

## Incorporating vocational training systems in CGE models

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### Abstract

Technical education and vocational training (TEVT) represents one of the essential determinants of human capital growth and sustainable development. Moreover, it is considered as a suitable remedy for improving the knowledge and productivity levels of individuals and societies. A recursive-dynamic CGE model provides a well-suited toolkit for evaluating the effects of public spending on the conventional education and vocational training systems in the agricultural sector. Furthermore, the developed model attempts to capture the medium and long-term influences of the government policies on human capital growth, households' welfare, labour markets and the production structure of the economy. The approach explicitly involves different types of education; including primary, secondary, tertiary and TEVE. Nevertheless, this model classifies the labour market based on their education and training skills as well as their potentials. It also considers the possibility of change on the educational outcomes affects the total number of workers in the economy. The results showed that an increase in the education investment have negative impacts on the supply of highly qualified workers and hence the gross domestic products (GDP) in the short term. On the other hands, the supply of low qualified workers declined dramatically in the medium to long term.

Keywords: Vocational training, DCGE, education, public spending, agriculture

### Introduction

Technical and vocational education and training (TVET) is a type of education that combines theoretical and scientific knowledge with practical experience to meet the skills demand for

livelihoods and labour market (Jones, 2014: 1; Mortaki, 2012, 52; Hoogerwaard, 2006, 14). It is classified into two parts: (i) technical and vocational education, and (ii) vocational training. Technical and vocational education targets the students, who have successfully completed compulsory education, to achieve employable skills in a formal education institution, while the vocational training involves all learning activities that are carried out outside the schooling cycle to upgrade the productivity levels. Thus, vocational training is of greater variety both in terms of training duration and entry requirement than the vocational education (Bidwell et al, 2013, 1; Hoogerwaard, 2006, 14).

TVET is deemed to be one of the essential determinants of human capital accumulation. An analysis of education attainment of the labour force indicates that the growth of education has a strong negative association with conventionally constructed, growth-accounting measures of total factor productivity (Pritchett, 2000, p:1; Hanushek, 2013, p:205). In contrast, other empirical evidence illustrates that TVET has an effective and crucial role in rising the growth rate of output per worker more compared to the academic education system (Hanushek, 2013, 205; Bellakhal and Mahjoub, 2013, 9-10; EU, 2011a, 18; EU, 2011b, 8; Alam, 2008, 21-22; Hoeckel, 2008, 1-17).

Nonetheless, education has been relegated to an inferior position in long-term plans and strategies for sustainable development for the majority of the governments, particularly in developing countries. This is reflected in disproportionately increasing investment in various education sectors other than TVET. Overall, the finance of various schooling activities relies basically on the public budget, which involves direct public expenditure as well as subsidies to households, such as tax deductions, scholarships and living allowances, etc.

Computable General Equilibrium (CGE) models have been widely employed to analyse the impacts of expenditure policies related to conventional education (primary, secondary and tertiary). The majority of studies attempted to deeply identify the potential economic consequences of increasing academic schooling investment (see for instance; Mardones, 2015; Schuereberg-Frosch, 2015; Robichaud et al, 2014; Lofgren et al., 2013; Balma et al., 2011; Odior, 2011; Cloutier et al., 2008; Zhai and Hertel, 2005a; Zhai and Hertel, 2005b; Jung and Thorbecke, 2003; Dabla-Norris and Matovu, 2002; Savard and Adjovi, 1997). Nevertheless, the TVET system has so far been neglected as an education sector by CGE modelers, despite its importance as a tool for human capital growth.

## Research Methodology

This paper develops a recursive dynamic CGE model that accommodates TVET and allows depicting the impact of various policies targeting the vocational training system with special focus on the

agricultural sector in developing countries. It attempts to capture the medium and long-term effects of these measures on human capital growth, households' welfare, labour markets and the production structure of the economy. The model classifies the workforce into six cohorts of workers, based on schooling years, education type and formality of education. The model builds on and expands the static CGE model of Stage.2 that is developed by McDonald (2015). Moreover, it adopts some dynamic concepts from Thurlow (2008), and follows the educational structure of the MAMS model of Lofgren et al. (2013), which links the effects of education on the economy through the labour market.

The model considers a small open economy with exogenous world prices and includes five production sectors. These activities involve agricultural, non- agricultural (industrial and services), academic education (primary, secondary, tertiary education), technical and vocational education, and vocational training sectors. Production factors in the model are eight, including capital, land and six cohorts of workers classified based on their education and training skills and potential. The different labour groups are differentiated using three standards. Firstly, the years of attending school, according to which wage earners are divided into four groups containing; 1) uneducated labour with no years of schooling; 2) primary educated labour (1-6 years of schooling); 3) secondary educated labour (7-12 years of schooling); and 4) tertiary secondary educated labour (13 – 16 years of schooling) (Dabla-Norris and John, 2002, p; 7). Secondly, secondary educated labour is disaggregated again referring to the type of education into two categories; (i) workers who attended TVET schools or centers including at least one year of practical experience; (ii) workers who attended academic education without practical experience. Lastly, TVET qualified workers are further divided basing on the formality criteria into technical and vocationally educated (formal students in TV schools or centers) and vocationally trained labour (training outside the school system).

The model also comprises four types of institutions: household, enterprises, government and the rest of the world. It includes income and expenditures for four representative household groups, which are classified by location (rural and urban) and occupation (agricultural and non-agricultural). The government account distinguishes into the core and taxation accounts, with the latter containing direct and indirect taxes.

In the base year, ( $t=0$ ), the economy is endowed with certain stock of physical and human capital. In non-base years, the accumulation of physical capital is modelled endogenously, based on the previous period investment for generating new capital stock for the subsequent period following the approach adopted by Thurlow, 2008. The evolution of each labour group is determined by using a logistic function, which relies on the education investment decisions, wage premiums, education quality and

the household's consumption per capita pursuing the approach of Lofgren et al. (2013) for education in the MAMS model.

## Simulations

In the model described above, two scenarios as well as the reference scenario are simulated, which represent the educational policy measures. The reference scenario reflects the evolution of the economy without additional public expenditure on the schooling systems. It accounts only the rising of the public spending on non-agricultural sectors. While, the second scenario indicates a rise on the spending for the formal education sectors (primary, secondary, tertiary and TEVT) and excluding the informal vocational training system. The last scenario illustrates an increase on the formal and non-formal education cycles.

## Anticipated Results

Overall, in the short run, increasing the ratio of the education expenditure leads to an increase on the number of the enrolled students in schooling cycles and improves the participation and graduation rates. This consequence reduces the gross domestic product (GDP) in the two scenarios compared to its level on the reference scenario. While in the medium to long run, the supply of qualified labour claimed dramatically, which generates higher GDP growth rates.

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