

## Final Paper plan in Nov, 2022

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- 1 Study Question & Motivation
- 2 Estimation of Production Function with Variable Parameters
  - Select the Function
  - Decomposition of Aggregate Factor
  - Industry/Sector Classification
  - Time-Series Change and Factor Scale
  - Estimates of markup rate
- 3 Estimation of Cost Function Independently
  - Select the Function
  - Estimation the factors price
- 4 Causal Inference between M&A and Factor Productivity
- 5 Consideration of Time-Series Relationship between Capital and Labor
- 6 Data

## My Study Question

- ▶ Can labor and non-labor capital co-exist in economic activity?
- ▶ What M&A brings to firms' and industries' production?

## Study Background

- ▶ aaa

In this phase, I choose a type of production function, considering the function characteristics and the relation to the next section and beyond.

- CES :  $\mathbf{Y} = \mathbf{F} \cdot \left[ \sum_i^n a_i \mathbf{X}_i^r \right]^{\frac{1}{r}}$

- Easy to determine the substitute/complementary relation among various factors and appropriate production function
- △ Difficult to use for time-series changes because the elasticity of substitution between factors is assumed to be constant

- Cob-Douglas :  $\mathbf{Y} = \gamma \prod_i^n \mathbf{X}_i^{\alpha_i}$

- Tractable
- △ Difficult to use for time-series changes because the elasticity of substitution between elements is strongly assumed to always be 1

- Trans-Log :  $\ln \mathbf{Y} = \alpha_0 + \sum_i^n \alpha_i (\ln \mathbf{X}_i) + \frac{1}{2} \sum_i^n \sum_j^n \beta_{ij} (\ln \mathbf{X}_i) (\ln \mathbf{X}_j)$ 
  - Suitable for measuring time-series changes because it makes no a priori assumptions about the elasticity of substitution of elements

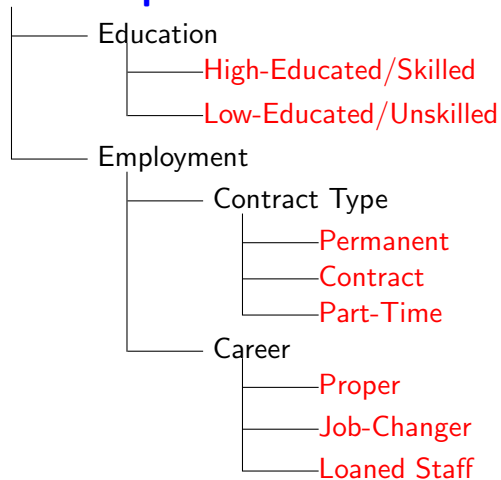
△ Awkward

- Linear :  $\mathbf{Y} = \sum_i^n \alpha_i \mathbf{X}_i$
- Leontief :  $\mathbf{Y} = \min\{\frac{\mathbf{X}_1}{\alpha_1}, \dots, \frac{\mathbf{X}_n}{\alpha_n}\}$ 
  - Tractable
  - △ Very restrictive and limited number of cases

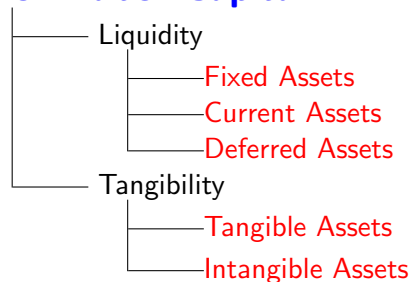
# Reference

- ▶ [生産関数推定について：手法に関する考察と規制緩和への示唆（中村豪）](#)
- ▶ [2 段階 CES 型生産関数の計測と誘発的技術変化仮説の検証（川越俊彦）](#)
- ▶ [フレキシブル関数の理論（浜口登）](#)
- ▶ [要素代替の弾力性（宮澤和俊）](#)
- ▶ [トランス・ログ型関数による航空輸送産業の費用構造の分析（衣笠達夫）](#)
- ▶ [Decomposition of Aggregate Productivity Growth with Unobserved Heterogeneity（笠原博幸、西田充邦、鈴木通雄）](#)

## Labor Capital



## Non-Labor Capital



I wanna classify firms/Corporation into some Industry or Sector with easy and versatile ways. Some classification-criteria candidates are as following;

- S&P Dow Jones Indexes(GICS)

- GICS for Japan Market ver. 2022

- 日経業種分類

- 日本標準産業分類

- Other ways & reference



In this phase, I organize the time-series changes of parameters of production function and the time-series trends of abstract/relevant amounts for each production factors.

Referring to [生産関数を用いたマークアップ率の計測に関する検証（中村豪）](#), I measures the markup rate and its relation with production parameters for each industries/sectors.

In this section, I estimate the Cost Function independently of production function with same factors.

The reference is as following;

- ▶ 国立大学の費用関数: トランスログ・コストシェアモデルによる同時推定 (北坂真一)
- ▶ 実証分析における生産, 費用関数 (中西泰夫)

In this phase, I will estimate the factor price with cost function estimate above or IO-table if possible.

- In the former paper written with seminar members, we investigated why M&A.
- In this paper, I study what M&A brought to firms' production/productivity with statistic causal inference.
- At last, I will study the connection between M&A and firms'/Sector or industry's markup.

Based on the aforementioned study, I put my own answers to my study questions.

- Human labor and non-labor capital are substitute? or complementary?
- How No. of entries and exit of companies and decrease No. of companies in a market affects their productivity or labor-capital relation?

- Bloomberg
- DBJ
- Nikkei needs
- IO table