

Tax Simulation & Policy Sandbox Results

Name: Paul Andy **Date:** 27 December 2025

1. Overview

In preparation for the Family Resources Survey work, I expanded my initial microsimulation script into a functional Desktop Application.

My objectives were:

1. **Validation:** Ensure the Python logic matches the Stata baseline 100%.
2. **Tooling:** Build a user-friendly interface ([wxPython](#)) to allow non-coders to test tax policy changes dynamically.

2. Tax Parameters (2024/25 Rules)

The model currently uses the standard FY 24/25 parameters:

- **Personal Allowance:** £12,570 (tapers by £1 for every £2 earned over £100k).
- **Basic Rate:** 20% (up to £50,270).
- **Higher Rate:** 40% (up to £125,140).
- **Additional Rate:** 45% (over £125,140).
- **National Insurance:** 8% main rate / 2% upper rate.

3. Baseline Validation (Stata vs. Python)

I generated a control dataset in Stata to serve as the "correct" answer. I then ran the same scenario in my Python App to verify accuracy.

A. Stata Output (Control) For a high earner (£150,000 gross), the Stata script calculates a Net Income of £91,286.40.

StataNow/MP 19.5

Log View

Results

```
(2 real changes made)

: gen net_income = income - tax_due - ni_due

: format income tax_due ni_due net_income %9.2f

: list name income tax_due ni_due net_income, separator(5)



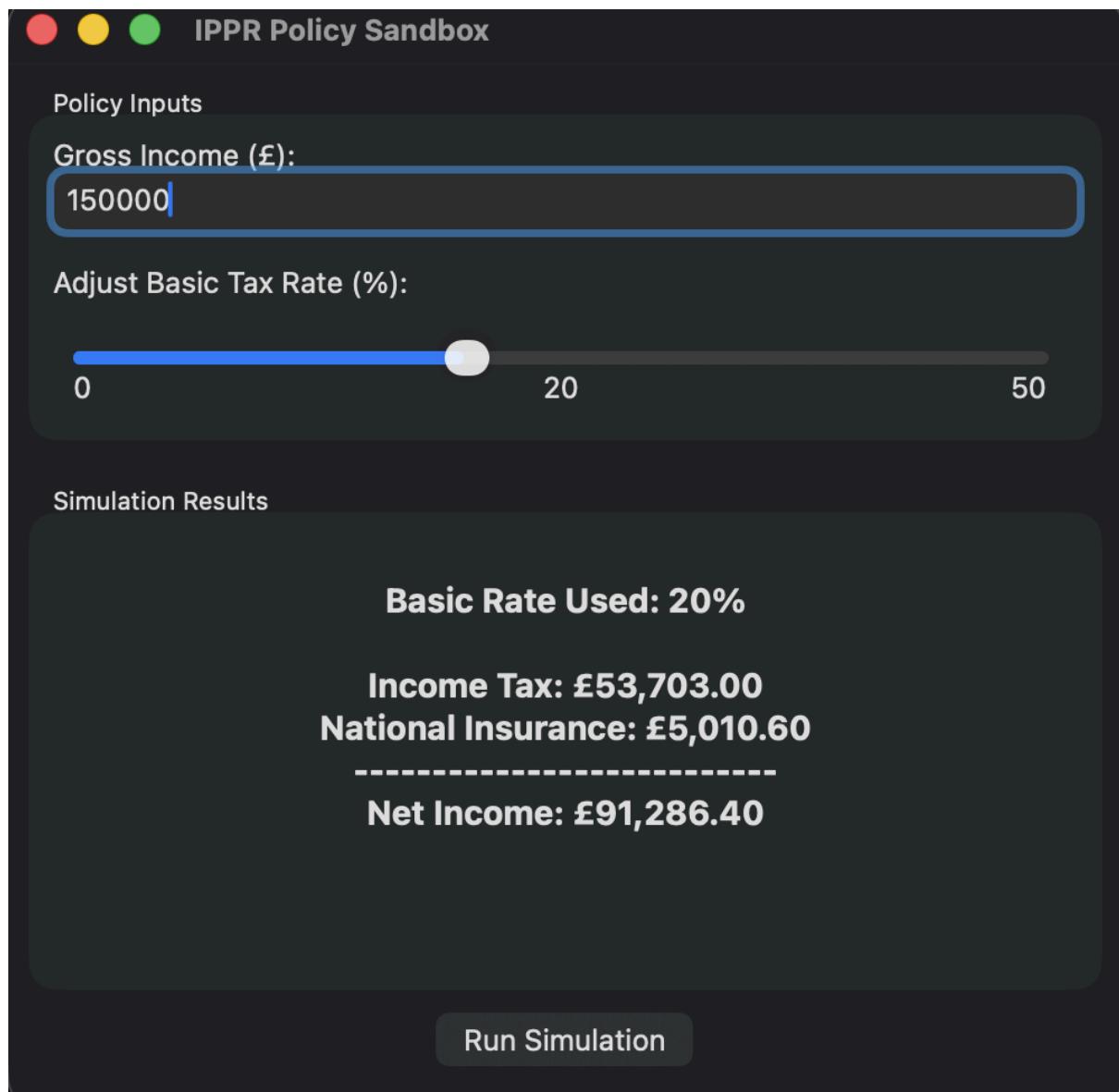
|    | name        | income    | tax_due  | ni_due  | net_in~e |
|----|-------------|-----------|----------|---------|----------|
| 1. | Low Earner  | 12000.00  | 0.00     | 0.00    | 12000.00 |
| 2. | Basic Rate  | 25000.00  | 2486.00  | 994.40  | 21519.60 |
| 3. | Threshold   | 50270.00  | 7540.00  | 3016.00 | 39714.00 |
| 4. | Higher Rate | 80000.00  | 19432.00 | 3610.60 | 56957.40 |
| 5. | Add. Rate   | 150000.00 | 53703.00 | 5010.60 | 91286.40 |



: end of do-file
```

(Caption: Stata terminal showing the control figures for the 5 mock individuals)

B. Python App Output (Test) I ran the exact same £150,000 scenario through the new Python GUI. The figures match the Stata baseline exactly.



(Caption: Python GUI confirming £91,286.40 Net Income, matching the Stata model)

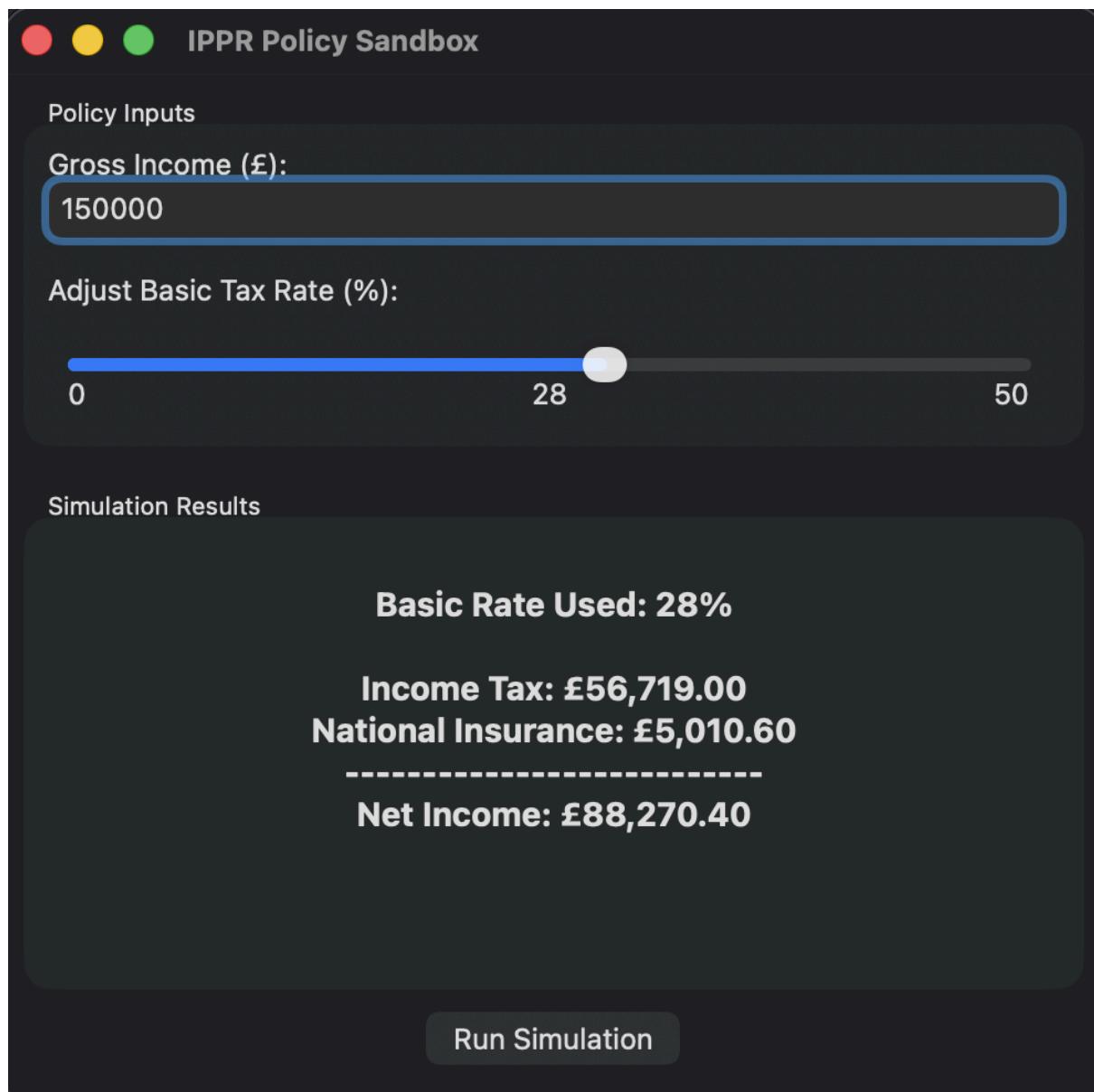
4. Policy Sandbox (New Functionality)

To demonstrate the "Desirable" requirement for **wxPython**, I built a graphical interface that allows users to modify tax parameters in real-time.

Scenario: "What if the Basic Tax Rate increased from 20% to 28%?"

Simulation Result:

- **Gross Income:** £150,000
- **New Basic Rate:** 28%
- **Impact:** Net Income drops from £91,286.40 to £88,270.40.



(Caption: Dynamic policy testing showing the immediate financial impact of an 8% tax rise)

5. Conclusion

- **Accuracy:** The Python logic is validated against the Stata script.
- **Usability:** The GUI allows for rapid policy testing without touching the code.
- **Readiness:** The environment (Pandas, wxPython, Stata) is fully operational for the January start.