

Approaches to Labor Demand Forecast in Developing Economies and Their Implications for Korea's ODA

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I. Introduction: Why Labor Demand Forecast Matters in TVET ODA

Technical and vocational education and training (TVET) programs are a critical area within the official development assistance (ODA) mandate of Korea. Korea has been implementing TVET projects in a wide range of regions, including Southeast Asia, Central Asia, Latin America and the Caribbean, the Middle East, and Africa. The Korean government approaches vocational education and training program as a strategic means of development cooperation, within the focus of its Country Partnership Strategy. Considering the increasing demand for TVET from developing countries, Korea is expected to continue and expand its TVET projects. Nevertheless, it has been assessed that Korea has not been conducting systematic labor market forecast in the preparation and implementation of TVET projects. Developing systematic labor forecast methods, thereby increasing predictability of future labor demand, should precede actual hardware supports, including the construction of job training centers and

distribution of training materials as well as curriculum development in order to increase the efficiency of TVET projects. However, the labor demand forecasts conducted by Korea up to now largely fall short of these expectations. As developing countries are transitioning from an agricultural economy to an industrial economy, there is a change in the demand structure of their labor force, although the degree and pace vary by country. In order to enhance the effectiveness of vocational education performed in line with ODA projects, as well as to improve the quality of this education, it is necessary to anticipate reasonable labor demand for skills or qualifications before developing an education plan, including curriculum design. Although the manufacturing sector currently accounts for only 10 to 20 percent of GDP in developing countries, ongoing industrialization is expected to further increase the demand for industrial workers. These changes in the economic structure of developing countries mean to bring about changes in the supply and demand structure of the labor market, and therefore the need for more detailed demand analysis by industry, sub-industry and occupation is increasing along with macro-level demand forecasting. Be-

cause demand for industrial labor force is a derivative demand largely affected by various factors surrounding the enterprise, industry and national economy as a whole, both a micro-level and macro-level approach are required. TVET projects usually undergo a sequential process of labor demand survey, curriculum development, project implementation, and monitoring & evaluation. Labor demand forecasting is at the forefront of this cycle and has a profound impact on the rest of TVET phases. In fact, the forecasting analysis of labor demand is treated as a paramount issue in advanced donor countries such as Europe and international development aid agencies because it is directly related to the effectiveness of TVET projects.

This study aims to develop systematic labor forecast methods, thereby contributing to increasing the efficiency of TVET ODA. Towards this, the study suggests a labor forecast method that considers characteristics of developing countries, and applies the method to Vietnam as a pilot application. Based on the results, this study estimates Vietnam's future labor demand by industry and by occupation. In addition, the study introduces alternative labor market projection methods that can possibly deal with new changes observed in the labor markets of emerging countries.

II. Review of Korean TVET ODA

This study reviews Korean TVET ODA projects and evaluates the demand side of the projects, for instance whether any labor market forecasts had been conducted for these projects or not, and the

scope and method of labor market forecast. We examine project proposals, project validity studies, and evaluation studies for evaluating how much the demand side was considered in the process of implementing TVET projects. When evaluating the progress of TVET projects that Korea has conducted, we cannot assess that analyses of the outlook for labor demand have been made systematically. Most of the methods to anticipate labor demand conducted by Korea have been largely fragmentary with limited scope and do not constitute a systematic demand forecast. According to an analysis of a feasibility study report on 32 TVET projects Korea has conducted within developing countries over the past five years, only 18 projects have been conducted with labor market analysis or demand surveys, and few have been carried out with systematic methodologies. This means that 14 of the above 32 TVET projects have been provided without labor demand surveys in advance, which is not an issue to overlook lightly given that forecasting the labor demand is directly related to the success or failure of the TVET ODA.

III. Comparative Analysis of Labor Demand Forecast Methods

As a precursor to developing an alternative labor projection method, this study introduces labor forecast models used in developing and advanced countries and compares their characteristics. Labor forecast studies started as the issue of effective human resource allocation emerged as a national task for many countries after World War II. Accurate macroeconomic projection is critical for labor forecast,

because labor demand is basically derived demand generated as the aggregate demand of the economy increases. Recently, econometric methods based on the general equilibrium model are largely used in order to include inter-related effects of sectors, by using population, macroeconomic, industrial, and labor time series data. As the model becomes larger, several countries divide the economy into several blocks (e.g. macroeconomy, international economy, labor market, etc.) and focus on the dynamic estimation in each block. Furthermore, qualitative methods are used to take account for the impact of new industries emerging and existing industries declining due to technological innovation and changes in the international trade environment.

In Korea, the Korea Employment Information Service was established to perform projections of labor demand and supply starting from 2006. This labor forecast reflects changes in population, society, economy, and industry structure. The projection model is composed of two main parts: a section dealing with aggregate labor supply and demand forecast, and another forecasting new labor force. The first section estimates the stock of labor supply and demand. The second section on new labor force forecast estimates the flow of labor supply and demand as well as the supply-demand gap for a certain time period. The supply side forecast estimates the labor force based on population prospects and economic participation rate projections. On the demand side, the labor forecast estimates real value-added using an industry-macro econometric model. By multiplying employment coefficients by this estimate, labor demand forecast by industry is

calculated. Subsequently, this yields a labor demand forecast by occupation and industry-occupation labor demand matrix. Finally, the recursive structure of the model matches aggregate labor supply and demand at the natural unemployment rate level. Labor forecast methods used in most advanced countries are similar to the Korean model. The US Bureau of Labor Statistics model uses segmented data by industry and occupation, while the Dutch ROA model is characterized by segmenting and forecasting job prospects by sector or level of education in the underlying labor markets.

In most developing countries, the lack of statistics, forecasting capacity, or experience makes it difficult to implement a systematic labor market forecast. Some countries are developing methodologies to build statistical information and forecasts for industrial labor demand with the support of international organizations or donor countries. However, these projects are likely to end as one-time events while performing forecasts on industrial labor demand involves huge expense and many experts. This makes it difficult to systemize and maintain the industrial labor demand forecasting system independently.

Quantitative and qualitative analysis have different strengths and weaknesses. It is necessary to increase prediction power through a “combination” of the analytical methods rather than relying on any one method. Combining analytical methods requires more time and cost than using one method, but various methods can be utilized to increase the reliability of predictions.

IV. Case Study: Labor Demand Forecast in Wireless Communication Equipment Manufacturing Sector of Vietnam

We applied our labor forecasting methodology to Vietnam to estimate future labor demand by industry and occupation, as a pilot analysis for emerging countries that combines quantitative and qualitative analyses. Vietnam was chosen for the pilot because of the following reasons. The quality of labor market statistics is relatively high compared to other emerging economies. Additionally, the manufacturing industry, a key industry in vocational education ODA projects, accounts for a high proportion in the economy. Lastly, Vietnam is the largest recipient of TVET assistance from Korea. Korea's TVET ODA to Vietnam from 2011 to 2017 amounts to \$66.7 million.

First of all, using data from the General Statistics Office of Vietnam (GSO), we forecasted labor demand for 20 industries and 9 occupations, following international classifications (ISIC Rev.4 and ISCO-08 respectively). These industries consist of a number of subdivisions, some of which will be revisited in the next steps of this research. Based on the forecasting methodology used in Korea, we conducted employment projection by industrial and occupational classification. Due to the characteristics of emerging countries including short time series data and less stable macroeconomic prospects, however, we could only perform a mid-term forecast for the period of 2019 to 2024. Our results indicate a significant trend difference by industry, though the total number of employees is expected to increase by 0.5% annually on average until 2024.

Employment in the manufacturing sector is expected to increase by 2.4% per year, while employment in primary industries such as the agricultural and mining sectors is expected to decrease by 0.8% to 3.1% per year. By occupation, employment in professional groups is expected to increase by 5.3% per year, while elementary occupations and skilled agricultural, forestry and fishery workers are expected to decrease by 1.9% to 3.5% per year.

Subsequently, we implemented a labor demand forecast for sub-categories of industries and occupations within the manufacturing industry. Due to the lack of detailed statistics on the manufacturing industry within the data from the GSO, we chose to use data taken from the UNIDO Industrial Statistics (INDSTAT) Database 4: the value-added and the employment by sub-sectors in the manufacturing industry. According to our forecast, total employment in the manufacturing industry is expected to increase by 1.7% annually during the 2017-2024 period. Employment in the manufacture of communication equipment (Industry 263 in ISIC Rev. 4) increased by 47.3% and 35.8% annually for 2007-2012 and 2013-2016, respectively. During 2017-2024, however, the annual growth rate of employment in this sector is expected to adjust to 3.9% annually.

Currently, traditional quantitative forecasting methods can be applied only to 161 minor groups (3 digits) of industries in Vietnam, because unit-level (4 digits) statistics have not been fully established. Accordingly, using non-traditional methods is necessary in labor forecast for further detail industries at unit

level. We applied a hybrid method of quantitative and qualitative approaches to the manufacture of wireless communication equipment, one of the most prominent sectors recently in the Vietnamese manufacturing industry. Given that TVET projects mostly target the manufacturing sector, this study chose model cases among the manufacturing industries.

The labor forecast of wireless communication equipment was conducted using the quantitative projection of its upper level category, the manufacture of communication equipment. Import and export statistics, enterprise survey, and interview of Vietnamese government officials and experts on Vietnamese industry were conjointly used in the forecast. UNIDO currently provides data on the Vietnamese communication equipment manufacturing industry only at minor group level (3 digits), thus an enterprise survey was implemented in order to gain more detailed statistics (4 digits data). Since the International Standard Industrial Classification of All Economic Activities (ISIC) does not specify unit level categories, we followed the Korean Standard Industrial Classification (KSIC) and divided the manufacture of communication equipment industry into manufacture of “wire communication equipment” and “broadcasting and wireless communication equipment (hereinafter wireless communication equipment).” We conducted an enterprise survey in only one of the two unit level industries due to time and budget concerns. Considering the large portion cellular phones and relevant parts account for in Vietnamese exports, the manufacture of wireless communication equipment was selected for our enterprise survey.

The enterprise survey asked respondents for their outlooks on the industry, the current employment status and future labor demand, and the future labor demand of three types of occupations (professionals, technicians and associate professionals, plant and machine operators and assemblers) that are closely related to TVET ODA within the industry. In order to compare trend changes over time, survey questions on the future outlook were subdivided into short-term (next year) and medium-term (next five years) expectations. Most of the respondents were foreign-owned companies producing cellular phones and related parts. Additionally, the portion of large companies with 500 or more employees was relatively large in the sample compared to the portion of large companies in the entire Vietnamese industry. Regarding the development of the wireless communication equipment industry, most companies evaluated the industry as showing stable growth. Particularly, enterprises with 500 or more employees appeared to have more positive expectations on the future of the industry. With regard to labor demand, more than half of the respondents had employed new workers during the previous year. Among them, newly established companies were more active in hiring new employees. Considering the future labor demand, most enterprises answered that they plan to further increase their employees over the medium term (five years) rather than over the short term (one year). According to the survey, the labor demand for the three occupations is also expected to gradually increase over the

medium term. The demand for “plant and machine operators and assemblers,” in particular, was higher than demands for other occupations. In the longer term, together with the technological development of Vietnam, the “plant and machine operators and assemblers” occupation could possibly replace unskilled elementary occupations.

The third component of our new forecasting method is stakeholder interviews. In order to include qualitative analysis in our hybrid-type of labor forecasting method, we interviewed Vietnamese stakeholders in charge of economy planning, economic forecast, and statistics. The interviews aimed to identify the characteristics and problems of the Vietnamese labor market, stakeholders’ expectations on the outlook of wireless communication equipment industry and labor demand, and the demand for TVET assistance. The information collected from interviews was used in adjusting estimated labor demand by industry and occupation, gained from a combination of quantitative analysis and enterprise survey. The information was also utilized in deriving policy implications for Korea’s TVET assistance to Vietnam. Key takeaways from the interviews are as follows. Firstly, the Vietnamese labor market is characterized by a large informal sector, less skilled workers, and substantial portion of foreign-owned companies in labor-intensive industries. Secondly, the experts’ opinions on the outlook of wireless communication equipment were divided into largely positive and negative expectations. Some experts predicted that the wireless communication equipment industry would continue to show a high level of growth, and accordingly,

labor demand growth rate would be high. They suggested the possibility of foreign direct investment increasing, the Vietnamese government’s drive to promote the industry, and local enterprises’ participation in cellular phone production as factors supporting their views. On the other hand, other experts with a somewhat pessimistic view expected a slowdown in the growth of the wireless communication equipment industry. These experts presented the decrease in Samsung Electronics’ production in Vietnam, and the possible decrease in foreign investment due to lack of capacity among local laborers and enterprises as evidence buttressing their opinions. Lastly, regarding TVET ODA, the demand for training of unskilled laborers was higher than demands for other types of assistance.

Finally, we combined the results of our quantitative analysis, enterprise survey, and stakeholder interviews, and subsequently estimated labor demand for the three key occupations in the Vietnamese wireless communication equipment industry. To be specific, we estimated the industry prospect of the wireless communication equipment industry, the overall labor demand prospect of the industry, and the labor demand for the three occupations in the industry. These estimates were computed by applying the results of our enterprise survey to the estimated value added of the Vietnamese communication equipment industry calculated in Chapter 4 and the trade statistics. The estimated numbers were adjusted to reflect the results of stakeholder interviews to supplement the lack of data. According to the quantitative analysis, the communication equipment industry annually grew by about 60% for the last 10 years,

and accordingly its largest subdivision, the wireless communication equipment industry, was estimated to have expanded at a similar rate. Regarding the future prospects of the wireless communication equipment industry, the quantitative analysis estimated that this growth rate would slow to 20% per year over five years. Considering the enterprise survey results and the stakeholder interviews, however, the medium-term growth rate of the industry was adjusted to 10%. Concerning the labor demand, the annual employment growth rate was estimated at around 2% for the next five years,

based on combining the trend of employment inducement coefficient from quantitative analysis, the enterprise survey, and stakeholder interviews. Currently, the “element occupations” group takes the largest portion in the labor demand by industry and occupation. Over the next five years, however, the “plant and machine operators and assemblers” group is expected to gradually increase, thus becoming the largest occupation group in the wireless communication equipment industry in the near future.

Table 1. Proportion of each occupation in selected industries

Industry	Occupation	2009–12	2013–19	2020–24 (estimates)
Manufacturing	Professionals	2.6%	3.2%	3.8%
	Technicians and Associate Professionals	2.2%	1.8%	2.4%
	Plant and Machine Operators and Assemblers	18.4%	25.1%	40.2%
Manufacture of wireless communication equipment	Professionals	3.1%	4.4%	5.2%
	Technicians and Associate Professionals	1.8%	2.6%	3.5%
	Plant and Machine Operators and Assemblers	19.6%	30.3%	48.3%

This study estimated labor demand by occupations in the wireless communication equipment industry in Vietnam, through a combination of quantitative and qualitative methods. This new approach is readily applicable to other emerging countries. Although most emerging countries have less-detailed labor statistics compared to Vietnam, many of them still provide time series data on the major (1 digit) and sub-

major (2 digits) group level. Thus, quantitative analysis, one of the bases for our new method, is feasible on these levels. Furthermore, many developing countries are establishing national and labor statistics systems with the help of the International Labor Organization and other developed countries. Therefore, in the medium and longer term, the use of quantitative analysis is likely to increase.

V. Conclusion: Innovative Approaches to Forecasting Labor Demand

There has been increasing demand for new methodologies that can fully reflect the complexities of the labor market, thereby rigorously forecasting future labor demand in emerging countries. Quantitative analysis methods are inherently limited in that they cannot reflect new changes as they predict the future based on the trend lines of historical data, which is bound to be greater for emerging countries undergoing a shift in their economic structure. Moreover, most developing countries have poor labor statistics systems, making it difficult to apply quantitative model analysis. While qualitative analyses such as literature review, expert panels, Delphi techniques are widely used, these cannot be seen as potent methodologies to predict future labor demand in the mid- to long-term perspective. Given the various circumstances surrounding the labor market in developing countries, other alternatives in addition to our hybrid method of combining quantitative and qualitative analysis can also produce well-founded labor force projections. This study suggests analytical methodologies using global value chain (GVC) and big data as innovative alternatives, which can complement the shortcomings of traditional evaluation methods.

For the labor demand forecast in the industry integrated in the international division of labor, the GVC method can be applied. When considering the active participation of emerging countries in GVC, this method may be practical. Although the labor demand

generated by participation in the GVC will depend on the characteristics of the sector (capital or labor-intensive) and types of participation (forward or backward industries), GVC analysis has significant implications for the anticipation of industrial labor demand. The demand for industrial workforce in developing countries is largely caused by foreign direct investment in GVC. For example, 2.1 million people are currently employed by foreign companies in Vietnam. It would be difficult to conclude that GVC participation necessarily contributes to job creation. This is because the inclusion of local companies in GVC would create demand for jobs as their production and exports expand, yet employment demand could decrease due to factors such as factory automation. However, a number of empirical studies reveal that jobs are clearly increasing with the participation of local companies in GVC. The expansion of developing countries participating in GVCs amid globalization has had a significant impact on their job markets. In the case of Vietnam, jobs (direct and indirect) in the export sector quadrupled between 1990 and 2010, with foreign companies accounting for more than 20 percent of the country's total employment.

Considering the complex reality surrounding the analysis of labor demand in developing countries, the big data analysis method is also necessary as an innovative approach. Big data analysis, which has been limitedly used so far even in advanced countries can also be practically used to forecast labor demand in developing countries, taking into account the increase in internet use and online job advertisements in these countries.

While the big data method has certain disadvantages considering the large informal sector in developing countries, this method also has some advantages compared to traditional labor demand surveys. The method is more cost-efficient and collects information at a more frequent rate compared to traditional methods. As the method can immediately reflect labor market changes in the labor forecast, it could be widely useful in emerging industries rather than traditional industries.

ODA implementing agencies would benefit from paying attention to the labor forecasting methods presented in this research, and devising policies supporting these methods in order to properly apply them in reality. **KIEP**