

**LABOR DEMAND PROJECTION BY
EXTENDED IO MODEL**

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1. OVERVIEW

- Projection Model in Canada
- Employment Projection Model the US – BLS Model
- Labor Projection Model in Netherland (ROA)
- Projection Model in Germany
- Labor Projection Model in Korea
- Projection Model in Sweden

2. LABOR DEMAND PROJECTION MODEL IN VIETNAM

• 2.1 Current situation

- Projection is being carried out by a wide variety of organizations with different management level and the type of organization.
- The coordination mechanism for implementing the Projection is not linked and unified according to the assignment of functions and tasks
- Lack of funds to organize supply and demand surveys, so the quality of Projection is still limited
- Lack of data exchange and connection among statistical agencies and projecting ones on labor market.
- The training and capacity building for staff specializing in labor projection is limited and there is a lack of staff at agencies and organizations engaged in projecting labor market.

2. LABOR DEMAND Projection MODEL IN VIETNAM

• 2.2 Database

- Current regulations on labor market information: Labor Code 2012; Employment Law 2013;
- Information sources are collected from various sources.
- Labor-Employment Survey
- Enterprise Survey of GSO
- Household Living Standards Survey of GSO
- Labor surveys, wages and labor demand in enterprises of the Ministry of Labor, Invalids and Social Affairs.
- Recording system of labor supply and demand.
- Information system from employment service centers.
- Other sources of information from the GSO, international organizations, etc.

2. LABOR DEMAND Projection MODEL IN VIETNAM

- **2.3 Labor demand Projection model**

(i) LOTUS Model, (Long-Term Occupation and Training Utilization System). Some countries apply this model, such as Philippines, Malaysia, Vietnam, ..

(ii) The ILSSA-MS model, the Vietnamese labor market analysis model and micro simulations are based on the ORANI-G model (Dixon et al., 1982; Horridge 2003) but there is scope for further elaboration of the labor market model.

(iii) The model of technical parameters that Korea has applied.

(iv) Extended IO model

2. LABOR DEMAND Projection MODEL

- **(i) Lotus Model**
- **Introduction:**
 - Long-Term Occupation and Training Utilization System.
 - This model was developed by the Inforum team of the University of Maryland (Australia). Some countries use this model, such as the Philippines, Malaysia, Vietnam.
 - The labor demand projection model is based on the simulation of macroeconomic indicators, from each component industry and the inter-industry I / O balance sheet.

2. LABOR DEMAND PROJECTION MODEL

- (i) Lotus: The model uses key data from the inter-industry balance sheet (IO).

	Intermediate consumption (X_{ij})	Final consumption (F_i)	GO
Use intermediaries	X_{11} X_{12} X_{13} ... X_{1n}	C_1 G_1 I_1 X_1 M_1	X_1
	X_{21} X_{22} X_{23} ... X_{2n}	C_2 G_2 I_2 X_2 M_2	X_2

	X_{i1} X_{i2} X_{i3} ... X_{in}	C_i G_i I_i X_i M_i	X_i

	X_{n1} X_{n2} X_{n3} ... X_{nn}	C_i G_i I_i X_i M_i	X_i
Added value	L_1 L_2 L_3 ... L_n		
	K_1 K_2 K_3 ... K_n		
	P_1 P_2 P_3 ... P_n		
	T_1 T_2 T_3 ... T_n		
GO	X_1 X_2 X_3 ... X_n		

2. LABOR DEMAND PROJECTION

- **(i) Lotus:**
- Total final demand (equal to GDP) is calculated using the following formula:
 - **$fd = fceh + fceg + gfcf + chin v + ex - im$**
- Including: fceh: Final consumption of households; fceg: Final consumption of government; chin v: Change in inventories; ex: Exports; im: Imports
- Based on different scenarios on changes of personal consumption, consumption of government, investment and trades to forecast the GDP or GDP by sector

2. LABOR DEMAND PROJECTION MODEL

- **(i) Lotus:**

Forecasting steps

- Predict the scenario: Calculate the value of each final vector, using econometric equations or hypothetical (exogenous) values.
- Calculate the Leontief type 2 from the IO table
- Demand forecast for production value for each sector

$q = (I - A)^{-1} f$ is the output, f is the final demand, A is the IO matrix, and I is the unit matrix.

2. LABOR DEMAND PROJECTION

- **(i) Lotus:**

Projecting steps

- The projection of labor productivity (prd) is based on time or assumptions. Labor productivity is calculated in q / e where q is the output value and e is the labor force.
- Calculate the number of employees by the formula $e = q / \text{prd}$
- Multiply the total number of laborers in 19 industries with the labor demand coefficient matrix by occupation to have the total number of employees classified by occupation in the industry.
- Use RAS adjustment method to correct labor demand by industry and sector

2. LABOR DEMAND PROJECTION MODEL

- **(ii) Extended IO Model**

- **Introduction:** The current situation in Vietnam is changing the structure of the labor market; Extensive international economic integration, technology change process, especially 4.0 Revolution application trend requires an open model and the ability to adjust and update.
- Based on the IO model, describe the linkages between economic sectors in the production process through inputs (capital and labor), intermediate costs with outputs
- Basic assumptions of the IO model:
 - The economy has only purely productive industries, that is, it produces only one type of product;
 - To produce products of each industry requires a fixed rate of input. This assumption implies a constant efficiency of scale in each sector.

2. LABOR DEMAND PROJECTION

(ii) Extended IO Model

The basic structure of the extended IO model:

- Growth in the size of the sector also calls for increased labor demand, thus creating jobs and incomes.
- This additional income will be used for household consumption and this additional consumption will stimulate development of production
- The I / O model will add a line showing the income of employees by industry. The additional column is the final consumption of the household.
- Then, the relationship between production value, direct cost-to-extend ratio and final consumption can be expressed as:

$$X_i = a_{i1}X_1 + a_{i2}X_2 + \dots + a_{ij}X_j + \dots + a_{in}X_n + a_{i,n+1}X_{n+1} + F^*_i$$

$$X_{n+1} = a_{n+1,1}X_1 + a_{n+1,2}X_2 + \dots + a_{n+1,j}X_j + \dots + a_{n+1,n}X_n + a_{n+1,n+1}X_{n+1} + F^*_{n+1}$$

2. LABOR DEMAND PROJECTION MODEL

(ii) Extended IO Model

- The basic structure of the extended IO model:
- Predict the scenario: Calculate the value of each final vector, using econometric equations or hypothetical (exogenous) values.
- Calculate the Leontief type 2 from the IO table
- Labor demand forecast by sector

$GO = (I - A)^{-1} f$, including: GO : output, f : Final demand, A : the IO matrix, and I : the unit matrix

- Employment coefficient : $\ln(EC) = a_0 + a_1 \ln(GDP) + a_2 t + a_3 t^2 + e$
 - $Emp = GO^f * E_f$ Với f : forecast year
- Example (IO model), scenario, parameters

2. LABOR DEMAND PROJECTION MODEL

(ii) Extended IO Model

- Labor demand forecasts model in specializing in engineering
 - Model estimation for a particular job: $\ln(\text{odds}) = \beta_0 + \beta_1 t + \beta_2 t^2$
 - Including: $\text{odds} = \frac{p}{1-p}$, p is the proportion of labor specializing in engineering/total of labor in forecast year, determine odds or determine p
 - Employment of the profession specializing in engineering: $i:\text{Occ}_i = P_i * \text{Emp}$
- Data used: IO 2012, enterprise survey, LFS survey

3. Labor Demand Projection By Extended IO Model to 2022

- **3.1. Predictions for forecast period 2018-2022**

- **The medium scenario** (baseline scenario) with the most likely occurrence. Investment growth of 7% per year, economic growth for the period 2018-2022 may reach 6.51%, while inflation remains low, about 5%.
- **High scenarios** are less likely to happen but can also be achieved, economic growth and average periodic inflation are 6.76 and 6%.
- **The low scenario**, though not very likely, may still occur if the Vietnamese economy continues to develop as the old economic model, the economic growth rate may be only 6%, inflation can Rise back to above 7% depending on the level of risk and the operational effectiveness of the policy.

3. Labor Demand Projection By Extended IO Model to 2022

3.1 Results of labor demand Projection

- 3 scenarios: low, medium and high
- *a) Labor demand Projection by sector*
- "AFF" employment continued to decline in terms of both quantity and structure, falling from 21.16 million (34.82%) in 2018 to 18.54 million (31.14%) by 2022.
- Employment continues to shift to "Manufacturing and processing industry, from 10.3 million (accounting for 18.7%) in 2018 to 12.1 million (21.21%) by 2020 and 14, \$ 23 million by 2022.
- The proportion of the sector increased: construction; administrative activities and support services;
- Sectoral tendency is to reduce the proportion of employment such as mining, professional activities, science and technology, education and training

Low scenario	2018	2019	2020	2022	2018	2019	2020	2022
	Nghìn người				Cơ cấu %			
Labor in agriculture, forestry and fisheries	20.961	20.228	19.457	18.001	38,48	36,71	34,89	31,24
Extraction	189	178	167	149	0,35	0,32	0,30	0,26
Manufacturing and processing industry	10.169	10.933	11.792	13.718	18,67	19,84	21,15	23,80
Production of electricity, gas, hot water, steam and air conditioning	175	182	189	203	0,32	0,33	0,34	0,35
Water supply; Waste and waste water management and treatment	145	151	156	167	0,27	0,27	0,28	0,29
Construction	4.105	4.244	4.356	4.589	7,54	7,70	7,81	7,96
Wholesale and retail; repair of automobiles, motorcycles, motorcycles and motor vehicles	6.868	6.873	6.848	6.798	12,61	12,47	12,28	11,80
Transportation, warehousing	1.663	1.684	1.699	1.729	3,05	3,06	3,05	3,00
Accommodation and catering services	2.640	2.706	2.761	2.873	4,85	4,91	4,95	4,99
Information and communication	361	380	401	445	0,66	0,69	0,72	0,77
Financial, banking and insurance activities	444	466	487	533	0,82	0,85	0,87	0,92
Real estate business	207	216	226	246	0,38	0,39	0,40	0,43
Professional activities on science and technology	217	213	209	201	0,40	0,39	0,37	0,35
Administratives and support services	2.196	2.283	2.356	2.512	4,03	4,14	4,23	4,36
Activities of the Communist Party, socio-political organizations; State management, national security and defense; compulsory social security	1.931	1.943	1.946	1.952	3,54	3,53	3,49	3,39
Education	441	396	355	284	0,81	0,72	0,64	0,49
Health and social work activities	50	50	50	51	0,09	0,09	0,09	0,09
Arts, entertainment and entertainment	334	388	456	631	0,61	0,70	0,82	1,10
Other	1375	1591	1852	2545	252	2,89	3,32	4,42

3. Labor Demand Projection By Extended IO Model to 2022

3.2 Results of labor demand Projection

b) Labor demand Projection by occupational group: medium scenario

- In 2018, the demand for high-qualified skilled workers was 4.75 million (accounting for 3.44%) and the leaders in sectors, levels and units were 926 thousand (1.68%); By 2022, the demand for employment in these occupations is 6.14 million (accounting for 10.4%) and 1.2 million (2.05%).
- The demand for employment in the occupational group is declining sharply. In 2018, the demand in this occupation group is 15.5 million (28.47%). In 2022, this figure is 12.03% million laborers (21.06%).

	Medium plan	Quantity (thousand persons)				Percentages (%)			
No.	Employment by profession	2018	2019	2020	2022	2018	2019	2020	2022
1	Leaders in Categories, levels and units	926	994	1.066	1.211	1,68	1,77	1,87	2,05
2	Advanced technical expertise	4.750	5.089	5.444	6.138	8,62	9,08	9,52	10,40
3	Intermediate technical expertise	1.897	1.922	1.945	1.967	3,44	3,43	3,40	3,33
4	Employee (professional profile, work in office, desk)	1.265	1.349	1.437	1.608	2,30	2,41	2,51	2,72
5	Employee in service, security order,..	11.396	12.107	12.836	14.191	20,69	21,59	22,46	24,04
6	Labor in agriculture, forestry and fisheries	6.434	6.625	6.813	7.112	11,68	11,81	11,92	12,05
7	Artisans and other technicians involved	6.849	6.904	6.953	6.960	12,43	12,31	12,16	11,79
8	The technicians have assembled and operated machinery and equipment	6.427	6.989	7.584	8.784	11,67	12,46	13,27	14,88
9	Handwork	15.366	14.436	13.528	11.676	27,90	25,74	23,67	19,78
10	Total	55.078	56.075	57.161	59.026	100,00	100,00	100,00	100,00

4. RECOMMENDATIONS

- Development of an Input-Output model to predict sectoral employment, using a model used by South Korea, Hungary, the Philippines, etc. to forecast employment by occupation, by region, by region, by ownership, ... in the industry
- The model is also improved in the forecast scenario (it is possible to use the scenarios for GDP in the forecast year or use the factors that contribute to GDP in the future).
- Continuing to build the database system for the model: updating data for the model on a regular and consistent basis, based on which the forecasted results will be close to reality..

4. RECOMMENDATIONS

- The current forecast model can be used for 21 sectors and need to be used for 85 sectors; This model also forecast 10 occupational groups but detailed occupations are not available. Therefore, it is necessary to continue to develop the model.
- Model development orientation:
 - i) Putting factors of scientific and technological changes; factors of labor productivity change into the model;
 - ii) Analysis of changes in production technology by developing a dynamic IO model;
 - iii) Develop the content of labor demand Projection for occupational groups; group in each economic sector.
- Coordination of stakeholders (MPI, MOLISA, other ministries)

Thanks for listening!

QUESTIONS

- What are the main constraints when applying the model of Labor demand forecast in Vietnam?
- What are the limitations when applying the extended IO model in Vietnam?