

ISDC 2026 · Delft · Supply Chain and Labor Market Instability

Education Mismatch, NEETs, and Macroeconomic Performance

A system dynamics model of youth detachment as a macro-relevant stock

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PRESENTING

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Türkiye has the highest NEET rate in the OECD

And it has persisted across economic cycles

NEETs



Neither in Education nor in Employment or Training

26.4%

Türkiye

12.8%

OECD average

Persistence across cycles points to structural frictions rather than cyclical fluctuation alone.

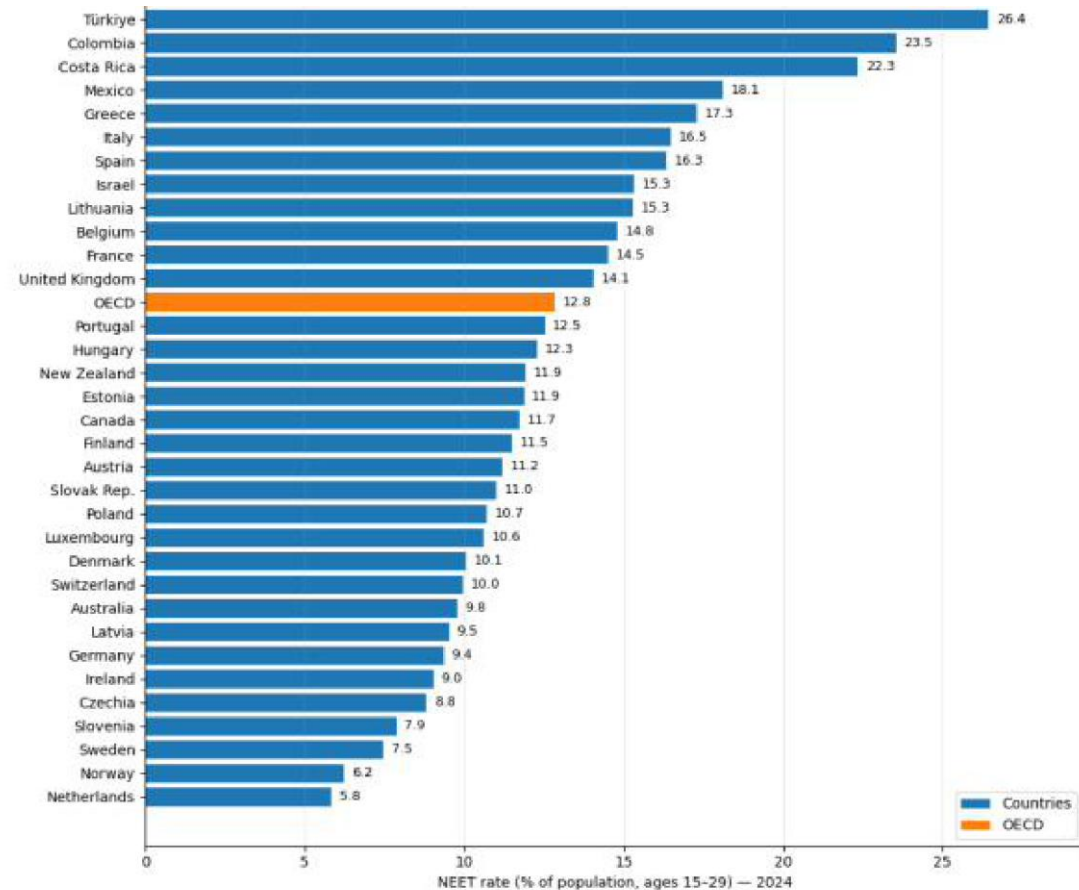


Figure 1: NEET percentages of 15–29 age population for OECD countries. Source: [OECD \(2024\)](#)

The human capital illusion

Hanushek et al. (2015): expansion can be large without a proportional gain in productive human capital

1

Seats expand fast

University capacity scales linearly with realized education spending.

2

Faculty expands slowly

Academic staff scales with an elasticity of 0.1 — the slow-moving input that sustains quality.

3

Quality dilutes

Student–staff ratios worsen; the diploma becomes a weaker proxy for skill.

The problem is not simply too many graduates, but graduates with the wrong mix of capabilities — fuelling underemployment, credential inflation, prolonged search, and eventual withdrawal into inactivity.

NEET as a stock, not a residual category

Standard usage

A point-in-time indicator covering both unemployed and inactive youth outside education and training.

This paper

A narrower operationalization: the inactivity margin — youth who have effectively withdrawn from active labor-force participation.

NEET is not only a symptom of mismatch, but also a mechanism through which mismatch feeds back into macroeconomic performance.

Contribution

To model NEET accumulation as a stock generated by education–labor mismatch and discouragement, and to show **how that stock feeds back into effective labor supply, output, and macroeconomic performance.**

Model boundary



The simplifications are deliberate and they shape what the results can claim

Inside

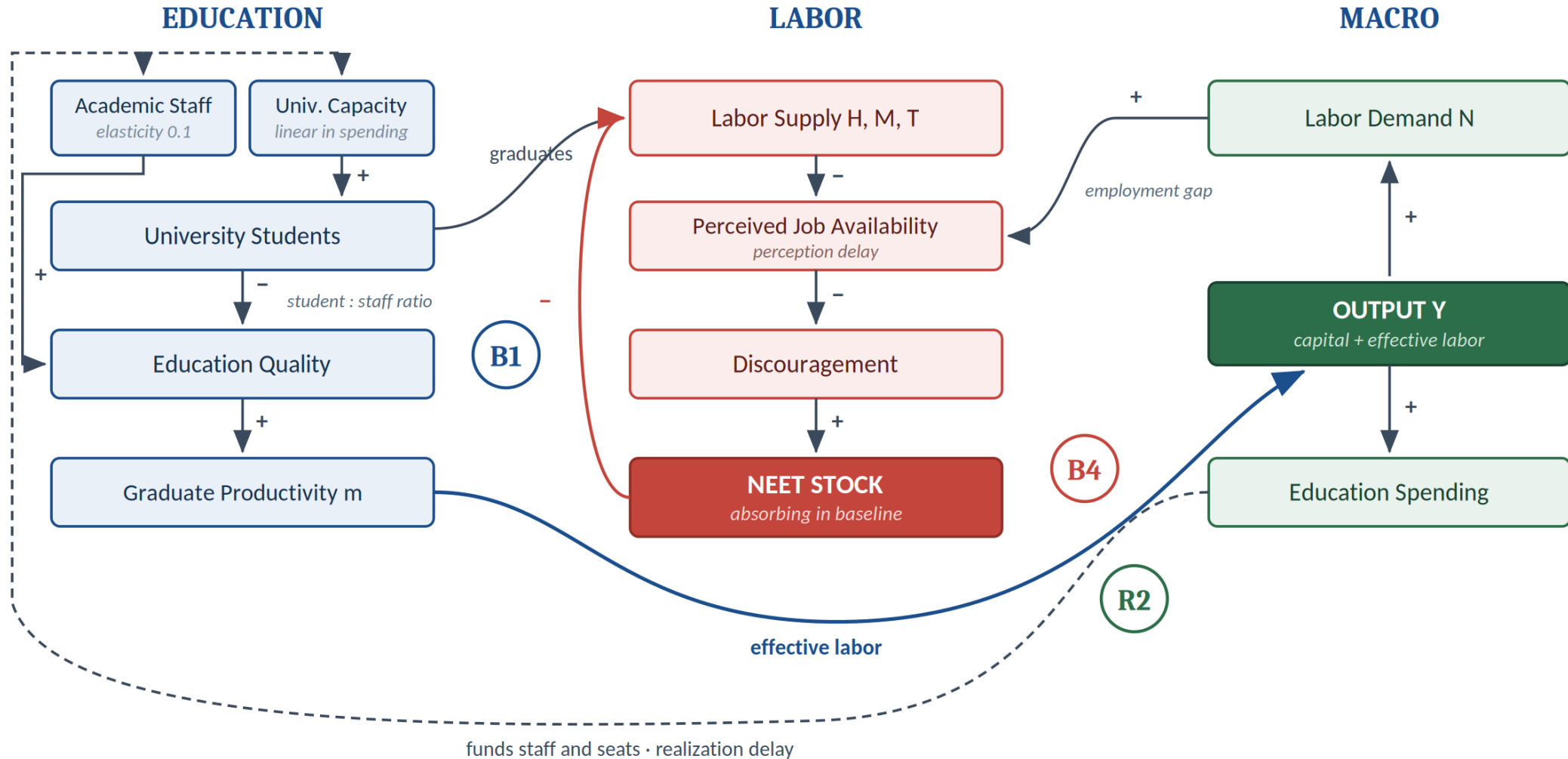
- Education aging chain with elite / mass / vocational track splits
- Low- and high-income youth facing different transition rates
- Tertiary capacity and quality constraints; DGS vertical transfer
- Three labor tiers with perception-delayed discouragement
- **NEET stocks, absorbing in the baseline specification**
- Solow–Swan macro block with education-adjusted effective labor

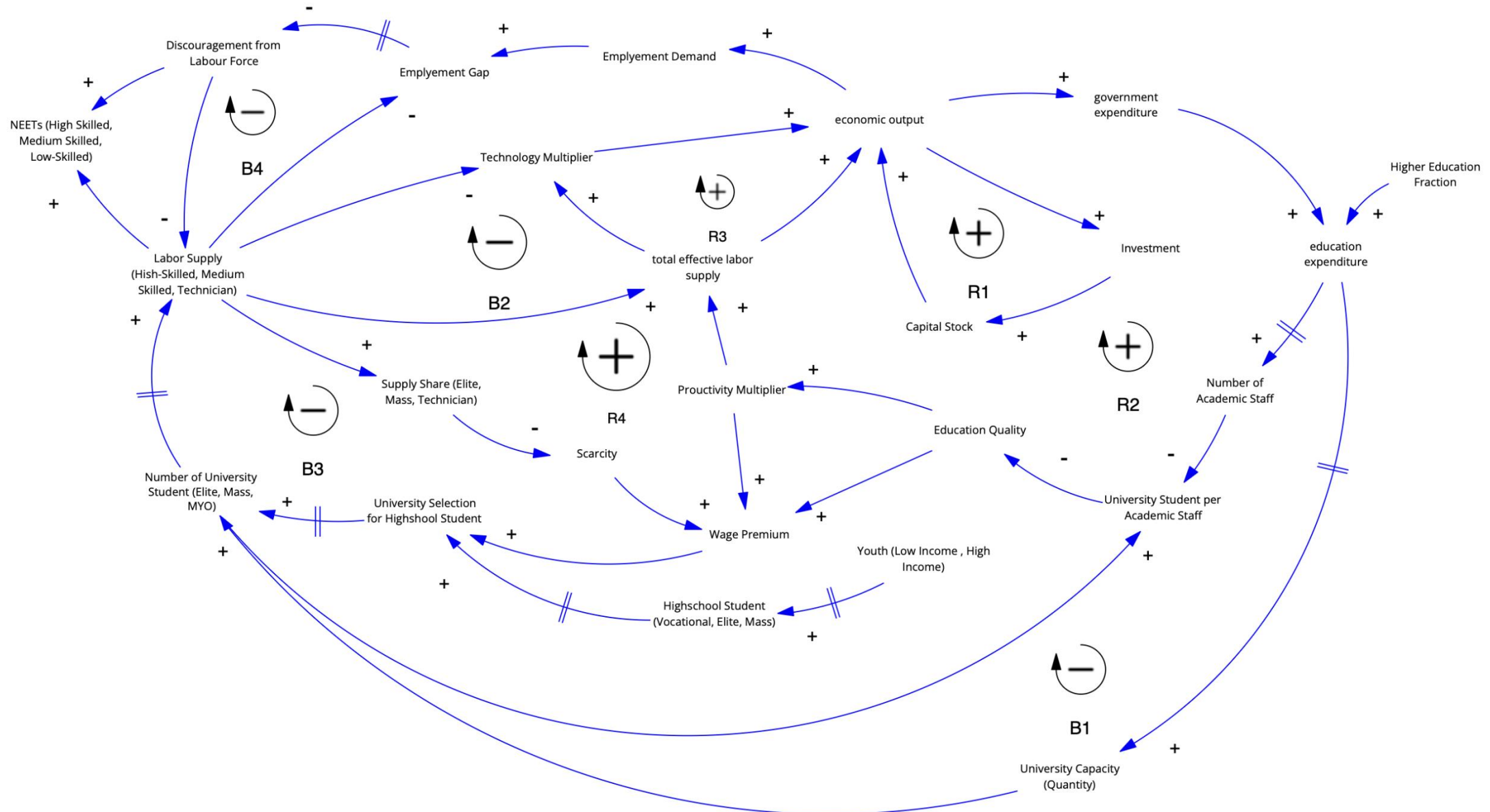
Outside

- Field of study and within-category institutional quality
- Endogenous labor demand composition — tier shares are fixed
- Firm-level matching foundations of unemployment
- Unskilled populations; informal and self-employment margins
- NEET by age or spell duration
- Inflation, monetary policy, external balance, business cycles

Findings are mechanism-based results within a deliberately stylized model boundary.

Redrawn for projection — the full causal-loop diagram is in the paper





The loops close at different speeds

Policymakers do not observe the full consequences of education policy in the short run

Education interventions operate with long lags. Discouragement does not.

B4

Discouragement

perception delay, then NEET entry

Fiscal channel

Output → spending

expenditure realization delay

B1 · R2

Education quality

a cohort must cross the whole pipeline

10–12 yr
Validation C

faster

time for the loop to close

slower

From loops to equations

Three coupled modules; full specification in the paper

Education

- Aging chain: youth → secondary tracks → tertiary
- Capacity linear in realized spending
- Academic staff elasticity 0.1
- Quality from student-to-staff ratio

Labor

- Three supply stocks: H, M, T
- Demand split by fixed tier shares
- Job availability = gap / own-tier supply
- Discouragement a lookup on perceived availability

Macro

- Cobb–Douglas, $\alpha = 0.5$ (Sevinc and Cakir, 2021)
- Effective labor replaces raw labor
- Wage-bill rule sets desired employment
- Fiscal share finances education spending

The transmission channel: $L_{\text{eff}} = m_E H + m_M M + a_T T$ *skill composition and quality affect output even when headcount is unchanged*

Validation

Euler, time step 0.125, 30-year horizon

Zero savings

Output flattens — the capital-accumulation loop behaves as specified.

Zero education funding

Elite education quality declines steadily as staff growth stagnates while student populations remain high.

Zero births

Total labor supply holds roughly 10–12 years before collapsing, testing the delay structures.

Dimensional consistency · extreme conditions · sensitivity analysis

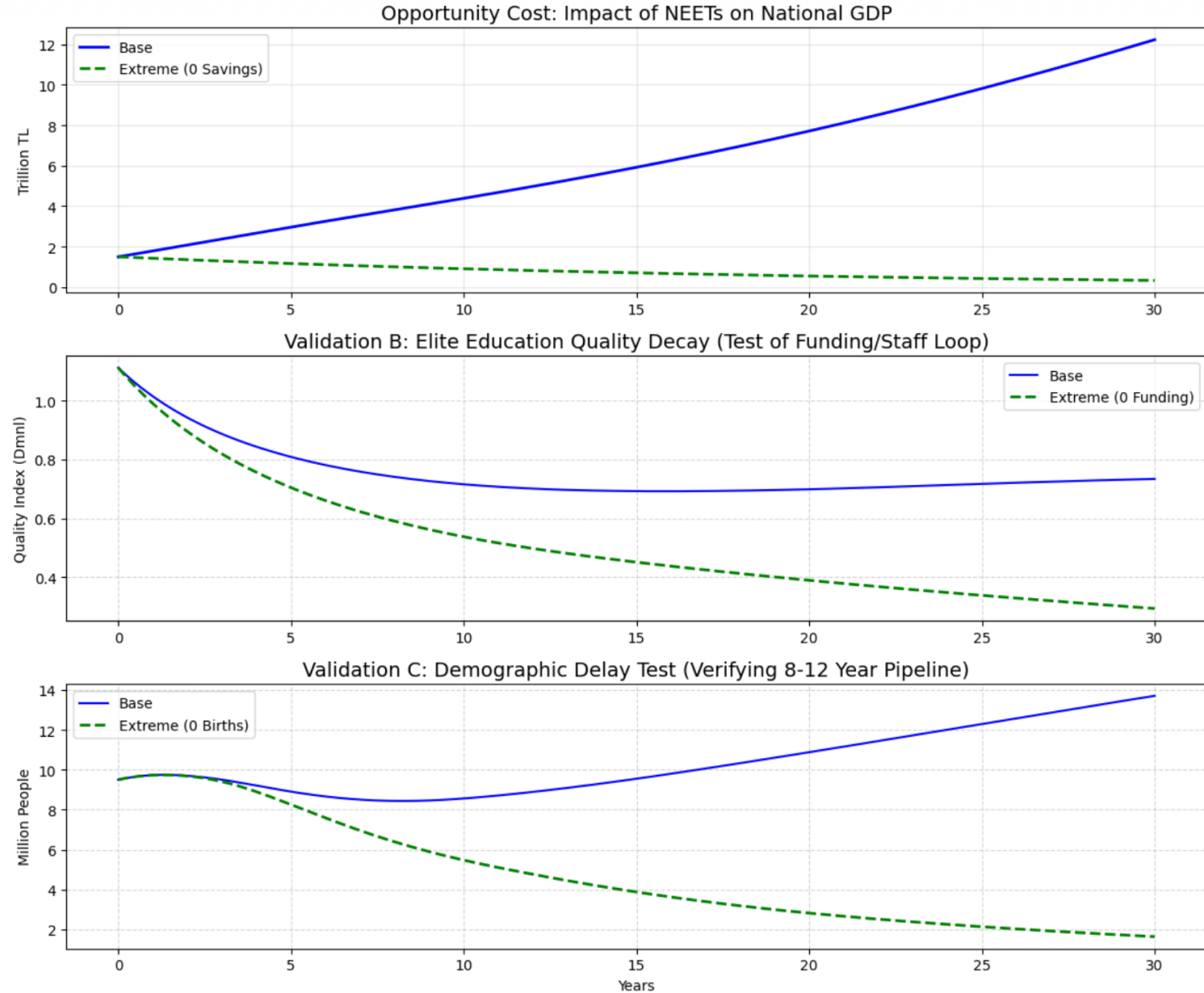


Figure 9: Output of key variables under various extreme conditions.

Result 1 — the cost of persistent inactivity

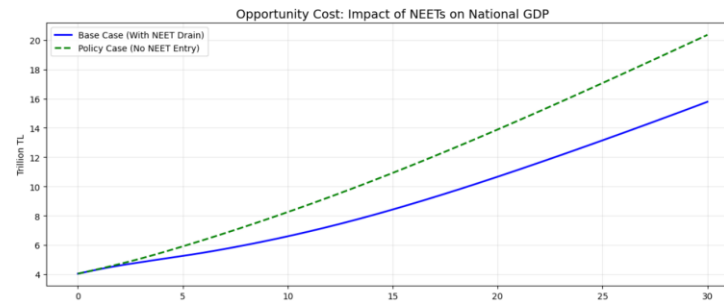
Base model against a counterfactual with NEET flows set to zero

The macroeconomic opportunity cost of persistent inactivity

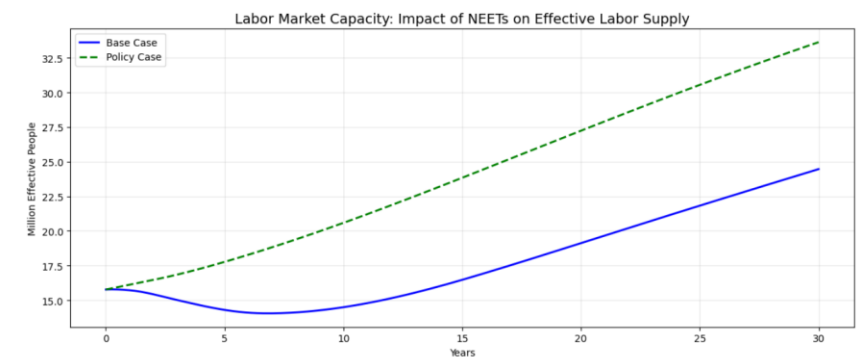
The mid-run dip is the signature. Keeping the same cohorts in active supply removes it, and output stays consistently above the base trajectory.

Under massification and weak absorption, mass-university graduates bear the largest NEET burden.

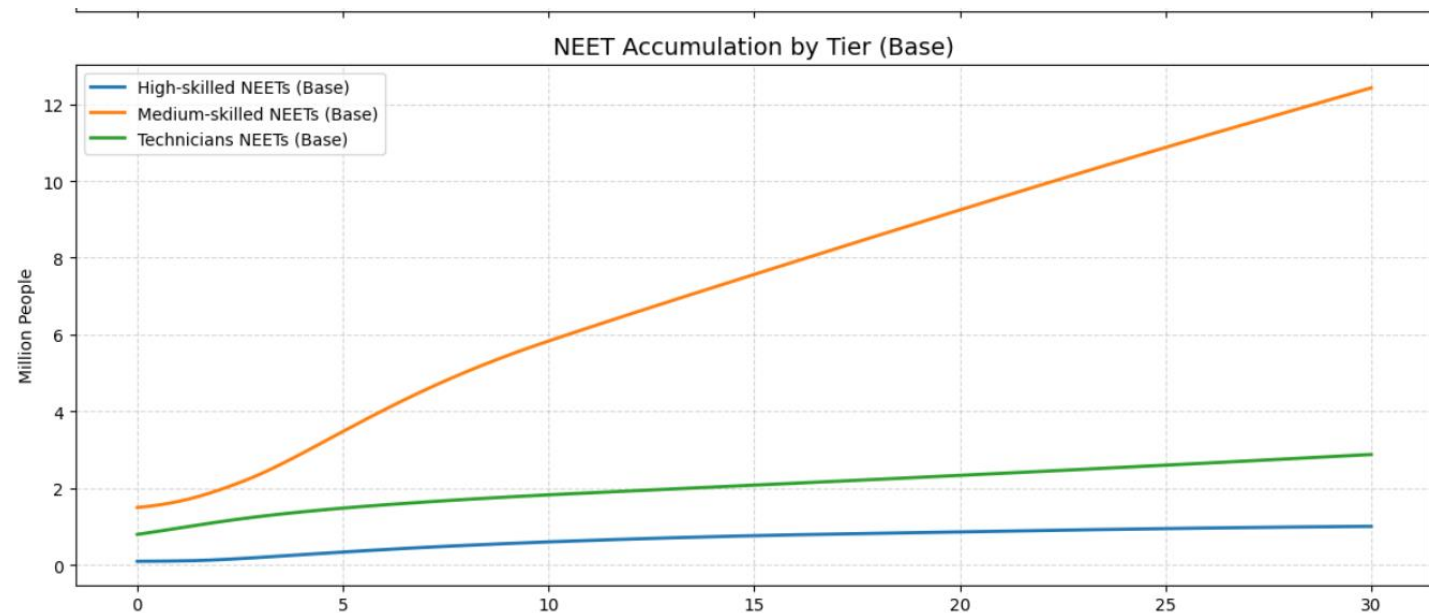
GDP: base vs. no-NEET



Effective labor supply



NEET accumulation by tier (base)



Result 2 — education is not the main lever (constrained and slow)

Varying higher-education expenditure across two margins: academic staffing and capacity creation

Staffing

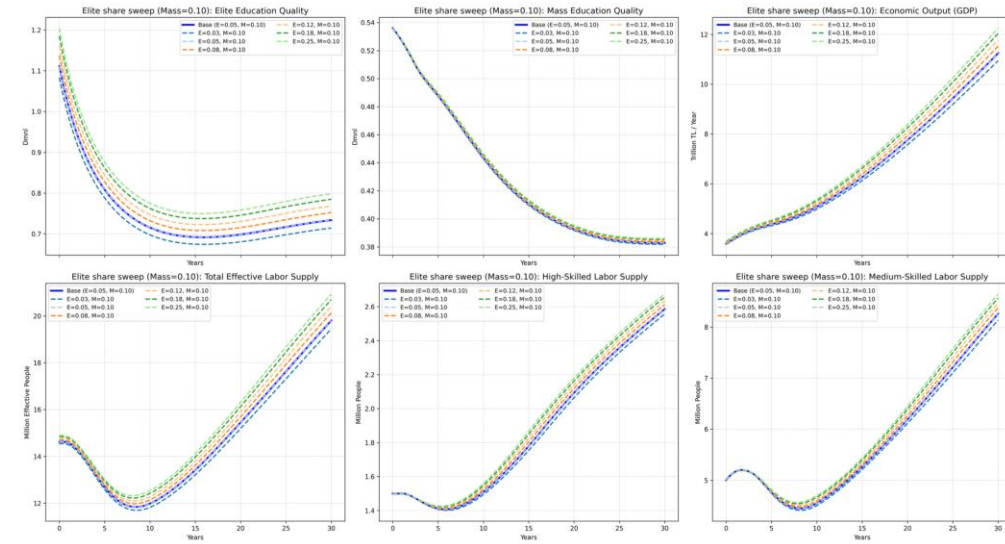
Only modest effects on aggregate dynamics. Mass-university staffing moves GDP more, because of the scale of the mass system.

Capacity

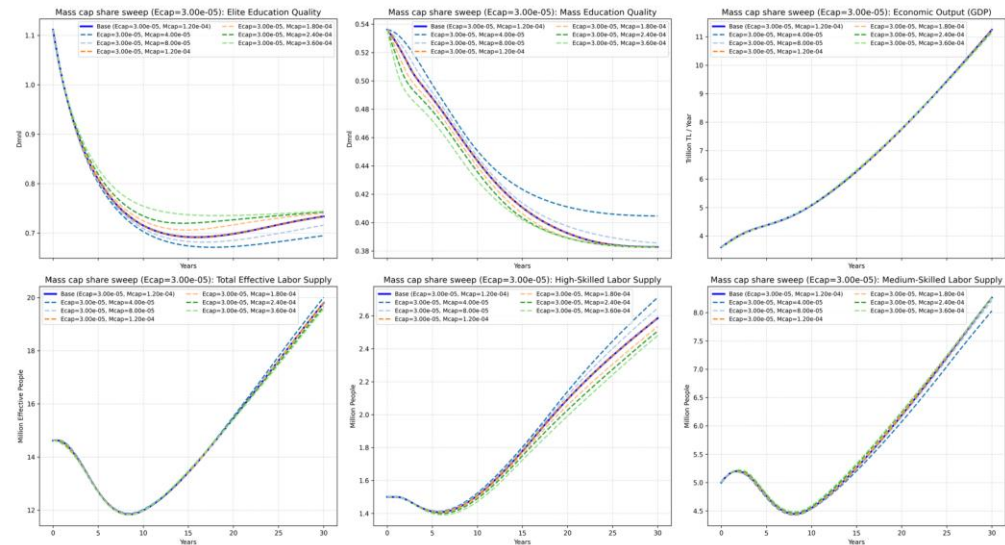
Even less consequential. Elite seats are not a binding constraint under the baseline calibration; mass seats mainly deteriorate quality as ratios worsen.

Neither staff growth nor capacity creation generates large reductions in persistent inactivity.

Staff-spending sweep



Mass-capacity sweep



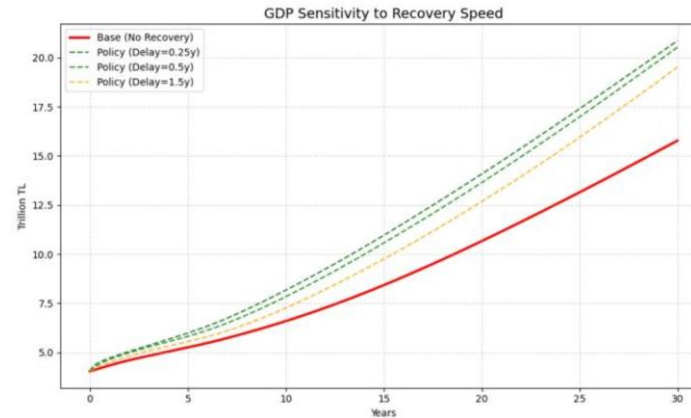
Result 3 — reintegration is a first-order lever

Relaxing the absorbing assumption: explicit flows from NEET back into labor supply

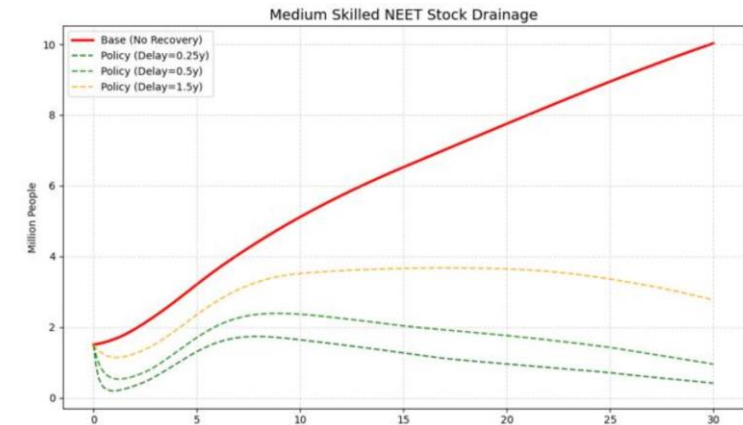
Monotonic

Shorter recovery delays reduce NEET stocks more quickly, keep active labor supply higher, and generate stronger output paths.

GDP sensitivity to recovery speed



Medium-skilled NEET stock drainage



Recovery delay

0.25 yr

0.50 yr

1.50 yr

baseline 0.5 yr —
the average duration of a
retraining or placement cycle

Reducing administrative and training delays substantially increases the payoff of reintegration.

Higher job availability raises recovery flows and active labor supply; output rises, which increases labor demand and further supports reintegration.

The policy scenario also includes additional parameter changes — results read as the combined effect of reintegration and the broader calibration.

Result 4 — reintegration plus DGS mobility

A recovery mechanism combined with mobility constraints on vocational-to-university upgrading

Recovery is the main lever

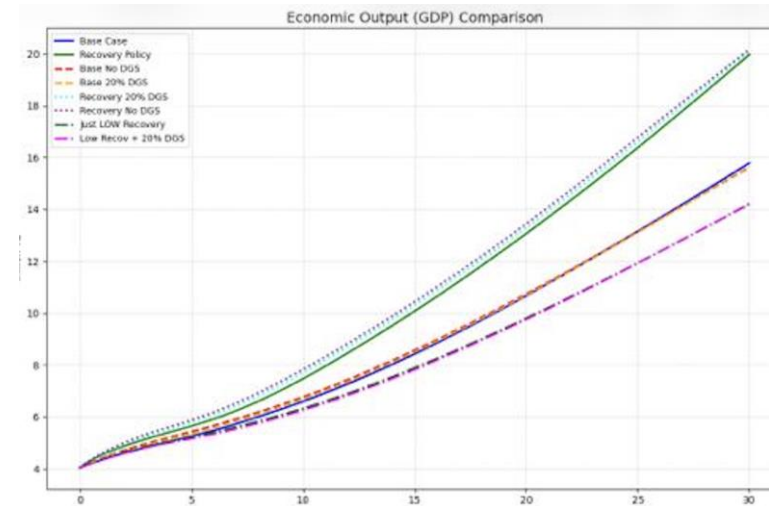
DGS moderation helps redirect labor away from congested education delays and toward production.

Scenarios

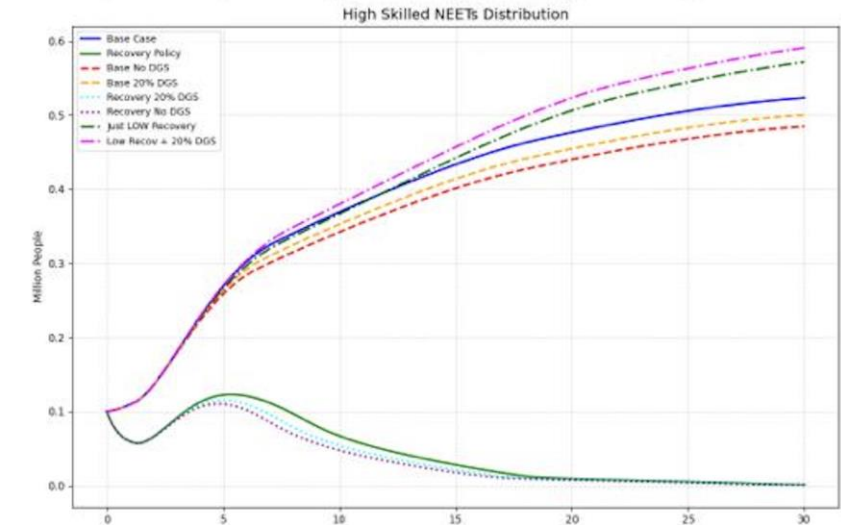
- Baseline
- No DGS
- 20% DGS willingness

Each run with and without the recovery mechanism.

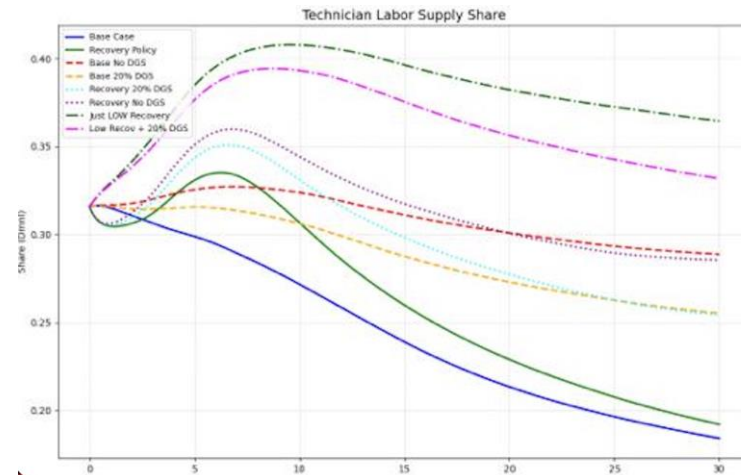
Economic output (GDP)



High-skilled NEET stocks



Technician labor supply share



A clear split by regime

With recovery, high-skilled NEETs fall toward zero. Without it, they accumulate.

Limiting DGS mobility raises technician retention but worsens high-skilled outcomes — targeting only the technical pipeline is not sufficient to reduce congestion across the full system.

The trade-off activation carries

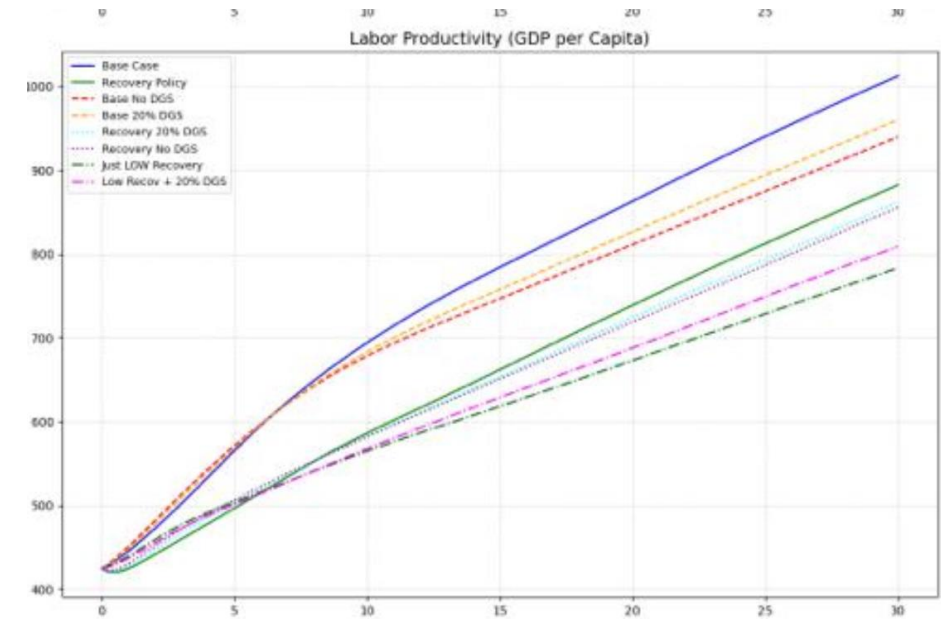
GDP per capita ranks the base case highest, despite lower aggregate output

Recovery expands the active labor force faster than productivity deepens.

Total GDP rises more than output per worker.

Recovery-driven scenarios reach the highest aggregate output but perform worse on a per-capita basis.

These are extensive-margin activation policies,
not intensive-margin productivity policies.



GDP per capita — reintegration and DGS-mobility scenarios

A trade-off between aggregate output expansion and per-capita outcomes, when activation raises the labor denominator faster than productivity deepens.

Conclusion



01 NEET dynamics are macro-relevant

Not a peripheral outcome but a stock that reduces effective labor input and bends the output path downward.

02 Education-only policies are constrained

By slow implementation, congested transitions, and feedback-driven quality dilution.

03 Reintegration is first-order — with a trade-off

Reducing persistent inactivity and shortening re-entry delays yields substantial macro payoffs, mainly through extensive-margin activation.

Extensions: disaggregate tertiary by major and institutional quality · endogenize labor demand composition · age- or duration-structured NEET to capture scarring and hysteresis

Backup

Reference material for questions

Full causal-loop diagram, as published

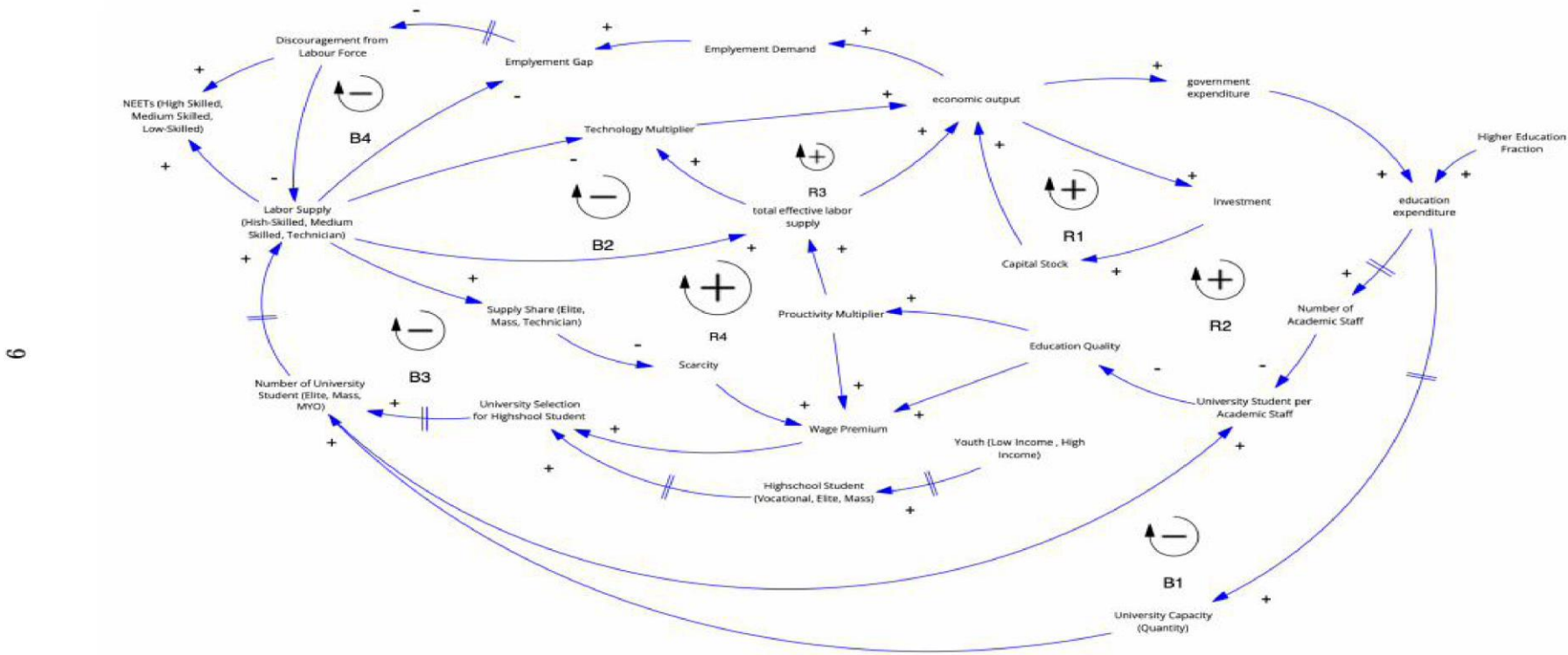


Figure 2: Simplified Causal-Loop Representation of the Model.

Reintegration and DGS mobility — full panel set

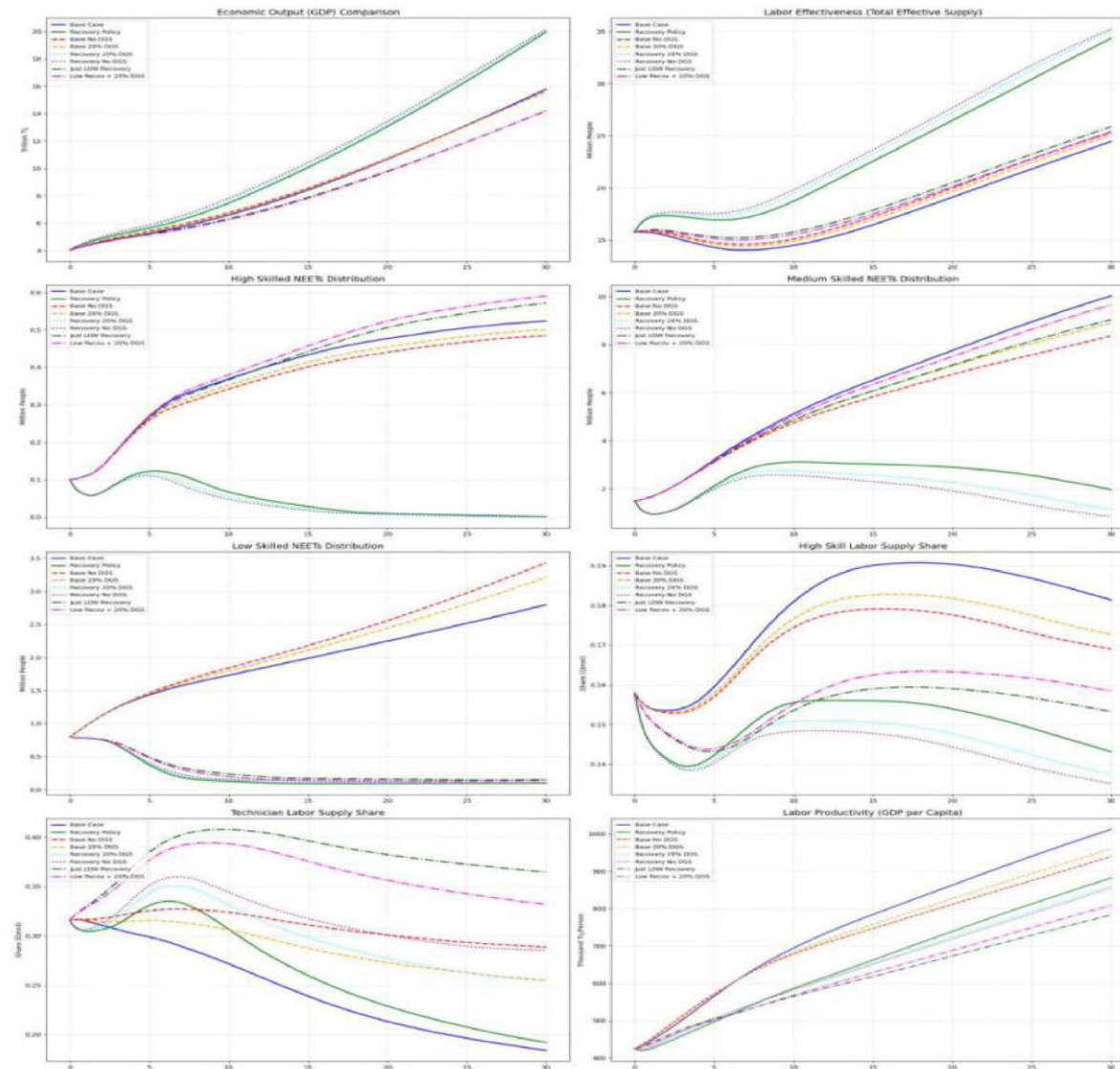


Figure 14: Reintegration and DGS Mobility Policy: Paths of Key Variables

Labor supply by tier: base against zero-NEET

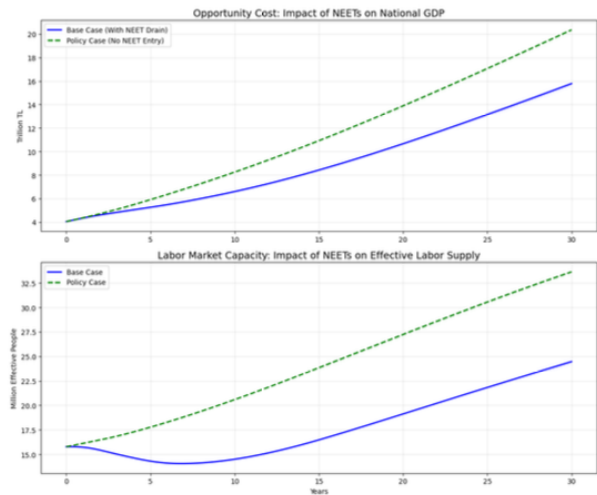


Figure 10: Economic Output and Labor Supply: base model versus zero-NEET counterfactual.

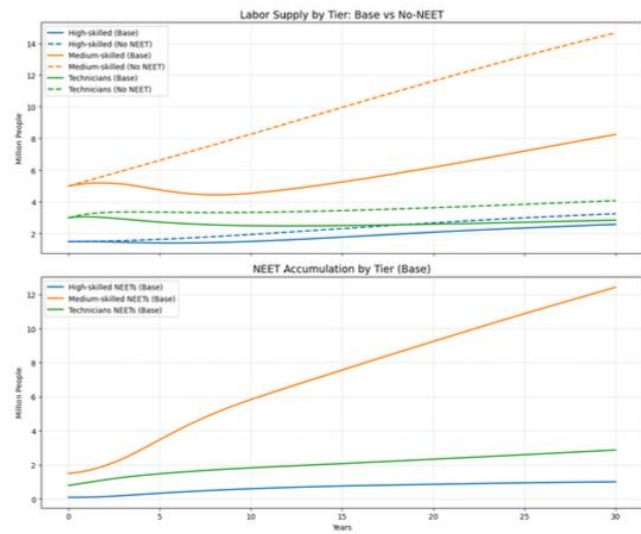


Figure 11: Segmented Labor Supply and NEET accumulation in the base model.

Stock – Flow diagrams of the model – 1 Macroeconomics

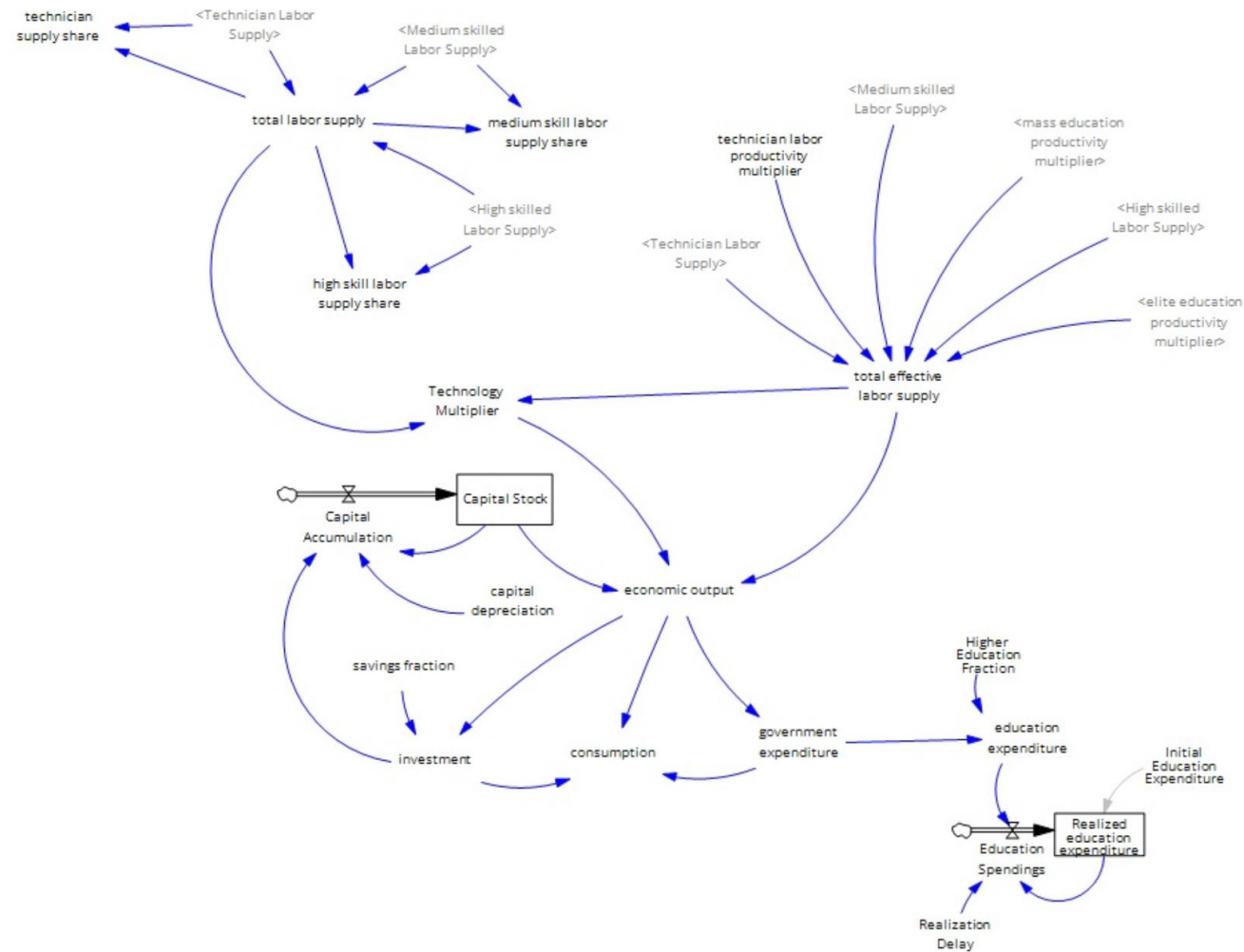
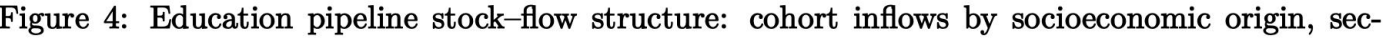


Figure 3: Macroeconomy block: Cobb–Douglas production using capital and effective labor, capital accumulation through investment and depreciation, fiscal rule for government expenditure and





Stock – Flow diagrams of the model – 4 Employment demand

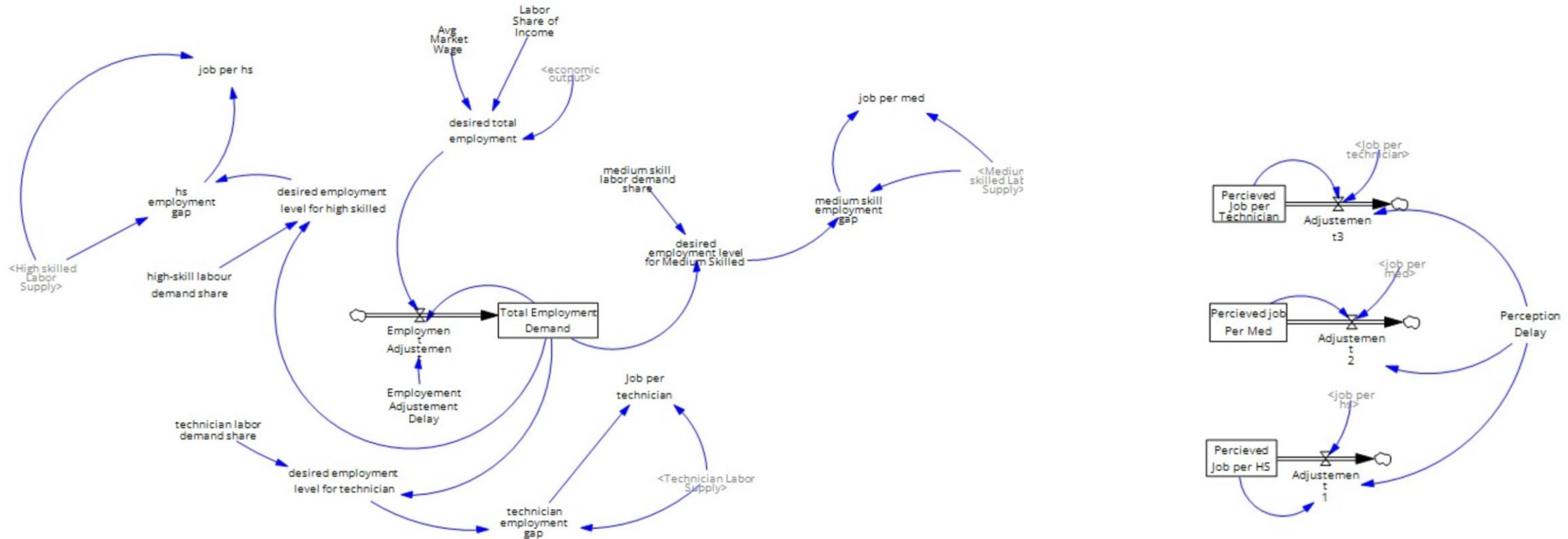


Figure 7: Labor-demand allocation block: aggregate employment demand adjusts to desired total

Figure 8: Perception-adjustment structure: perceived job availability indices adapt to actual job availability with a first-order perception delay.