget.

Taxes (Tau) – HH choices

The tax rate (τ):

```
τ = 0.0
```

Inside the parameters. Remember that the taus are exogenously set, but b is not, this is determined from the behaviour of the households.

In the HH's decisions:

```
coh_future = (1 + r) * a * (1-τ) + ys[yi] + b
```

In the cash on hand calculations for the value function.

```
coh_future = (1 + r) * saves[i] * (1-τ) + ys[yi] + b
```

In the cash on hand calculations for the savings grid.

```
RHS_of_euler = β * (1+r) * (1-τ) * RHS_of_euler
```

In the Euler (we are, in effect, getting a lower return on our assets)

```
cohs[n,t] = sol.sp(cohs[n,t-1])*(1+ep.r) * (1-ep.τ) + y
```

In the initial cash on hand calcs. The b could also be here, it makes no real difference.

Taxes (Tau) – Budget Balance

The budget balancing functions:

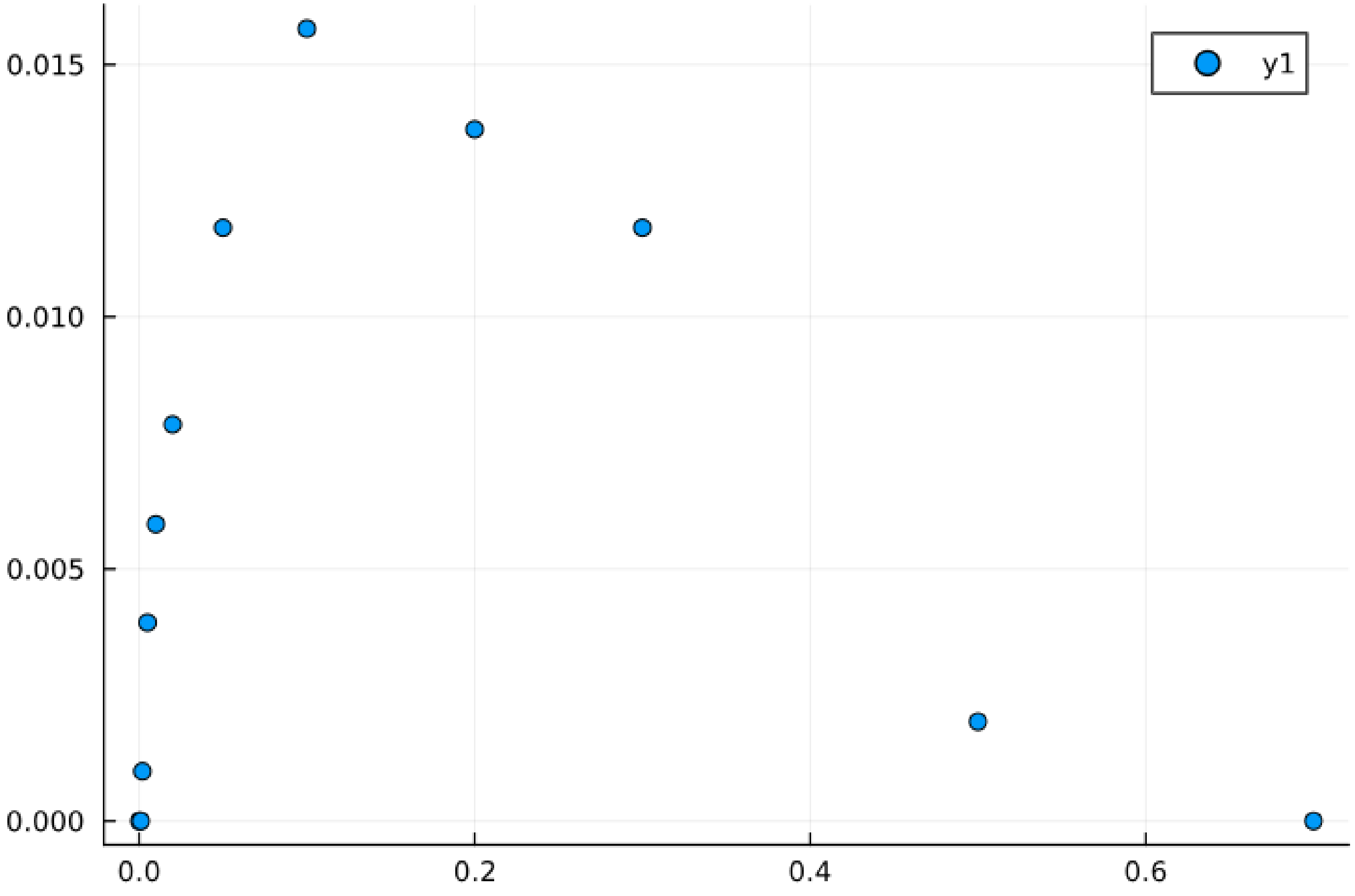
```
return mean_wealth*(1+ep.r)*τ - b
```

Against mean wealth, as we saw earlier.

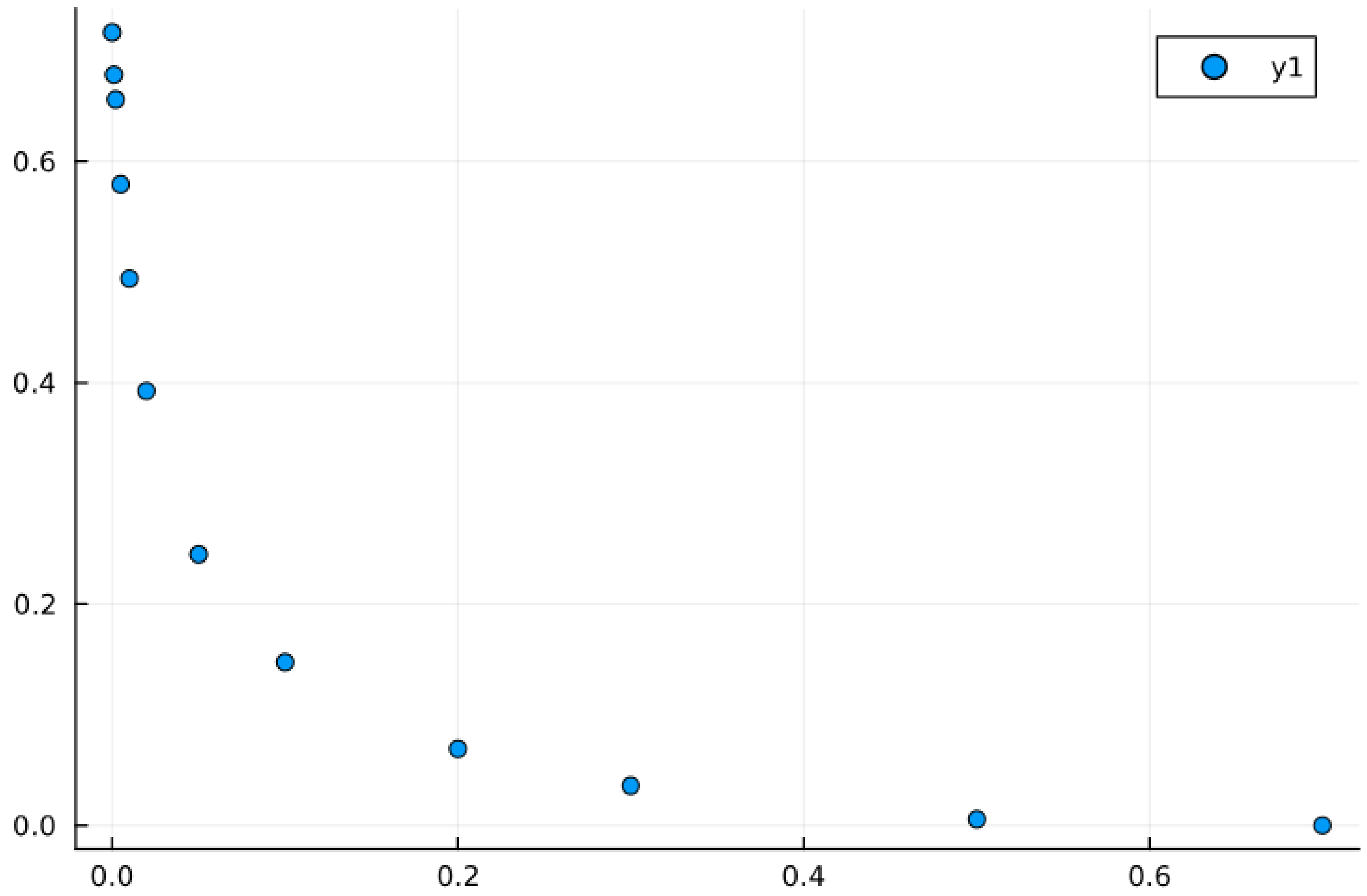
```
return find_zero( b-> budget_balance(τ,b), (0,1), atol = 0.001)
```

In the budget balance as we find the zero.

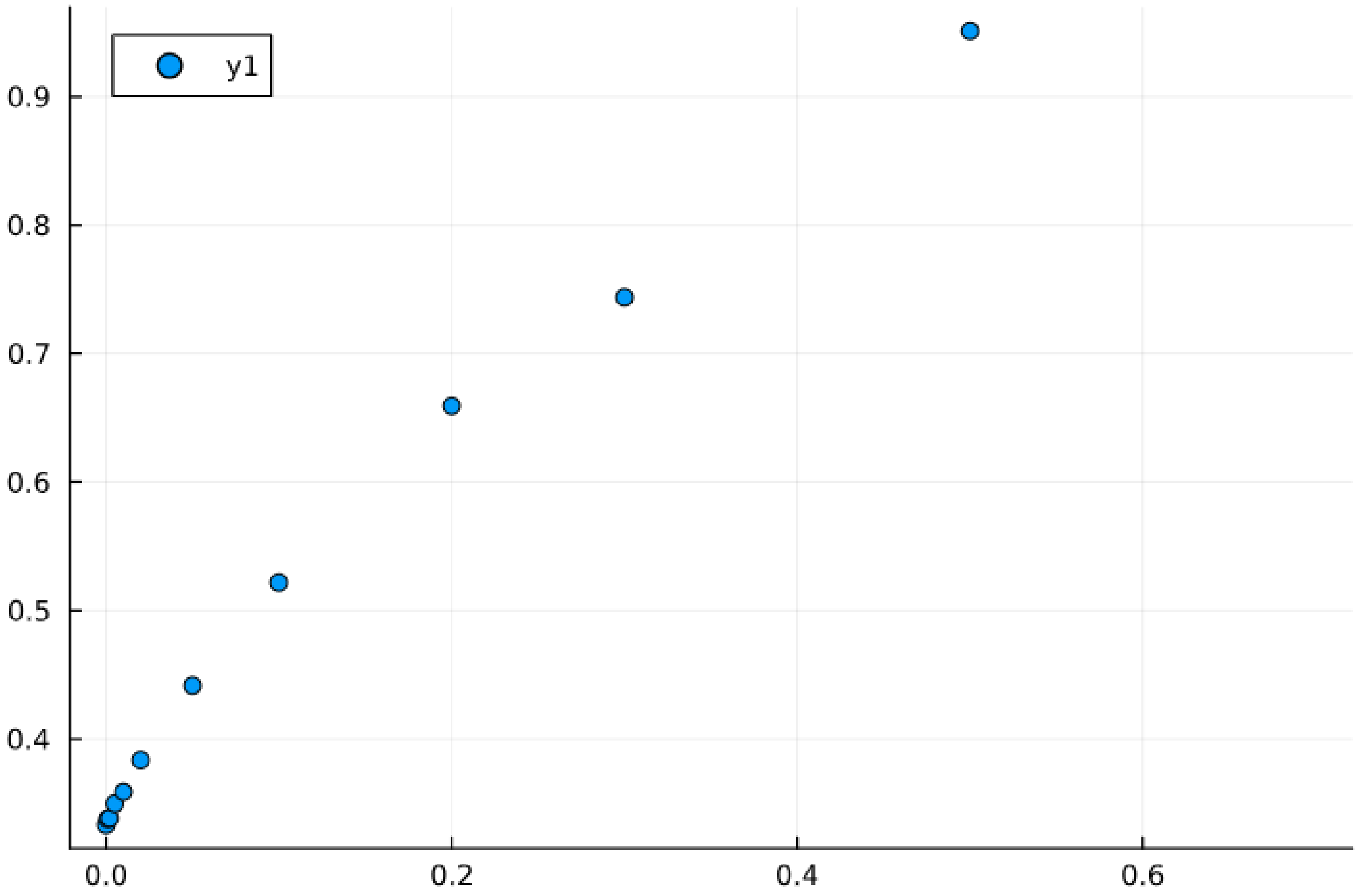
Benefits for different tax rates.



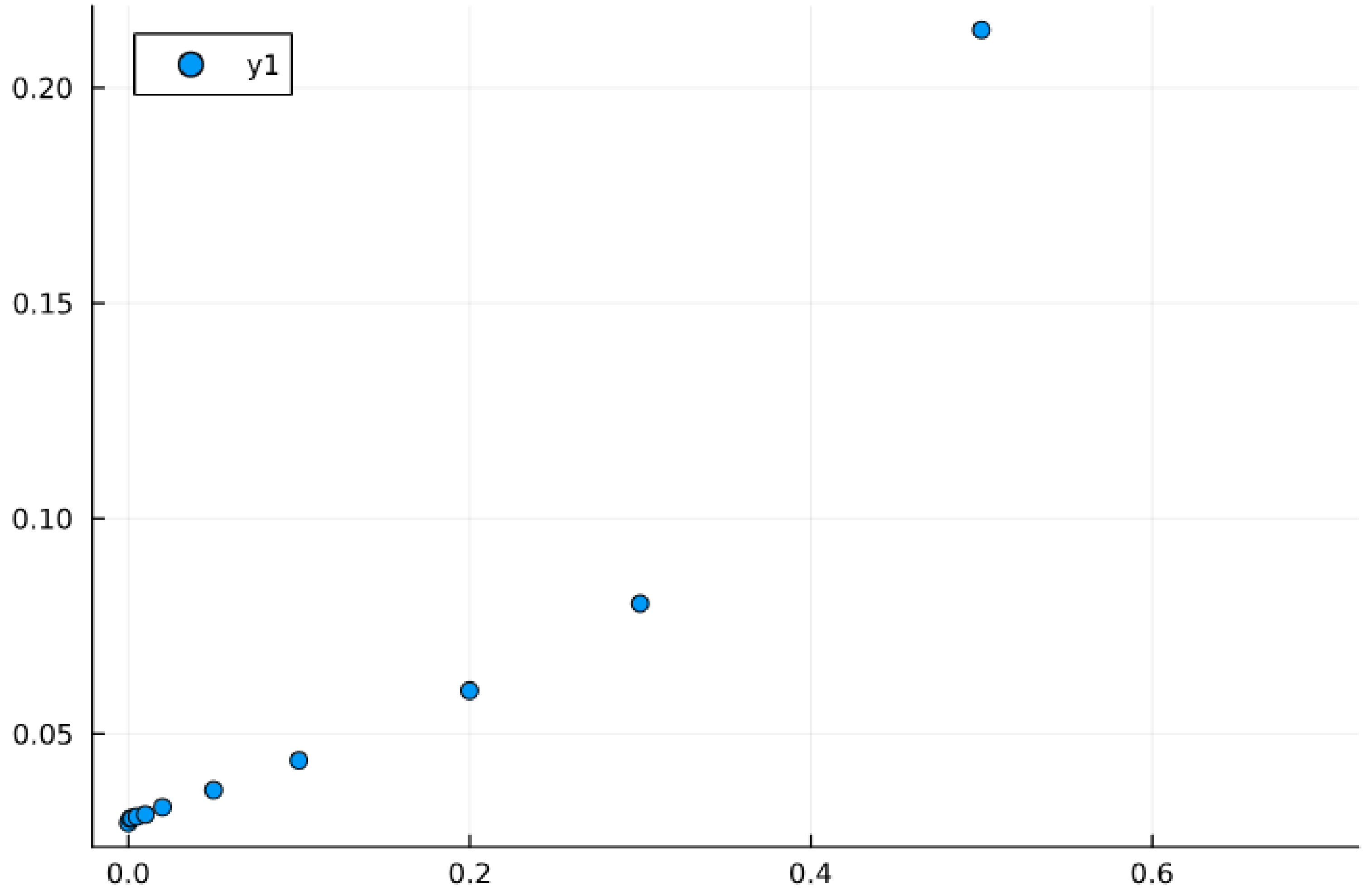
Mean Wealth vs. Tax rate



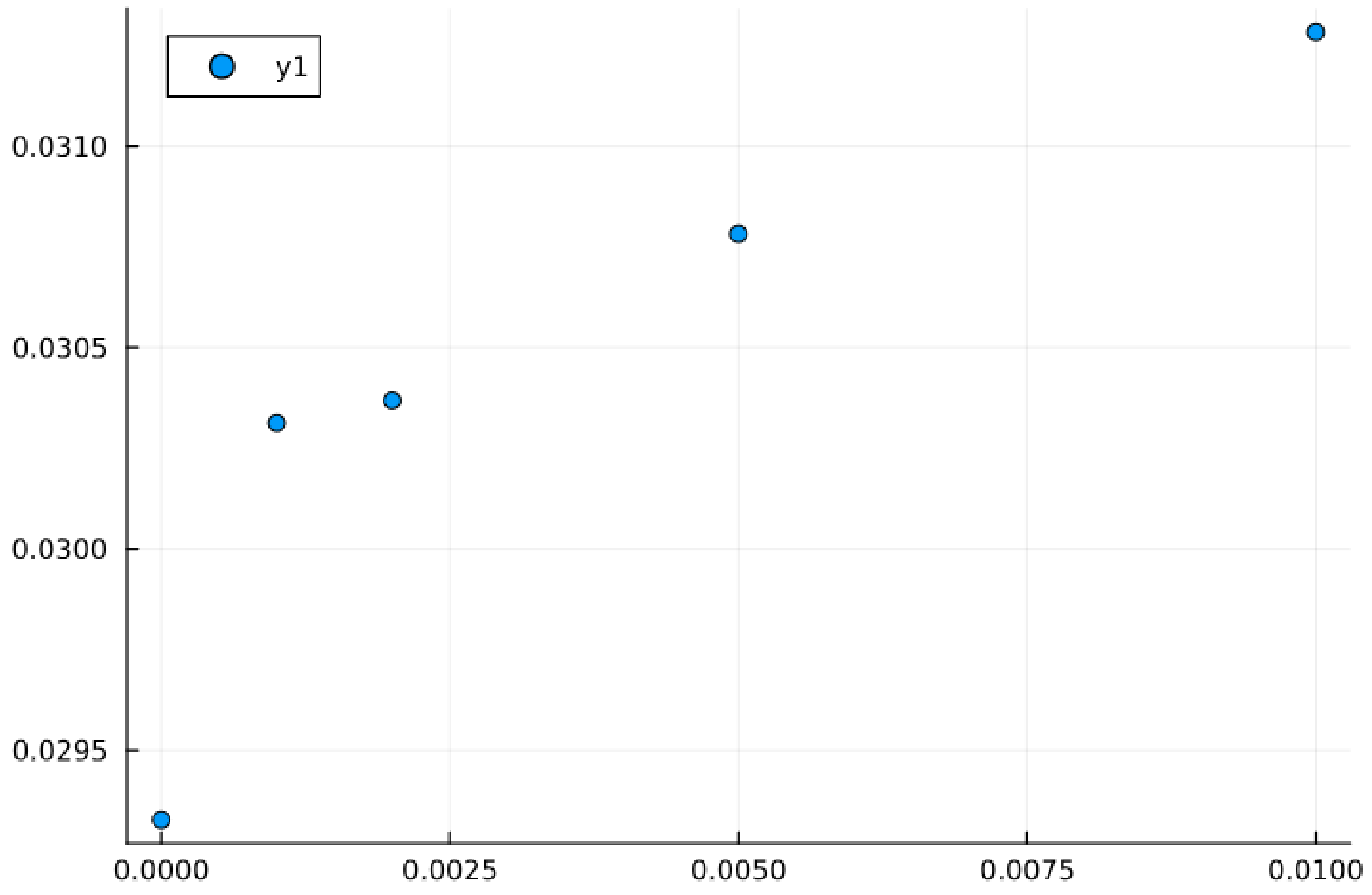
Gini vs. Tax Rate



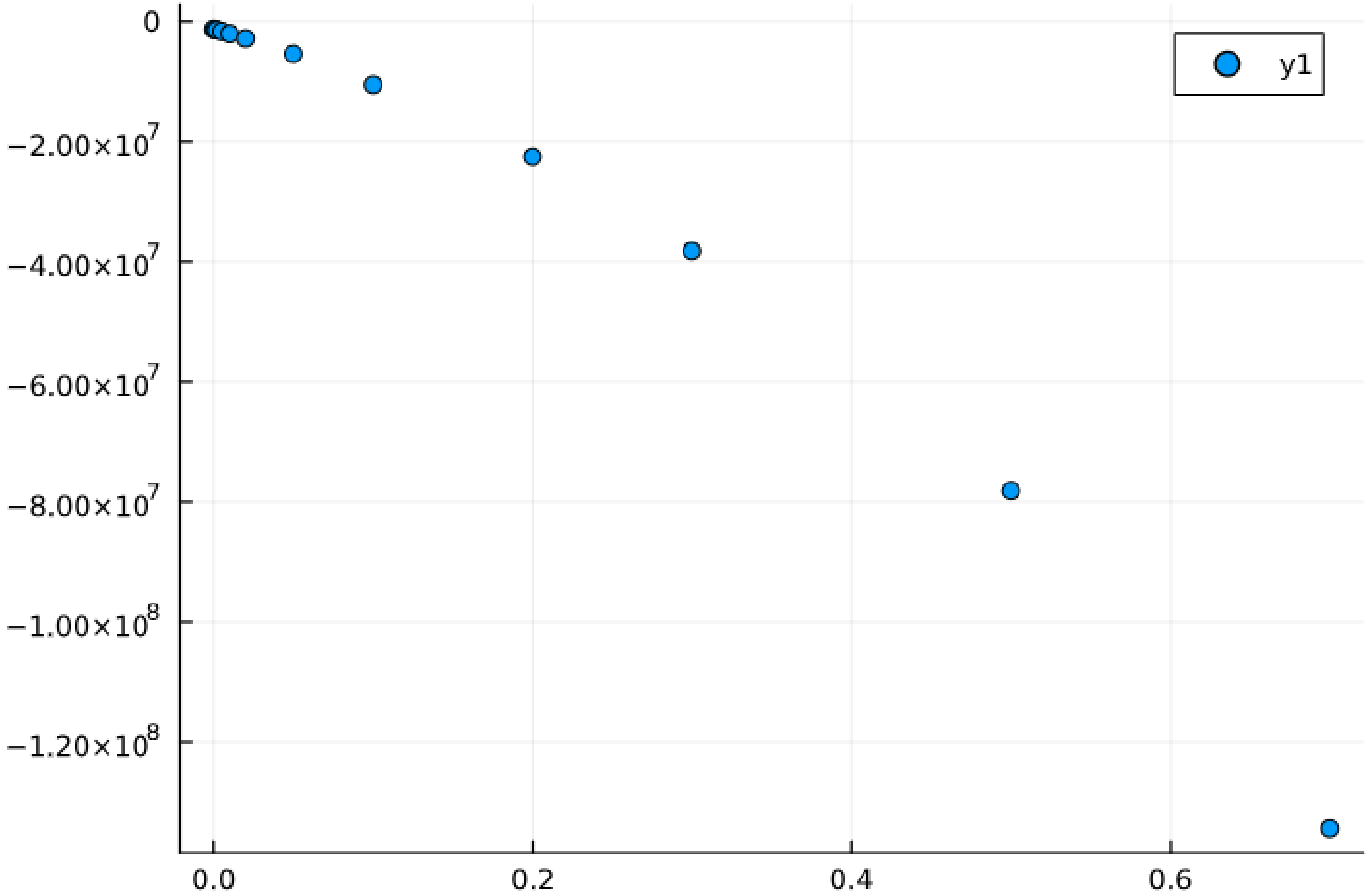
1% Share of Wealth vs. Tax Rate



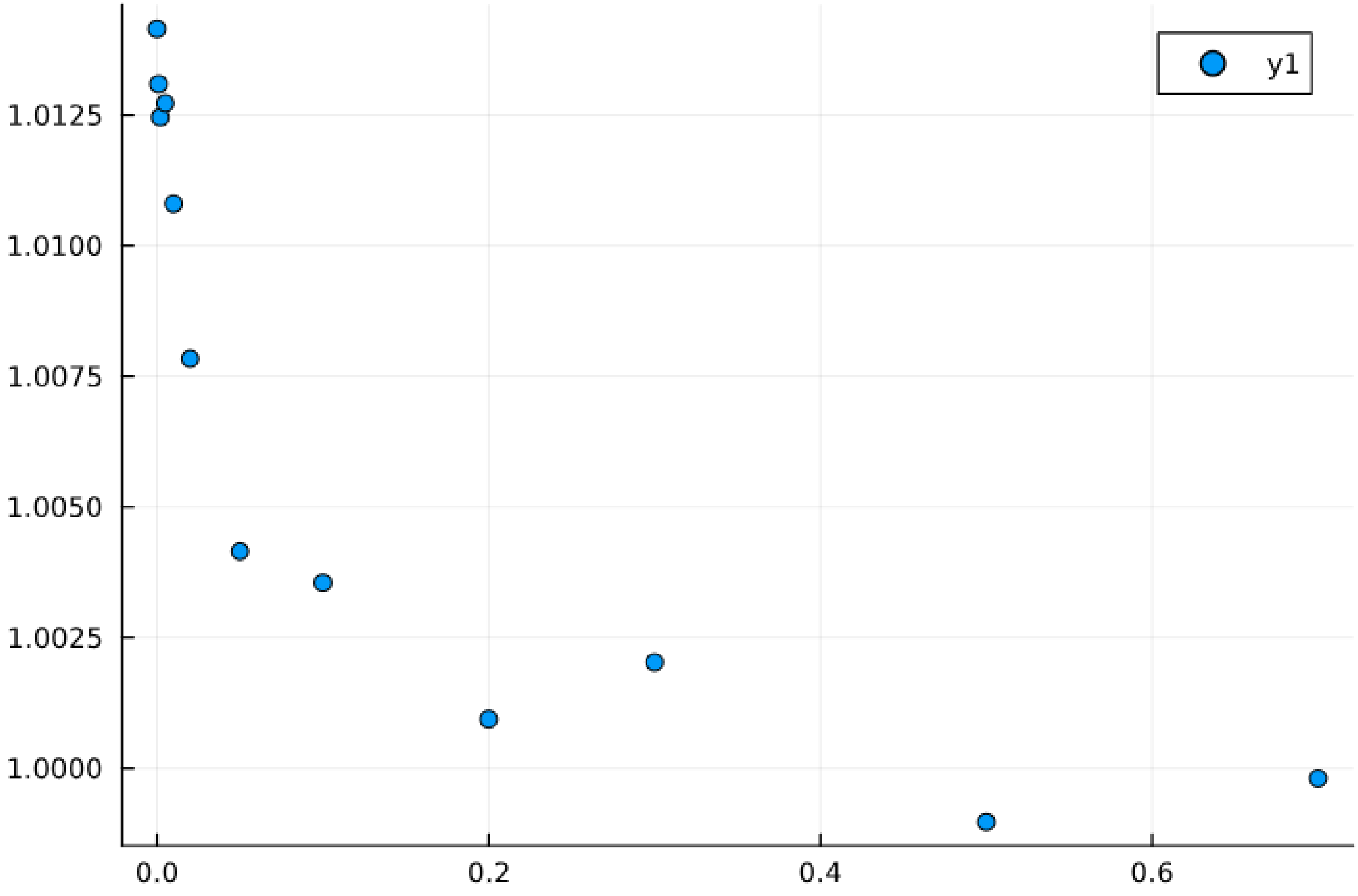
Zooming In



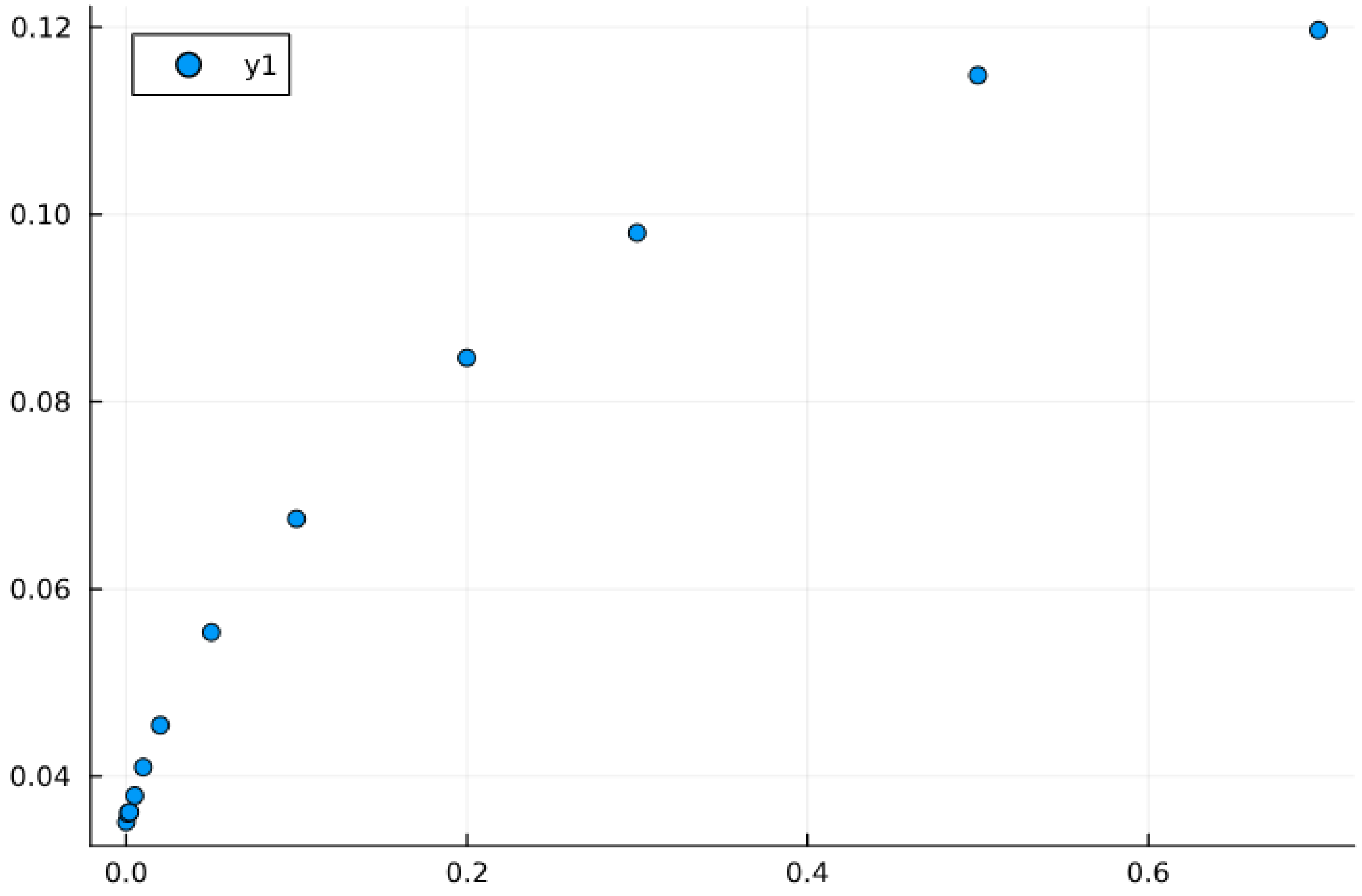
Values vs. Tax Rates



Mean Consumption vs. Tax Rate



Consumption Gini vs. Tax Rate



1% Consumption vs. Tax Rate