Planning to construct

A DSGE model of the Australian economy

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Australian Conference of Economists, July 9 2025

Planning to construct

- Decades of restrictive planning have driven up housing costs
  - Planning regulations and development approval processes are too restrictive, complex and lengthy (Productivity Commission, 2021)
  - Projects that *do* proceed are increasingly costly to build (Productivity Commission, 2025)
  - Tax and transfer policies of the 'hidden housing welfare state' (Kholodilin, 2023, cited by Peter Siminski on Monday) exacerbate supply constraints, market inefficiencies, and inequality
- Beyond housing, dysfunctional regulation and NIMBYism also threatens the clean energy transition (Jarvis, 2025)
- I develop a structural, policy-oriented *dynamic stochastic general equilibrium (DSGE)* model to examine the effects of planning delays and restrictions and simulate the effects of reforms

Development constraints

- Large empirical literature on effects and costs of land use zoning, height restrictions, etc
  - Glaeser & Gyourko (2002, 2005): land use controls make US coastal cities expensive—and now even cities like Phoenix (Glaeser & Gyourko, 2025)
  - In Australian cities Tulip & Kendall (2018) and Saunders & Tulip (2020) estimate large costs of regulation for houses and apartments respectively
  - Greenaway-McGrevy & Phillips (2023): significant gains from 'up-zoning' in Auckland
- Comparative static or dynamic spatial general equilibrium models support empirical and policy analysis, e.g.
  - Turner, Haughwout & van der Klaauw (2014): welfare effects of regulation
  - Hsieh & Moretti (2019): land use regulations and labour misallocation

  but they abstract from supply-side dynamics.

Approval processes

- In theory, planning costs, delays and uncertainty will reduce supply, but this is under-studied empirically
  - Ball (2011): long and variable delays in England
  - Millar, Oliner & Sichel: long and increasing approval times (partly explained by regulatory differences) in US
  - Mayer & Somerville (2002): delays reduce supply elasticities in US
  - Wrenn & Irwin (2015): elasticity of development to approval time 1 in Maryland
  - Gabriel & Kung (2024): 25% reduction in time and variance of approvals would boost project starts 21% in LA
- Unaware of studies evaluating planning delays in general equilibrium

Time-to-plan (TTP) and time-to-build (TTB) in macro models

- Strong macroeconomic evidence for TTP/TTB, e.g.
  - Kydland & Prescott (1982): 4-qtr TTB improves fit in RBC model
  - Christiano & Todd (1996); Christiano & Vigfusson (2003): empirical support for TTP (low inputs) *and* TTB (high inputs)
  - Wen (2002): persistent investment demands *and* elastic supply can explain 7-yr investment cycles
- But represented in a reduced form in most DSGE models
  - Quadratic investment adjustment costs (Christiano, Eichenbaum & Evans, 2005) match hump-shaped investment responses seen in macro data
  - Interpretable as local approximating explicit TTB (Lucca, 2007) but preclude modelling policy interventions
- I build on Glancy, Kurtzman & Loewenstein (2024)
  - Plans may be endogenously abandoned, providing developers and important margin of adjustment that increases supply elasticity

Planning regulation in general equilibrium

- In DSGE models with a housing sector, the focus is usually on house prices and monetary policy (e.g. Iacoviello & Neri, 2010)
- Large-scale *computable general equilibrium* models are often used to study microeconomic policies (e.g. Nassios & Giesecke, 2023)
- I develop a model combining a detailed and policy-relevant structure with dynamically optimal decision-making under rational expectations
- To study effects of planning regulations/reforms, it features
  - Explicit time-to-plan, endogenous abandonment, time-to-build
  - Fully specified construction sector subject to competing demands

Preliminary findings

- The simulations I present show how
  - Effects planning delays on dynamic responses to exogenous shocks
  - Short-, medium- and long-run responses to several planning reforms
- Aim is to explore responses qualitatively and build a foundation for future calibration and applied policy modelling

Overview of the prototype DSGE model

- Representative household:
  - Large, growing households with stochastic lifetimes
  - Full participation in frictional, segmented labour markets
  - Habit in consumption of each good
- Four industries in which firms:
  - Invest in structures capital with times to plan and build
  - Invest in non-structures capital with adjustment costs
  - Hire workers and bargain over wage and hours
  - Purchase intermediate inputs
  - Sell output in competitive markets
- Various taxes and (exogenous) public expenditure
- Closed economy

Planned extensions

- *Trade* in goods and services, and *capital flows*
- Government investment in *productive infrastructure*
- Further *disaggregate industries* as relevant
- Labour markets segmented by *occupation* rather than by *industry*
- Accumulation of *occupation-specific human capital*

Labour market frictions

- In each quarter, the labour market evolves as follows prior to production and consumption :
  1. The working population evolves:
     - A fixed fraction of existing workers exit the economy
     - An exogenous number of new workers enter
  2. A fixed fraction of (surviving) employed workers are separated from firms
  3. Some unmatched workers choose between industry labour markets
     - A fraction of continuing workers
     - All new workers

     while the rest remain in their current industry
  4. Unmatched workers in each labour market search for vacancies created by firms
  5. Firms bargain over hours and wage rates with new and continuing workers alike

Project planning and construction

1. Projects are conceived and planned with random gestation lags and endogenous abandonment as in Glancy, Kurtzman & Loewenstein (2024):
   1. Developers add to stock of project plans, subject to congestion effects
   2. Plans-in-progress mature/approved at an exogenous rate
   3. Developers draw random, Pareto-distributed construction costs for shovel-ready plans then abandon unprofitable projects
2. Profitable projects are constructed with random gestation lag as in Antosiewicz, Kowal (2016):
   1. Developers add to stock of construction projects
   2. Construction-in-progress matures at an exogenous rate
3. Owners of finished structures choose the optimal utilisation rate

Planning, construction and structures dynamics

- Stocks evolve as:

$$\text{Plans-in-progress: } K_t^{\mathrm{P}} = (1 - \delta^{\mathrm{P}} - \gamma_t^{\mathrm{P}})\, K_{t-1}^{\mathrm{P}} + \wp_t \tag{1}$$

$$\text{Construction-in-progress: } K_t^{\mathrm{C}} = (1 - \gamma^{\mathrm{C}})\, K_{t-1}^{\mathrm{C}} + \gamma^{\mathrm{P}} F(\overline{\xi}_t) K_{t-1}^{\mathrm{P}} \tag{2}$$

$$\text{Productive structures: } K_t^{\mathrm{S}} = (1 - \delta^{\mathrm{S}}(u_t^{\mathrm{S}}))\, K_{t-1}^{\mathrm{S}} + \gamma^{\mathrm{C}} K_{t-1}^{\mathrm{C}} \tag{3}$$

- $\wp_t$ are new project plans
- Planning (γ_t^{P}) and structures (γ^{C}) completion rates are given
- Project survival rate $F(\overline{\xi}_t)$ depends on optimal maximum construction cost $\overline{\xi}_t$
- Plans may become obsolete at rate δ^{P} (if only to compensate for omission of developers' risk premium)

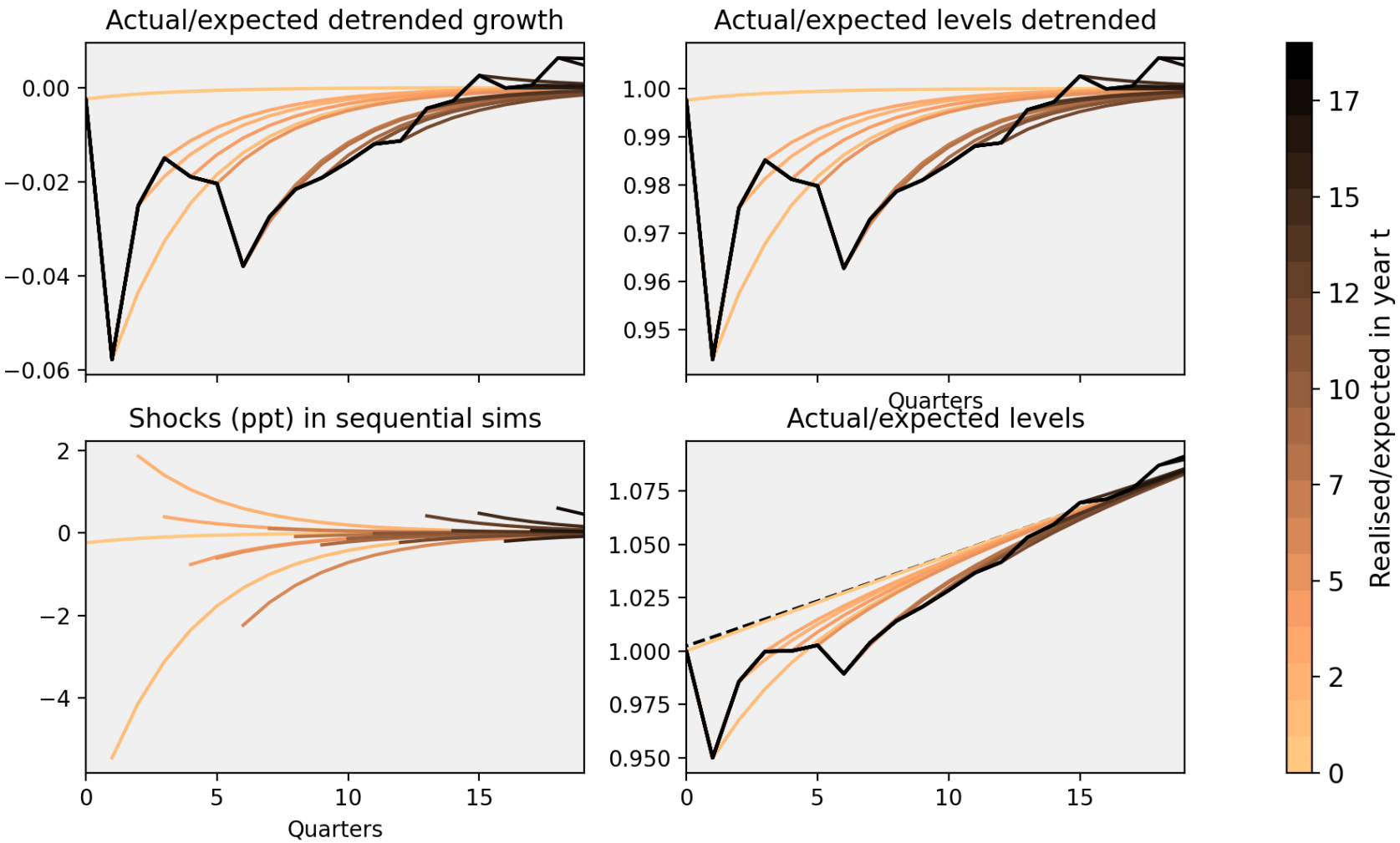
Solving the model

- Formulate and solve the model assuming certainty-equivalent expectations as in Cai and Judd (2023)
  - I.e. solve a dynamic general equilibrium with perfect foresight of *expected* values of exogenous shocks
  - Solve for all periods simultaneously (or Fair–Taylor methods for larger models)
- Pros and cons of simulated certainty-equivalent approximation (SCEQ)
  - Simulate arbitrary sequences of stochastic and deterministic shocks
  - Avoid linearly approximating around a steady state (e.g. Dynare)
  - Leverage established software for CGE models (GEMPACK)
  - Cannot account for risk

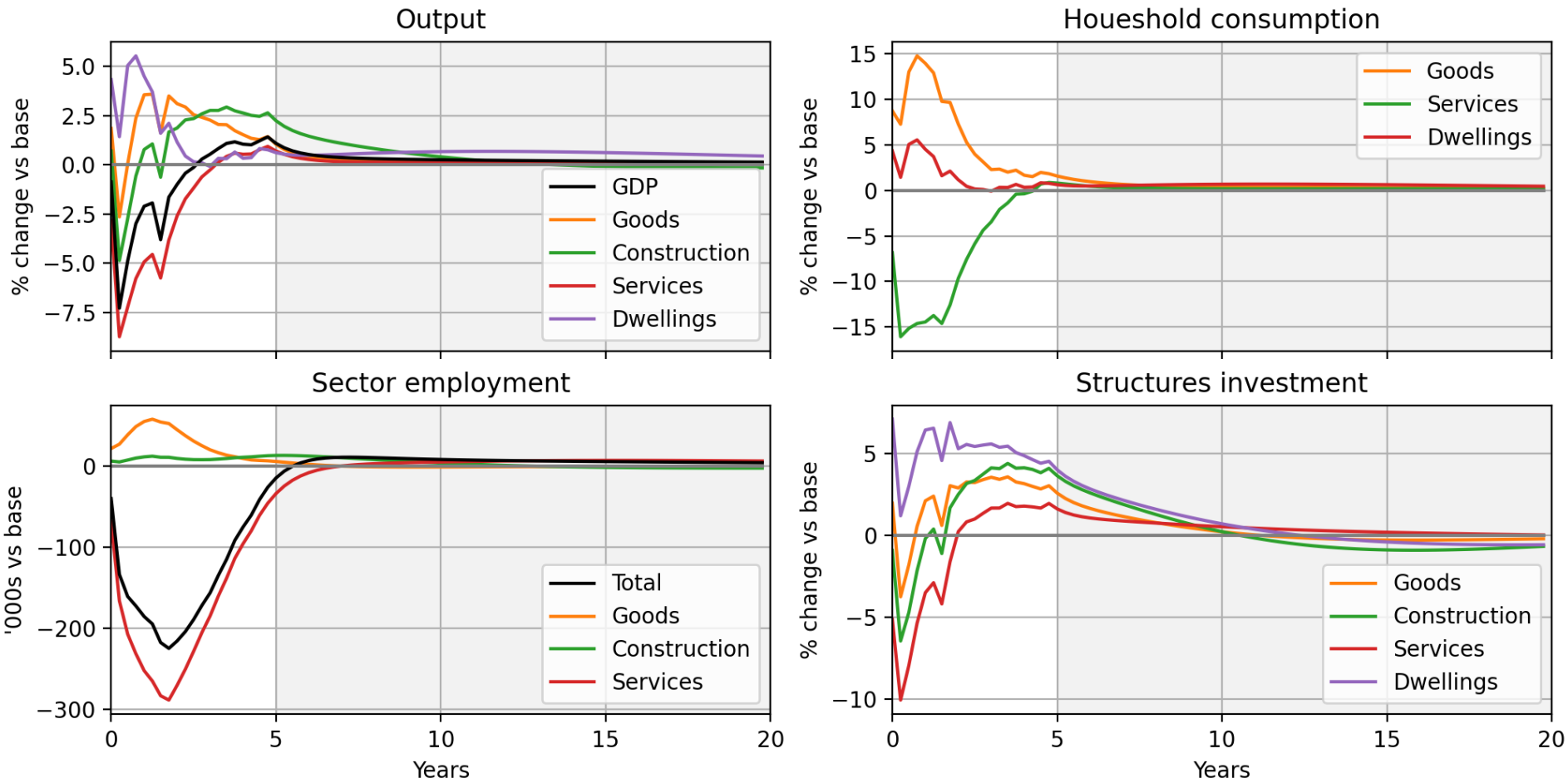
Baseline simulation with pandemic shocks

- Stylised series of historical shocks representing pandemic and aftermath
  - Labour force shocks (border closures, lockdowns, etc) as shocks to AR1 process
  - Labour productivity shocks (social distancing, etc) as shocks to AR1 process
  - Taste shift away from non-housing services consumption (social distancing) as -50% and decaying shock
  - Taste shifts towards housing (working from home) as *permanent* +1% taste shocks in each of Q3-Q6
- *Not* a 'historical decomposition' and missing
  - Monetary and fiscal policies
  - International trade and supply chain disruptions

Labour force expectations from 2020 Q1 with SCEQ



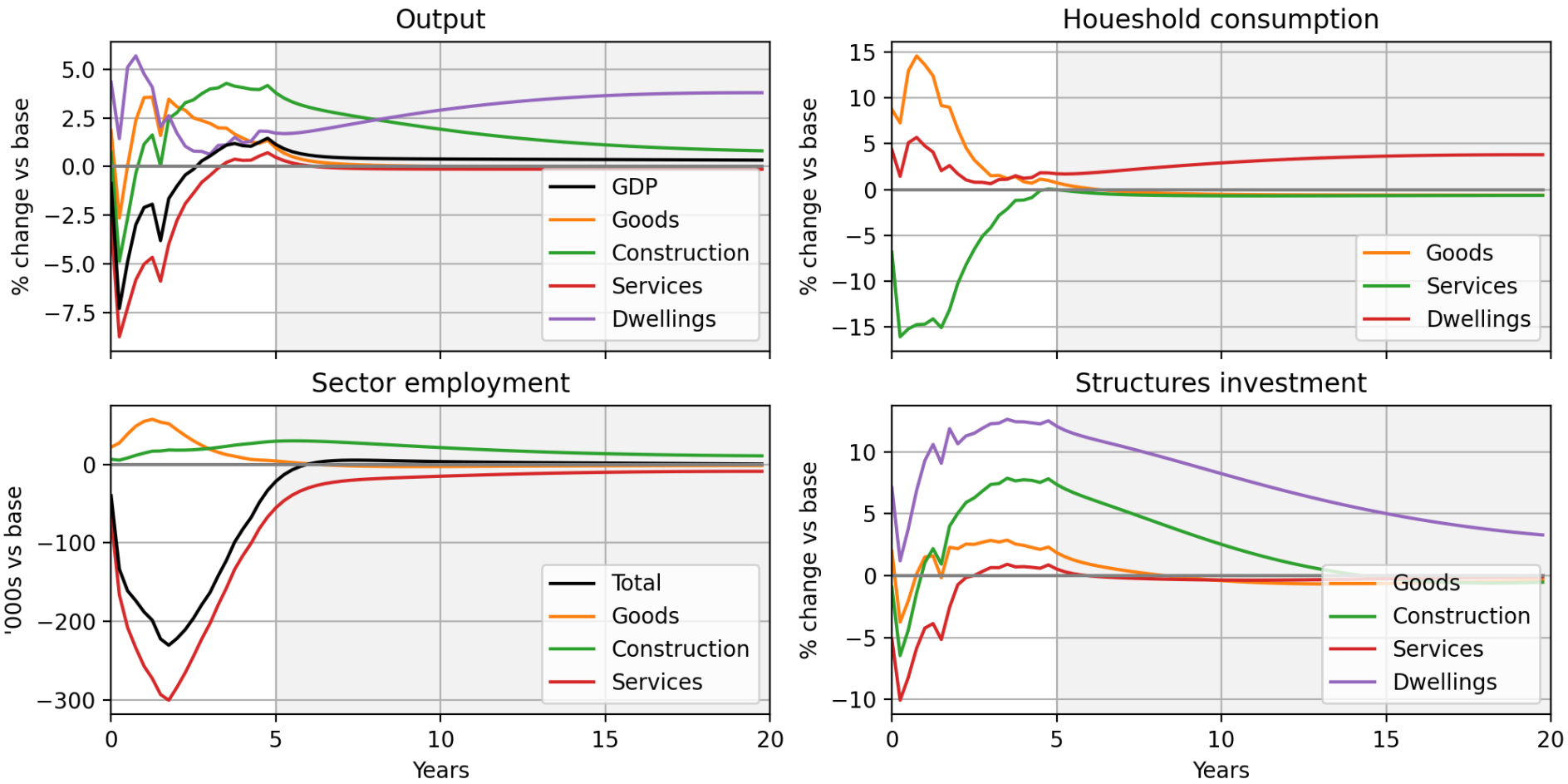
Illustrative pandemic simulation



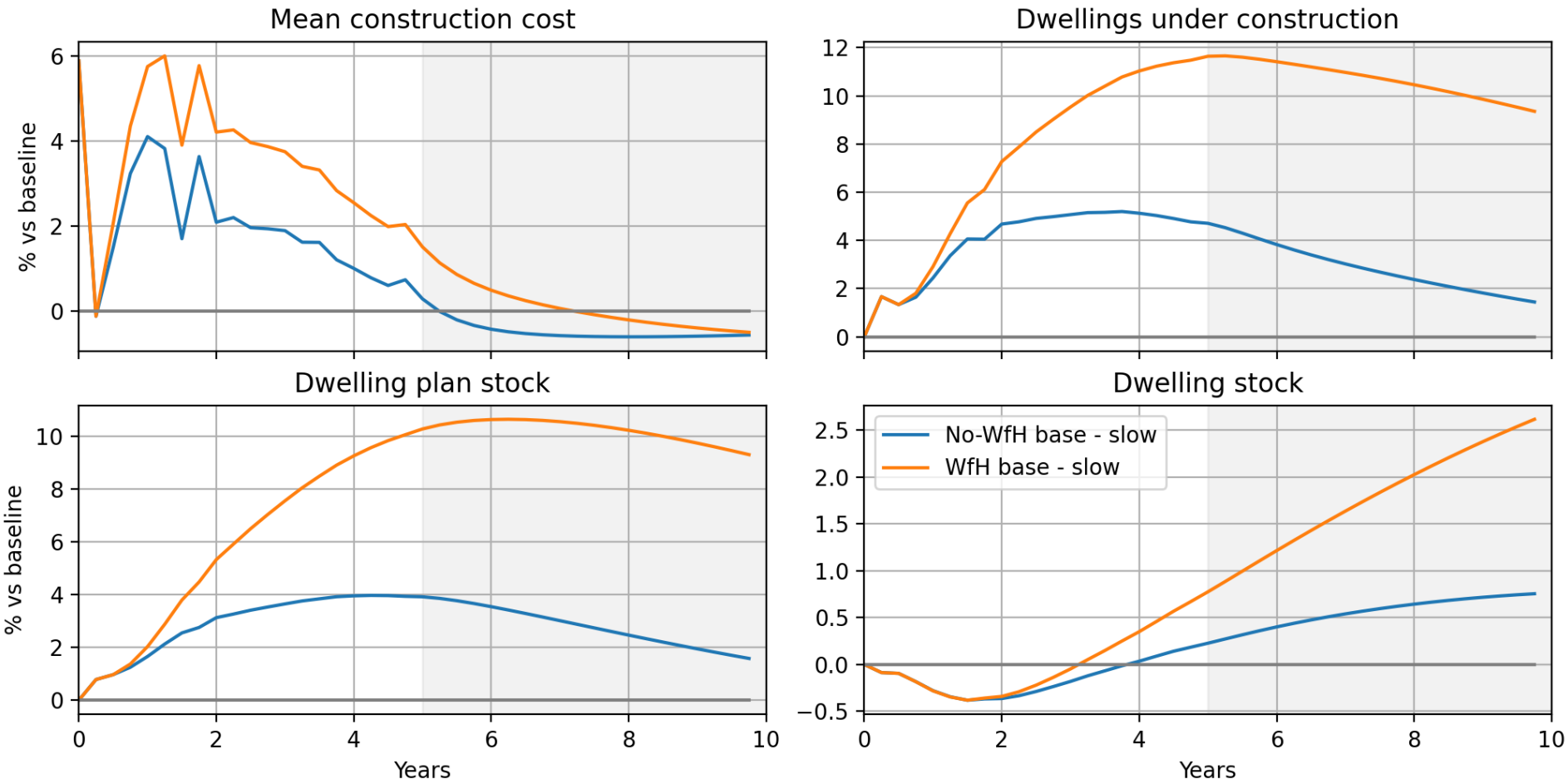
Including working from home (WfH) shocks

- The pandemic super-charged diffusion of remote working technologies and preferences
- Mondragon & Weiland (2022) estimate WfH caused a 12% price rise in US, suggesting 4.8% higher demand
- We represent this in the baseline with
  - Permanent +1% taste for dwelling vs other consumption in each of Q3-Q6
  - Each increase is unanticipated, reflecting learning by doing
- Ignore effects of WfH on participation, hours, productivity, commuting expenditure, ...

Baseline including working from home shocks



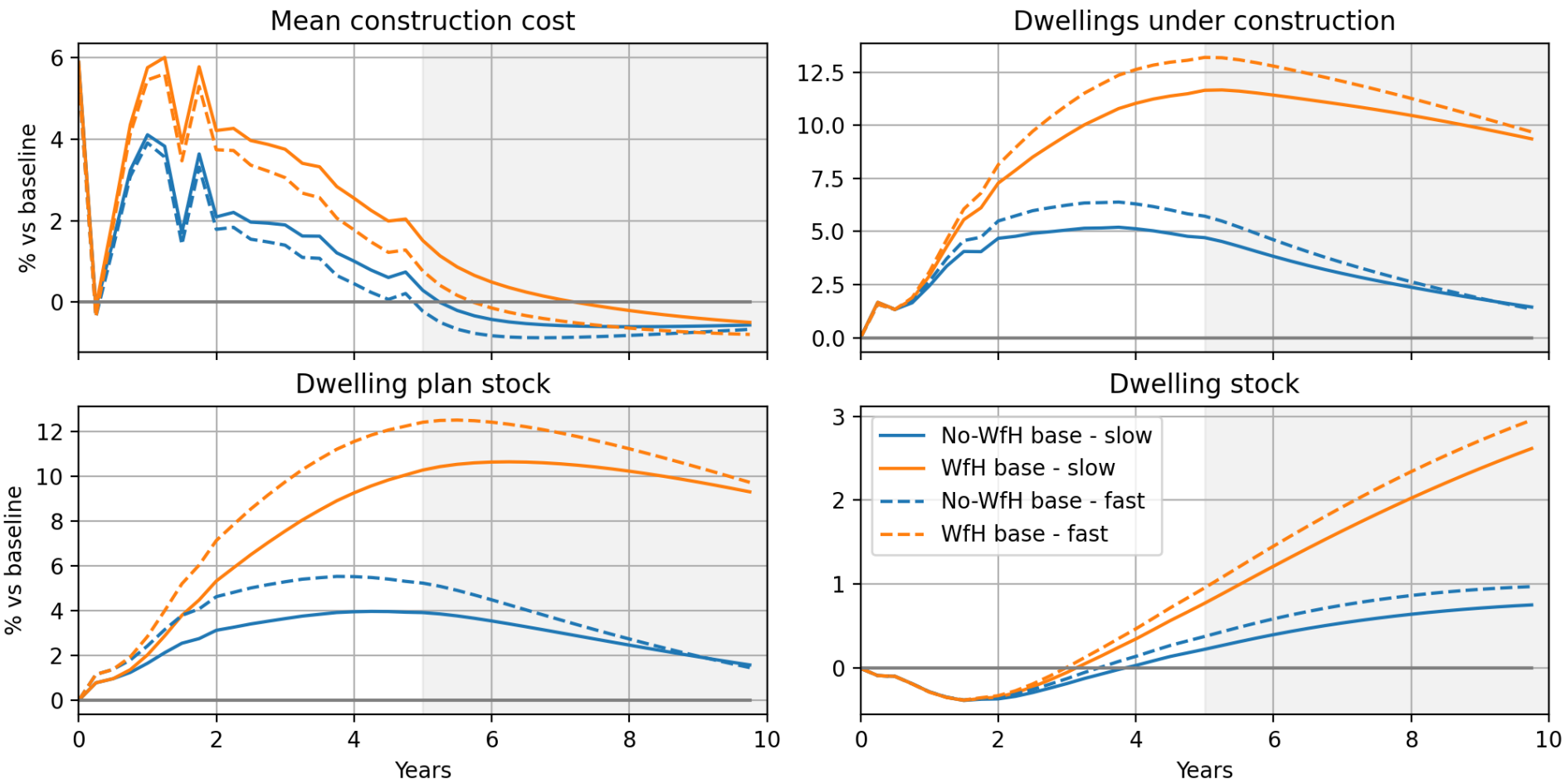
Housing supply responses are slow



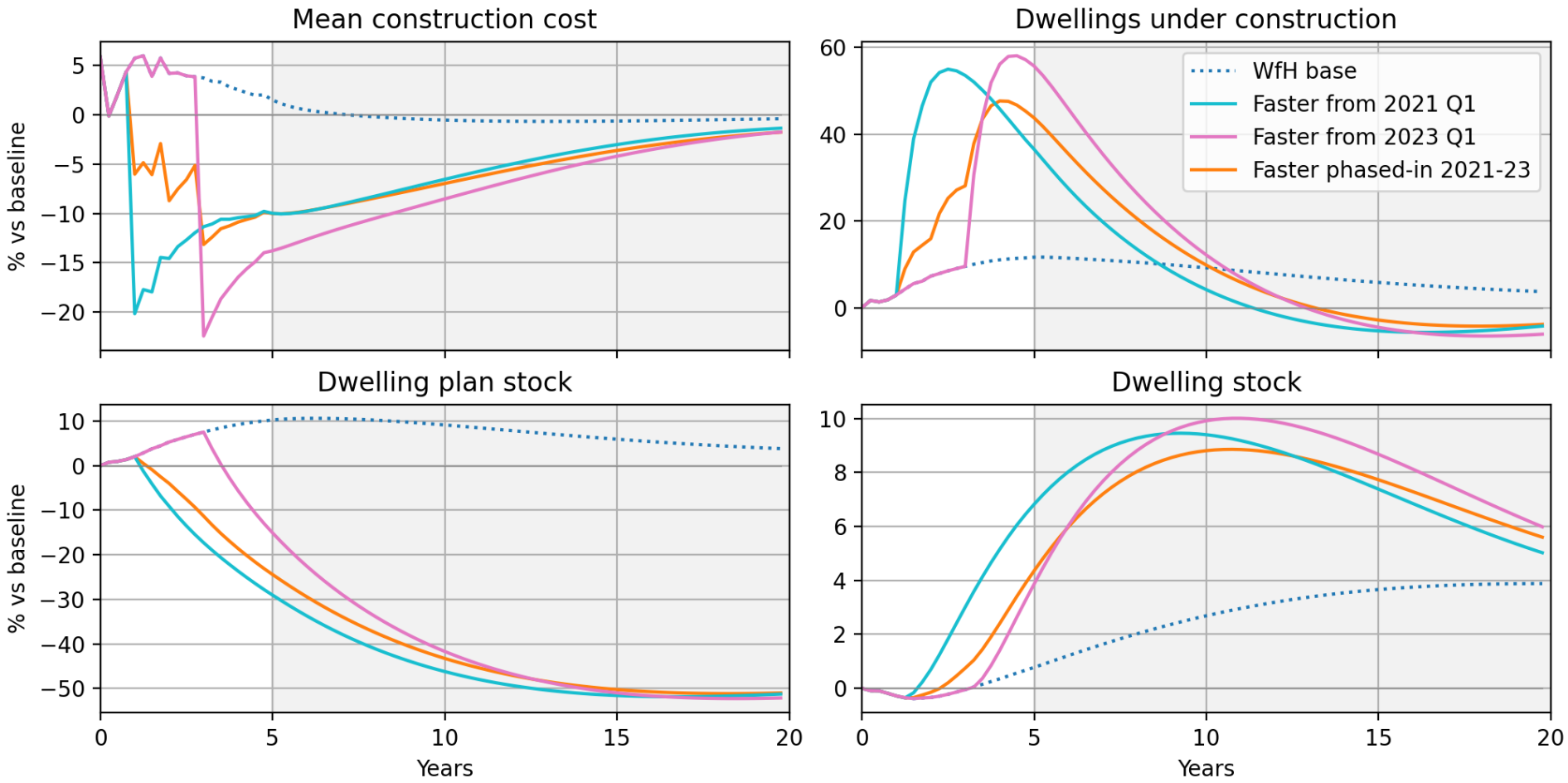
What are the effects of planning delays?

- To what extent are these slow responses due to slow planning?
- What are the effects of reforms to reduce planning delays? E.g.
  - Make conforming small-scale development as-of-right
  - Limit scope of consultation requirements for larger projects to matters of public interest
  - Require councils and quasi-judicial authorities to provide timely decision-making

Medium-run supply elasticity is higher in a rapid planning world



Faster planning processes

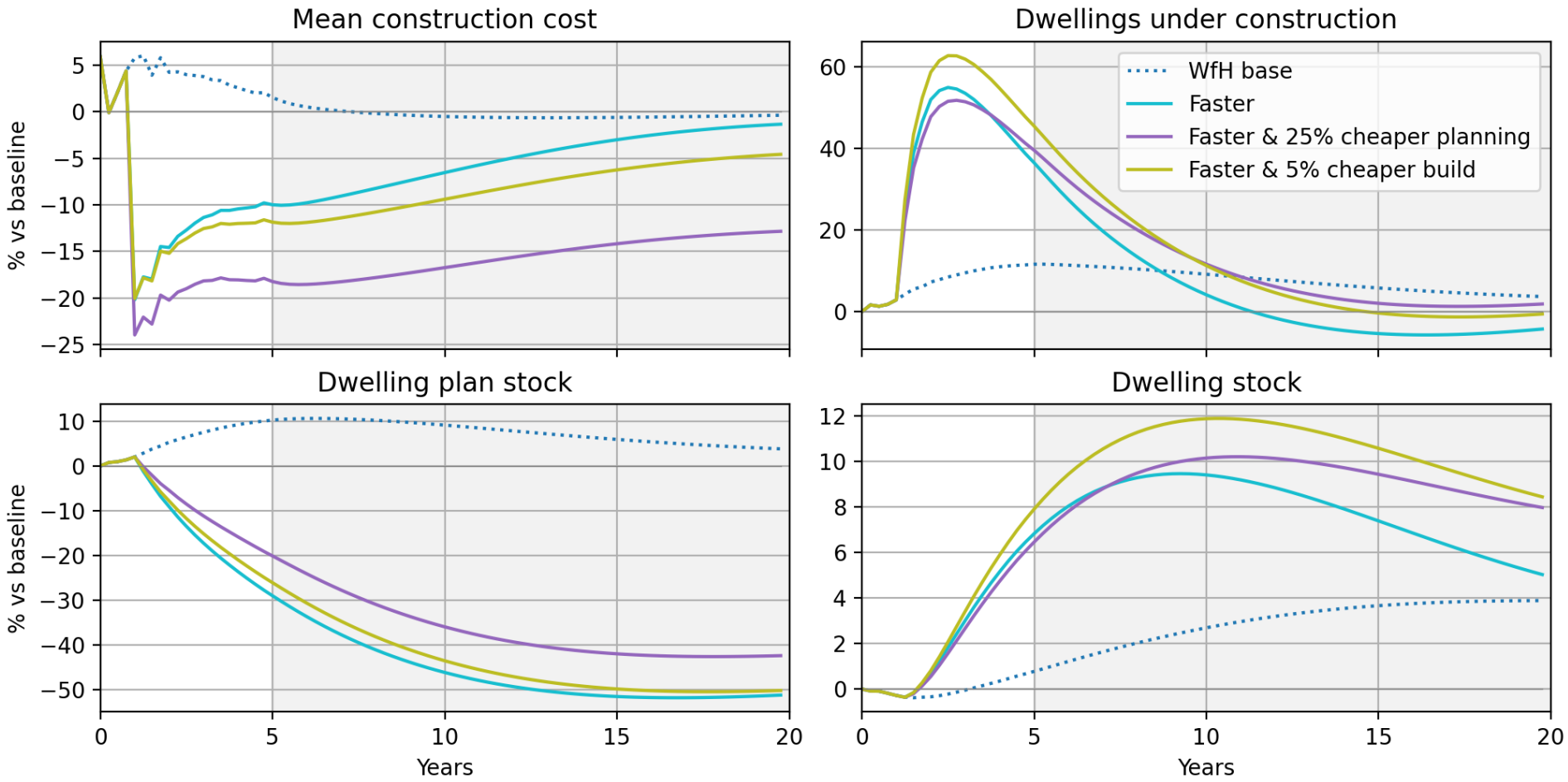


Time to approval is halved in 2021, in 2023, or phased in 2021-23.

Reforms could reduce direct costs too

- Planning reforms could reduce development costs, permanently raising housing supply
  - Costs to demonstrate compliance and adjust proposals
  - Cost of constructing approved projects: construction (e.g. reducing parking minimums, height limits, setbacks)
- Simulate reductions in planning (25%) and minimum construction (5%) costs

Faster planning and lower costs



Policy simulations (solid) and baseline simulation (dotted). Time to approval is halved in 2021 with or without reducing minimum construction costs 5%.

Preliminary conclusions

- While the model is at an early stage, and these simulations are only illustrative, I offer some preliminary conclusions.
- Development dynamics are inherently slow, but this is exacerbated by protracted regulatory processes.
- Reforms that reduce planning times could create a protracted construction boom, and more modest gains in the very long run
- A phased approach to planning reforms is probably more feasible, and could also help smooth this transition.
- Reforms that reduce either direct planning or construction costs, have their largest effects in the long term.
- For construction regulations, this suggests proceeding incrementally, starting with low-hanging fruit to avoid costly mistakes.

Future work

- The completed model will include
  - International trade and capital flows
  - Government investment in productive infrastructure
  - Additional industry disaggregation when needed
- To permit simulation of a wide variety of planning and fiscal reforms
- Longer-term, more detailed modelling of labour markets could focus on occupational switching, and occupation-specific human capital

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