Each region is unique in terms of amenities, geography, and productivity. Firms produce product varieties, innovate, and trade subject to iceberg transport costs under perfect local competition. Benefits from innovation last only for one period, then technology diffuses.

Technology
- Firm’s productivity is determined by its decision to innovate \( \phi_{fr} \) and an exogenous good-specific productivity shifter \( z_{fr} \).
- Firm’s efficiency level, \( \tau_{fr} \), is evolving according to:

\[
\tau_{fr} = \frac{\phi_{fr}}{\phi_{fr-1}} \left( \frac{1}{\int_{fr-1} \tau_{fr-1} \, ds} \right)^{1-\gamma_1} \tau_{fr-1}^{\gamma_1} \quad (1)
\]

Innovation
- \( h_{fr}^{inn} = \psi \phi_{fr}^{\gamma_2} \)

Utility of a representative worker
\[
u_{fr} = \bar{a}_{fr} L_{fr}^{\frac{\gamma_1}{\gamma_2}} \left( \int_{fr} C_r(w) \, dw \right)^{\frac{\gamma_1}{\gamma_2}} \quad (3)
\]

Calibrate the model to 5,633 REGPAT regions (see Figure 1).

Estimation of \( h_{fr} \)
- Assumption: \( \phi_{fr} = \frac{\text{Patents}_{fr}}{\text{Patents}_{fr-1}} \frac{\bar{L}_{fr}}{\bar{L}_{fr-1}} h_{fr} \quad (4) \)
- Parametrize \( h_{fr} \):

\[
h_{fr} = \exp(D_{fr} \beta + |\text{lat}| D_{fr} \gamma) \quad (5)
\]

- \( D_{fr} \) is a vector of binary R&D policy indicators: patent box, grants, super deduction, other deduction, tax holidays, tax credit, EATR R&D (Boesenberg and Egger, 2016).
- Interaction of each binary policy indicator with absolute value of latitude (Theil and Chen, 1995; Hall and Jones, 1997).

Estimation Results (negative binominal regression, year=2005)
- Dependent variable: registered patents (inventors), avg 2000-2010.
- Population is instrumented with regional remoteness index.
- All policy instruments have a positive marginal effect on registered patents (except for patent box).
- Overall fit: 0.71