Advanced statistical modelling exam.

**🔹 Research Problem**

**“Which municipalities are the most loyal when choosing agency staffing suppliers in healthcare?”**  
And specifically:

* Is loyalty higher in **small or large municipalities**?
* Is loyalty higher in municipalities with **high payroll cost per inhabitant**?
* Is loyalty higher in municipalities with **stronger financial results (profit)**?

**🔹 Conceptual Definitions**

* **Loyalty (DV):**  
  Persistence in supplier choice. You can operationalize it in different ways:
  1. **Incumbent retention dummy:** 1 if the top supplier this year is the same as last year, 0 otherwise.
  2. **Share stability:** Correlation or year-to-year similarity in market share distribution.
  3. **Tenure length:** Number of consecutive years a supplier remains #1.
* **Explanatory variables (IVs):**
  1. **Municipality size:** population (SSB).
  2. **Payroll cost per inhabitant:** from your KOSTRA table.
  3. **Municipal profit:** *netto driftsresultat i % av brutto driftsinntekter*.
* **Controls:**
  1. Elderly share (80+).
  2. Centrality index (SSB).
  3. Total healthcare expenditures per inhabitant.

**🔹 Hypotheses**

* **H1:** Large municipalities are less loyal (more suppliers, more tenders, more switching).
* **H2:** High payroll cost per inhabitant → greater need for stability → higher loyalty.
* **H3:** Municipalities with better financial results may afford more continuity (higher loyalty), while those under deficit pressure switch more often.

**🔹 Methods**

1. **Panel Data (Main approach)**
   * **We measure loyalty as how similar the distribution of market shares across staffing suppliers is from one year to the next in each municipality. If the supplier mix is unchanged, loyalty is 100; if it completely changes, loyalty is 0.**
   * **To explain differences in loyalty, we use a panel dataset combining Ecura’s supplier market share data with municipal covariates from SSB/KOSTRA. The key factors we test are:**
   * **Municipality size (population),**
   * **Payroll cost per inhabitant in health and care,**
   * **Municipal profit (net operating result), and**
   * **Elderly share and centrality as controls.**
   * **We apply a panel fixed effects regression, which compares municipalities to themselves over time. This controls for time-invariant differences between municipalities (such as culture, geography, or long-standing practices) and isolates the effect of changing payroll costs, population size, and profit on supplier loyalty.**
   * **As a robustness check, we also estimate simpler models, such as a binary outcome for whether the top supplier is retained.**
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**🔹 Example Model Setup (FE Logit)**

P(Retaini,t=1)=f(αi+β1Populationi,t+β2PayrollCosti,t+β3Profiti,t+γt)P(\text{Retain}\_{i,t}=1) = f(\alpha\_i + \beta\_1 \text{Population}\_{i,t} + \beta\_2 \text{PayrollCost}\_{i,t} + \beta\_3 \text{Profit}\_{i,t} + \gamma\_t)P(Retaini,t​=1)=f(αi​+β1​Populationi,t​+β2​PayrollCosti,t​+β3​Profiti,t​+γt​)

* Retaini,t\text{Retain}\_{i,t}Retaini,t​: 1 if top supplier is same as last year.
* αi\alpha\_iαi​: municipality FE.
* γt\gamma\_tγt​: year FE.

**🔹 Contribution**

This research problem is neat because it:

* Ties together **competition** (supplier switching) and **economics** (municipal finances).
* Uses **unique Ecura + KOSTRA data**.
* Answers a question that’s relevant for both municipalities (procurement stability) and suppliers (customer retention strategy).