Final Report

# Cambodia Macroeconomic Impacts of Public Consomption on Education – A Computable General Equilibrium Approach

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March 2016


PAGE
policy analysis on growth and employment

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## Abstract

Lack of human capital, skilled and highly educated labour is seen as one of the most significant constraint for Cambodia to be more competitive and to move forward to upper-middle income country. A recent discussion among researchers, policy makers, private sector, and development partners came up with a broad consensus that the skill gap is emerging in the country. Education is one of the top priority sector of the Royal Government of Cambodia (RGC). It was emphasized as the key sector to enhance the capacity building and human resource development. In spite of concerted efforts, policymakers and bureaucrats are still facing challenges in designing and executing the education policies that could efficiently build more human capital, particularly the highly educated labour. Questions such as what would be the impacts of the increase of public education expenditure on the labour market and who benefits from this spending, are important inputs for promoting the inclusive growth and rural livelihoods. Many studies have examined the nature of education policies and the structure of this sector's spending. However, none of these studies did provide a systematic country-wide analysis and quantify the impacts of public education spending on the labour market and the households' welfares. Employing available Social Accounting Matrix, government budget data, the Cambodian Socio-Economic Survey and the Cambodia Economic Census, this research study aims to fill this gap by addressing the above questions and examining the distributive impacts of education public expenditure in Cambodia. This is important given the major role of fiscal policy and education in the Cambodia economy.



**JEL:** C63, C67, C68.

**Keywords:** Public Education Spending, Labour market, Household Welfares, CGE, Simulation Modeling



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## Acknowledgements

This research work was carried out with financial and scientific support from the Partnership for Economic Policy (PEP) (www.pep-net.org) with funding from the Department for International Development (DFID) of the United Kingdom (or UK Aid), and the Government of Canada through the International Development Research Center (IDRC). The authors are also grateful to Professor *Bernard Decaluwé*, Professor *Hélène Maisonnave*, and *Dr. Lulit Mitik* for technical support and guidance, as well as to *Dr. Erwin Corong*, MoEYS, MEF, and CDRI staffs for valuable comments and suggestions.

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## List of abbreviations

| | |
|---|---|
| **ADB** | Asian Development Bank |
| **ASEAN** | Association of South East Asian Nations |
| **CGE** | Computable General Equilibrium |
| **CMDG** | Cambodian Millennium Development Goal |
| **CPC** | Central Product Classification |
| **CSES** | Cambodian Social Economic Survey |
| **ESP** | Education Strategic Plan |
| **GDP** | Gross Domestic Products |
| **MEF** | Ministry of Economy and Finance |
| **MOEYS** | Ministry of Education, Youth and Sport |
| **MOP** | Ministry of Planning |
| **IO Table** | Input-Output Table |
| **ILO** | International Labour Organization |
| **ISIC** | International Standard Industrial Classification |
| **MAMS** | Maquette for MDG Simulations |
| **NGO** | Non-Governmental Organization |
| **NIS** | National Institute of Statistics |
| **NSDP** | National Strategic Development Plan |
| **RGE** | Royal Government of Cambodia |
| **SAM** | Social Accounting Matrix |
| **SUT** | Supply-Use Table |
| **WDI** | World development Indicator |

| | |
|---|---|
| **LEL** | Low Educated Labour |
| **FEL** | Fairly Educated Labour |
| **HEL** | Highly Educated Labour |
| **CAP** | Capital |
| **Kedu** | Education Capital |
| **LAND** | Land |
| **HUP** | Urban poor |
| **HUNP** | Urban non-poor |
| **HRP** | Rural poor |
| **HRNP** | Rural non-poor |
| **FIRM** | Firm |
| **GVT** | Government |
| **TV** | Sales tax (VAT) |
| **TC** | Excise tax |
| **TM** | Import tariff |

| | |
|---|---|
| **TX** | Export tax |
| **TD** | Direct tax |
| **LEL** | Low Educated Labour |
| **FEL** | Fairly Educated Labour |
| **HEL** | Highly Educated Labour |
| **CAP** | Capital |
| **LAND** | Land |
| **ROW** | Rest of the World |
| **AGR** | Agriculture |
| **MIN** | Mining and Quarrying |
| **MAN** | Manufacturing |
| **EGW** | Electricity, Gas, and Water Supply |
| **CON** | Construction |
| **WRT** | Wholesale and Retail Trade; and Repair of Motor Vehicles |
| **HTR** | Hotels and Restaurants |
| **TRC** | Transport, Storage and Communications |
| **FIN** | Financial intermediation |
| **REAL** | Real estate, renting and business activities |
| **ADM** | Public Administration and Defense |
| **PRE** | Primary Education |
| **SCE** | Secondary Education |
| **HIE** | Higher Education |
| **HSW** | Health and Social Work |
| **OTC** | Other Community Service Activities |
| **AGR** | Agriculture |
| **MEGW** | Ores and minerals; electricity, gas and water |
| **FOOD** | Food products, beverages and tobacco; textiles, apparel and leather products |
| **TRG** | Other transportable goods, except metal products, machinery and equipment |
| **MPME** | Metal products, machinery and equipment |
| **CONS** | Constructions and construction services |
| **TRS** | Distributive trade services; accommodation, food and beverage serving services; transp electricity, gas and water distribution services |
| **FINREA** | Financial and related services; real estate services; and rental and leasing services |
| **ADM** | Public Administration and Compulsory Social Security Services |
| **PRE** | Primary Education |
| **SCE** | Secondary Education |
| **HIE** | Higher Education |
| **HEALTH** | Health and Social Services |
| **OTHS** | Other Services, n.e.c. |
| **INV** | Savings |
| **VSTK** | Change in stocks |

# 1. Introduction

## 1.1 Context of the study

Cambodia is expecting to attain lower-middle income status in the next few years. The average growth rate of GDP is around 8 percent over the last decade. Poverty rate has dropped drastically, from 50.1 percent in 2007 to 20.5 percent in 2011. However, it is noticeably that this rapid poverty reduction has mainly concentrated in Phnom Penh and other urban areas. Rural poverty has remained high, standing at 23.7 percent in 2011 compared to only 1.5 percent in Phnom Penh and 16.1 percent in other urban areas, which reflects the unequaled income distribution between the regions as well as among people (The Gini index is almost 32 in 2011).

Lack of human capital, skilled and highly educated labour is seen as one of the most significant constraint for the country to move forward to lower-middle income country. This is going to be much more significant factor for Cambodia to avoid being stuck in what is called middle-income trap later on. A recent discussion among researchers, policy makers, private sector, and development partners came up with a broad consensus that the skill gap is emerging in Cambodia. A study was conducted by Dr. Murdur (2014) revealed that Cambodia is currently facing a skills shortage both schooling gap and learning gap. The study also discussed about the skill mismatched between industry and the existence human resource. As a result, it is suggested that the government need to narrow the gap by enticing the children to school, building education hardware, and enhancing education software (improving curriculum and tackling teacher shortage), which mean more resource should be allocated to education sector, especially in the higher education.

*"Education and health are basic objectives of development; they are important ends in themselves. [...] At the same time, education plays a key role in the ability of a developing country to absorb modern technology and to develop the capacity for self-sustaining growth and development."* — Michael P.Todaro/Stephen C.Smith, Economic Development, 2012

*"Education can add to the value of production in the economy and also to the income of the person who has been educated. But even with the same level of income, a person may benefit from education—in reading, communicating, arguing, in being able to choose in a more informed way, in being taken more seriously by others and so on."*—Nobel laureate Amartya Sen, Development as Freedom, 1999

Having seen the vital role of human capital for the growth and development, education has become one of the top priority sector of the Royal Government of Cambodia (RGC) and was considered as the key sector to enhance the capacity building and human resource development. This sector is considered as the strategic sector for Cambodia to raise its competitiveness, especially in the transition period from a lower-middle income country, which is expected to attain in the next few year, to an upper-middle country and high income country. (RGC/MOP 2014). Lots of institutional reforms and policies were carried out aiming for ensuring equitable access to education services, improving quality and efficiency of educational services and

institutions, and capacity development for educational staff for decentralization (MOEYS 2009).

*"The development of high quality and capable human resources with high standards of work ethics is key to support economic growth and competitiveness of the country. This is even more important for Cambodia's transition from a lower-middle income country status to be reached in the near future, to an upper-middle income country by 2030 and a developed country by 2050"* – envisaged by the Royal Government of Cambodia, quoted from Education Strategic Plan 2014-2018.

Recently, MOEYS has just released the Education Strategy Plan (ESP) 2014-2018. The long term goal of the policy is to provide equitable education and training by enhancing the access to the education for all the potential students and prioritizes more on higher education. To achieve this goals, as indicated in table 1, the MOEYS as well as the government has planned to increase the education budget from only 2 percent of GDP (16.3 percent of the government total spending) in 2014 to 2.4 percent (20.7 percent of the government total spending) in 2016 and to 2.6 percent 3 percent (around 26 percent of the total government spending) in 2018.

**Table 1: Estimated resource needed for education sector**

| Resource Estimated | 2014 | 2015 | 2016 | 2017 | 2018 |
|---|---|---|---|---|---|
| MoEYS share as % of GDP | 2.0% | 2.2% | 2.4% | 2.7% | 3.0% |
| MoEYS share as % of Gov't expenditure | 16.3% | 18.6% | 20.7% | 23.1% | 25.7% |

**Source: Education Strategic Plan 2014-2018**

However, regarding the limitation of the Cambodia fiscal space, it is debatable about the source of the financing and the impact of the increase of this expenditure over households' welfares. The questions about its impacts on macroeconomics, labour market and households' welfare; who will benefit from this spending; and the source of financing become a controversial discussion among bureaucrats and policy makers. These few questions can be answered through ex-ante analysis by employing some econometrics models. However, in order to capture such questions systematically with evidence-based, a country wide approach such as Computer General Equilibrium (CGE) is needed in order to examine and capture all the relationship among the sectors, economics agents and the key variables.

## 2. Research questions

This study intends to fill the gap of the previous studies and provide an in-deep analysis by quantifying the impact of the increase of public education spending on the labour market and the households' welfares in Cambodia. This study proposed the CGE analysis approach in order to provide systematic analysis about the impact of Cambodia fiscal policy, particularly the impact of education public expenditures and the source of its financing. The analysis of the study tends to answer to following questions:

- What would be the impact of expansion of the education public consumption on the labour market and the households' welfares? What if the government concentrated more on higher education development?

- What would be the appropriate source of the budget financing to maximize the households' welfares?

The above questions are extremely crucial, especially for policy makers to quantitatively understand the impact of their spending on education and the appropriate source of the budget financing. It is beneficial to know that whether the spending can benefit to the poor as expected and what can be done to maximize and diversify benefit of that spending.

## 3. Literature Survey

*Education Sector in Cambodia*

Despites the rapid growth of the GDP and the significant progress in eradicating poverty and hunger, the United Nation and ADB's report (2011) declared that Cambodia has been steady moving toward Millennium Development Goals (MDGs), particularly the slower progress in realizing the universal literacy and basic education. Annual Cambodia millennium development Goals (CMDGs) progress report (2014) disclosed that Cambodia has made a solid progress in primary and tertiary education and slow in early childhood and secondary education. The net enrollment rate in lower-secondary education is only around 40 percent in 2012 while 100 percent is expected to achieve in 2015. More importantly, according to table 2, the dropout rates in lower secondary education is up to 20 percent whereas it is only 13 percent targeted by Ministry of Education Youth and Sport (World Bank 2011; MOEYS 2014).

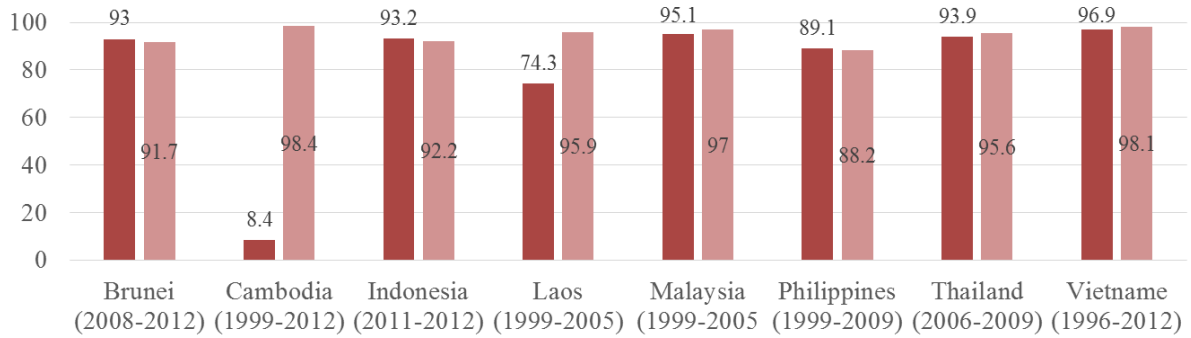
**Table 2: Dropout rate in lower and upper secondary education in Cambodia**

| Areas | 2004/05 | | 2008/09 | | 2012/13 | |
|---|---|---|---|---|---|---|
| | Lower Sec | Upper Sec | Lower Sec | Upper Sec | Lower Sec | Upper Sec |
| Dropout (urban) | 14.3 | 9.8 | 12.2 | 5.9 | 14.3 | 8.3 |
| Dropout (rural) | 25.4 | 23.9 | 21.4 | 14.9 | 23.2 | 17.2 |
| Dropout (country) | 22.3 | 17.0 | 18.8 | 11.3 | **21.2** | 14.0 |

**Source: MOEYS Education Statistics and Indicators (2013)**

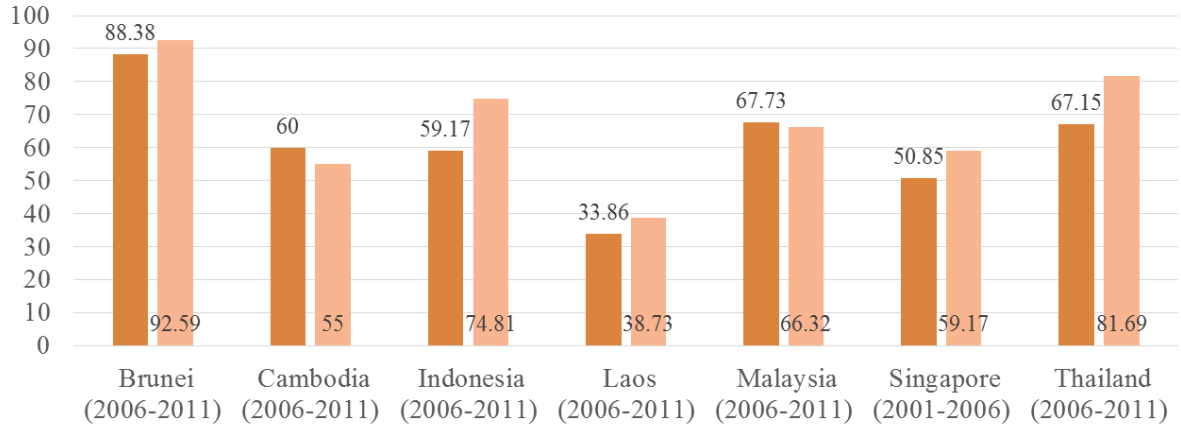
Figure 1 and Figure 2 illustrated the net enrollment in primary and secondary education in ASEAN countries, respectively. Regarding the figures, Cambodia is successful in the primary education. The number of enrollment increased from 8.4 percent in 1999 to almost 100 percent in 2012 which is the highest percentage in ASEAN. Nevertheless, the percentage slightly decreased in secondary education, from 60 percent in 2006 to 55 percent in 2011, which is the second lowest enrollment rate in ASEAN after Laos.

**Figure 1: Net Primary Enrolment rate in ASEAN region (percent)**




**Source: UNESCO database, retrieved on from http://data.uis.unesco.org/ retrieved on 3 Oct 2015**

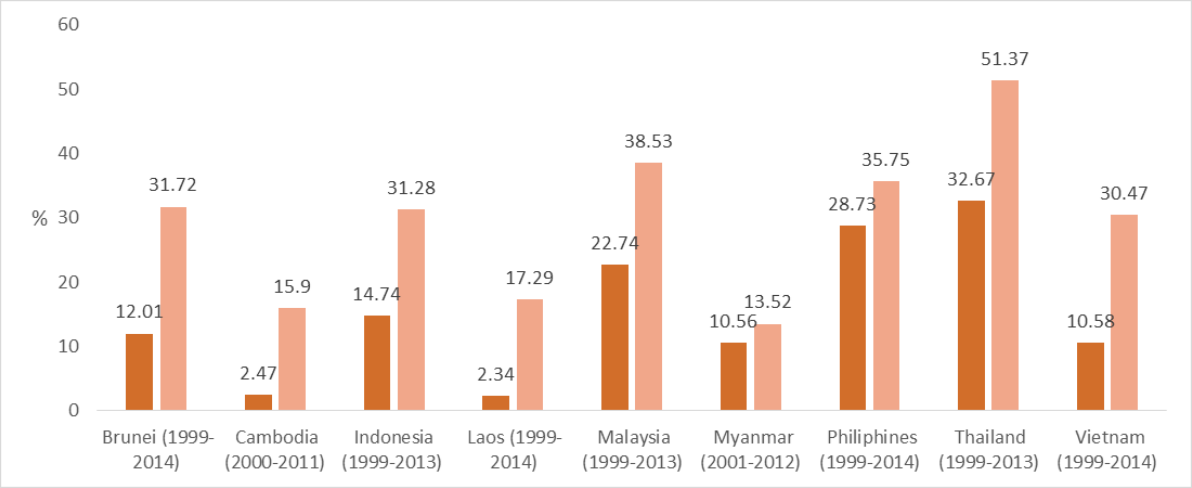
**Figure 2: Net enrolment in secondary education in ASEAN countries (percent)**




**Source: UNESCO database, retrieved on from http://data.uis.unesco.org/ retrieved on 3 Oct 2015**

Interestingly, figure 3 demonstrated the low rate of gross enrollment in higher education in Cambodia. Regarding the figure, the enrollment rate in higher education remarkably increased from almost 2.5 percent in 2000 to 16 percent in 2011. Nevertheless, the rate is the lowest one comparing to the other country in ASEAN countries, particularly to the neighboring countries such as Thailand (51 percent in 2013) and Vietnam (30.5 percent in 2014), and Laos (17.3 percent in 2014).

**Figure 3: Gross Enrollment rate of Higher Education in ASEAN Countries**



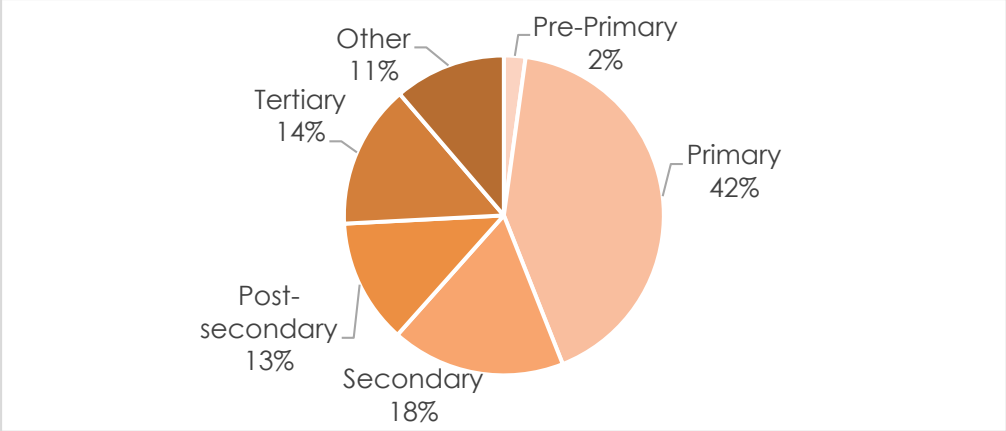

**Source: UNESCO database, retrieved on from http://data.uis.unesco.org/ retrieved on 3 Oct 2015**

ESP 2014-2018 indicates a deep reforms in education sector. The reform focus more on expansion of early childhood education, expanding access to quality secondary, post-secondary education, higher education, non-formal education, and technical and vocational education. Furthermore, the strategy includes the measure to improve the education budget management. With the commitment for the educational deep reform and increase the quality of students, who are going to enter the higher education, recently, MOEYS has been trying to strengthen the high school examination process by encouraging the involvement from the public and civil society in the country-wide high school examination process. The reform aims for selecting the qualified candidate to ensure the quality of education within the countries.

## 3.1 Cambodia Public Spending on Education

The following figure 5 displayed the share of total education spending in Cambodia. According to the pie chart, the government spend mostly on Primary education up to 42 percent, followed by second and post-secondary education, which accounted for around 30 percent. A very small amount around 14 percent of the total government budget was spend on tertiary education.

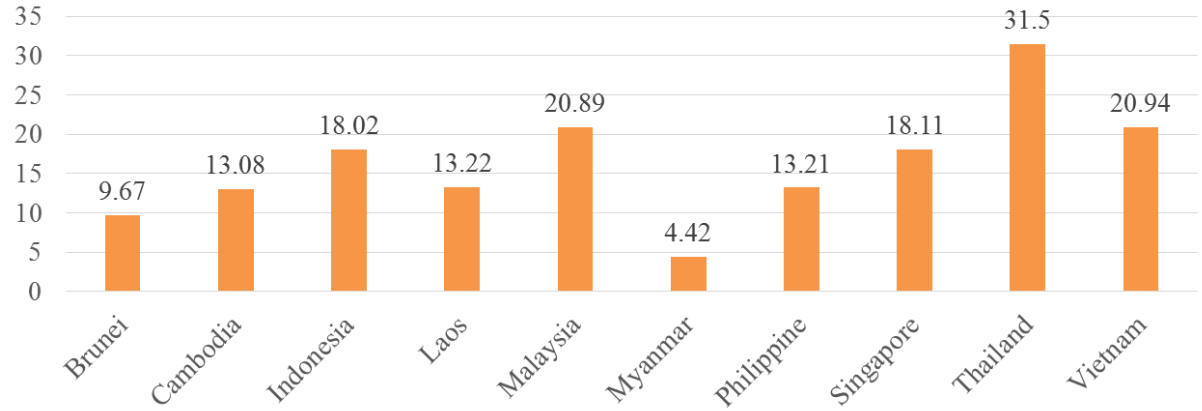
**Figure 4: Total Public Education Spending share in Cambodia, 2010**




**Source: UNESCO Institute of Statistics 2014**

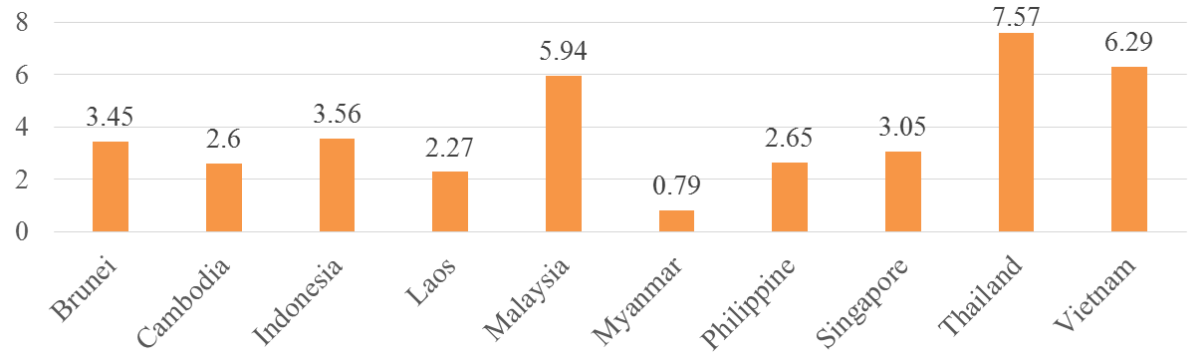
Cambodia public spending in education steadily and yearly increased in absolute value but relatively decreased comparing to GDP. The percentage decreased from 3 percent of GDP in 2003 to 2.6 percent of GDP in 2011, which is considerably small comparing to the neighboring countries such as Thailand (31.5 percent of total government spending and 7.5 percent of GDP) and Vietnam (21 percent of total government spending and 6.3 percent of GDP) and the other countries with a similar level of income (In average: 4.6 percent of GDP in Southeast Asia, 4.8 percent in Sub-Saharan Africa and 5 percent in Latin America and Caribbean) (World Bank 2011). (See figure 3 and figure 4 for detail)

**Figure 5: Expenditure on education as percentage of total government expenditure in ASEAN in 2011**




**Source: World Bank, WDI (2015)**

**Figure 6: Expenditure on education as percentage of GDP in ASEAN in 2011**




**Source: World Bank, WDI (2011)**

## 3.2 Existing and Related Studies

There are a few studies about the Cambodia fiscal policies. Most of them are employing the qualitative methods and available descriptive data to access the impacts of Cambodia fiscal policies. For instance, World Bank (2011) did an extensive study about the Efficient Cambodia Government Spending for Strong and Inclusive Growth. The study focus on three key sectors, Agriculture, Health and Education, which provided the overall reviews on the structure, strengths, weaknesses and the impact of the Cambodia fiscal policies on the three sectors. This studies revealed that RGC needs to concentrate more on equitable access to education and increase more budget to this sector. ILO (2012) did some policies literatures on the government budget, particularly on social protection policies. Again, this study mainly did the literature survey on the fiscal policies and other related policies. Dom, Ensor, and Leon Bernard (2003) accessed the consistency results of Cambodia's development policies and programmes by focusing on education, health, Legal and Judicial Reform, and agriculture/ rural development. This studies mainly reviews the budgetary system of the RGC in each sector and try to identify their consistency with the policies targets. None of the above study have quantified the impact of government spending on education on the labour market and the households' welfares.

Nevertheless, there are many other quantitative research studies was carried out in other countries related to the impacts of the government expenditure on poverty and income distributions. One of the most common methodology for the impacts study of public spending on poverty and inequality is the incidence calculation, known as the benefit incidence, tax incidence, and net incidence analysis; for instance, a paper of world bank conducted by cuesta et al. (2012) tried to identify the pro-poor and progressiveness of the social spending of Zambia. Also, Alabi et al. (2011); Wokodala, Magidu and Guloba (2010); and Ajwad and Wodon (2002) used the same methodology, benefit and marginal benefit incidence to study about the impacts of public spending on education and public infrastructure on poverty and income distribution in Nigeria, Uganda, Bolivia and Paraguay, respectively.

In Cambodia, there is also a recent study conducted by Phay and Tong (2014) on "*Public Spending on Education, Health and Infrastructure and Its Inclusiveness in Cambodia*" by employing the same methodology, marginal benefit incidence calculation. Given the available data on Cambodia Socio-economic survey (CSES)

the study tried to find out whether the Cambodia public spending is equally distributed across household income group and geographical zone by calculating the benefit incident, marginal benefit incident of those spending. The study revealed that the public spending in Cambodia is not pro-poor, except the spending on primary and lower secondary school. However, the study excluded the tax incidence calculation and failed to generate the net incidence of Cambodia fiscal policy, which is very crucial to illustrate the whole picture of fiscal policies. Plus, this study did not quantitatively show any impact of public spending on human capital development within the country. One of the major drawback of the benefit incident methodology is it could not systematically capture the country-wide impacts of fiscal policy on economic agents such as household, labor and sectors within the economy.

More interestingly, given the available data, particularly the supply and used table as well as the input-out tables, lots of research in other countries have applied the CGE model to study the impact of education sector on poverty. For instance, Jung and Thorbecke (2003) studied about the impact of public education expenditure on the human capital development, growth and poverty in Tanzania and Zambia using the CGE approach. The study did the simulation in some scenarios such as increase the education public spending in fix labor and excess supply of unskilled labor and the targeted the education expenditure. Also, Earnest Simeon O. (2011) employed a CGE micro-simulation to access the impact of government spending on education on economic growth and Long Waves in Nigeria. Another interesting paper from Cloutier, Cockburn, and Decaluwé (2008) studied about the education and poverty in Vietnam by using the CGE model. This study tried to examine the impact of cutting public education expenditure accompanied by the corresponding tax cuts. More interestingly, Robicaud, Tiberti, and Maisonnave (2014) conduced a remarkable research on the impacts of increased public education spending on growth and poverty in Uganda by employing the CGE, integrated micro-macro approach. In this study, the authors employed the Maquette for MDG simulation (MAMS) combined with a standard CGE model (PEP-1-t) and integrated with micro-simulation model in order to tackle the impacts of public spending on education, poverty and income distribution.

Yet, regarding the limitation of data and its complexity, there are not many studies in Cambodia, employing the CGE model in the policy research. A few past and recent study that employed this methodology included Heng et al. (2014), who tried to quantify the impact of trade liberalization on household's welfare and labor market. The study employed the standard CGE model from PEP as a framework for the analysis. Some simulations by totally reducing the tariff with some complimentary policies such as increase the tax was done in this study in order to provide good policy option to the policy makers. On the other hands, Oum (2011) employing the static CGE model, focusing on the impact of agriculture policy on the poverty in Cambodia. The simulation was done based on the expected output in the Cambodia agriculture policy such as the increase in real wage and productivity in Agriculture sector in Cambodia and access its impact on income and poverty in Cambodia. Another study conducted by Khin and Kato (2010) employing the conventional CGE model to measure the impact of global economic crisis on the Cambodian garment exports. Another interesting study conducted by Oum (2007) using the recursive dynamic CGE model to access the Cambodia poverty reduction in meeting millennium

development goals target. Nevertheless, none of the study in Cambodia has touched the impacts of education public spending on the labour market and households' welfares in Cambodia employing the CGE model.

# 4. The methodology

This study proposed a computable general equilibrium (CGE) model to measure the impact of public spending on education on the labour market and the households' welfares. CGE is a country-wide approach and powerful model that could capture all the relationship between sectors (inter-link industries), agents (households, firms and the government), income/expenditure, factor markets and other significant economic variables in the economy. A standard CGE model can provide a theoretical framework to address the policy questions including trade policies, fiscal policies and other important policy options. Within a model framework, various kinds of simulations can be made based on the theory and policy decision which could project the future effects and answer to "what if" questions.

This study will employ a standard static CGE model based on the PEP-1-1 (Version 2.1) model, developed by Decaluwé et al. (2013) as the analytical framework to examine the impacts of increasing the education public consumption on the Cambodia Macroeconomic, particularly, the labour market and households' welfares. This is a static CGE model that is the most appropriate to systematically capture the impacts of the increased public spending on the labour market and welfares of the people.

The PEP-1-1 would need to be slightly modified in order to introduce the unemployment in the labour market, endogenous the volume of education capital and exogenous the education capital rate of return of education sector. For one thing, this modification could reflect the reality in Cambodia economy that unemployment is actually existed. Secondly, in order to develop any education sector, the government need not only to increase their current expenditure but also to invest a certain amount in this particular sector; so that, the supply of service of this sector could increase in accordance to the demand.

## 4.1 Limitation

There are two major limitations in this study.
1. Since this study is going to employ the standard PEP-1-1 CGE model, which is the static model, the study could mainly capture the short-term or immediate impacts of the increased public consumption on education on the Cambodia macroeconomics. The long-term impacts of increased public spending on education would be different from its immediate impacts when more human capital have been accumulated as a result of raising-up the public spending on education sector.

2. In this study, the impact of the expansion of public spending on education on human capital development could not be capture. In PEP-1-1 CGE model, there is no link between public education spending and human capital development. Simply said, the existing labour categories in Social Accounting Matix (SAM) could only move across sector within its categories, not across its categories.

Even though it is impossible to capture the long-term macroeconomic impacts of the expansion of public spending on education, especially the development of human capital development, the result from this study will be able to inform the government the immediate impact of their policies. This could allow them to be well-informed and prepared for the short-term negative results.

# 5. Data

## 5.1 The available Micro SAM and other socio-economic data in Cambodia

In Cambodia, there are two main sources of data for constructing both Macro and Micro-SAM. The first source is from the Input-output table developed by Dr. Oum Sothea consisted of 35 sector in 2004 and 22 sectors in 2008, which was published in GTAP database. Another source is the Supply and used table (SUT) developed by Asian Development Bank (2012) for 18 countries of its member, including Cambodia.

This study employed the Micro-SAM which was developed based on the structure of the Cambodia SUT data framework. This Micro-SAM was constructed by Heng et al. (2014) under the support of PEP, which consisted of 24 activities, 26 commodity, three types of labour, and 24 households categories. Based on this SAM, this study have aggregated some Activities and Commodities, disaggregate the Education sector and re-disaggregate the Labour and Household based on their education attainment and their poverty status, respectively.
Beside the social accounting matrix, this study have employed the other major data source such as the Cambodia socio-economic survey – known as the household survey, and the Cambodia Economic Census, mainly for the Education sector, factor market, and household disaggregation.

## 5.2 Micro SAM aggregation

Since the major objective of this study is to quantify the impact of the public education spending on the labour market and the household welfare, also for simplifying the simulation process, this study has aggregated the current 'Activities' and 'Commodities' in the Micro-SAM. The aggregation was carried out based on the standard ISIC code version 3.1 for 'Activities' and on the CPC standard code for 'Commodity' as it was classified in the SUT as well as in SAM. Finally, the 24 activities was aggregated into 14 activities and 26 commodities was classified into 12 commodities[1].

Additionally, in the previous SAM, there are 24 households and three types of labour categories, which was categories based on the administrative locations – province and skills, respectively. Those households and labours were also aggregated into one category, which will be reclassified again based on the geographical location and their poverty level and their education attainment[2]. (Please see Annex 1 and Annex 2 for the detail of how each activities and commodity were aggregated).

[1] As education sector will be disaggregated in to three sectors in the next section. Thus, at the end, we obtained the SAM that consisted of 16 Activities and 14 Commodities.
[2] The process for household categorization was written in detail in section 5.4 and 5.5.

## 5.3 Education Sector Disaggregation

Education is the major concentration in this study. However, there is only one education sector in the existed version of SAM. Hence, in order to provide more in-depth analysis on the impacts of public spending on education, the education sector both in the activities and the commodity were disaggregated into three categories: Primary Education, Secondary Education, and Higher Education.

The disaggregation was carried out based on the Cambodia economic census data, which had been conducted in March 2011 and published in March 2012 by National Institute of Statistic (NIS). This census covered all the movable and fixed establishment in the whole territory of Cambodia. There are more than 500,000 establishments in the whole country, included both public and private, formal and informal establishments. From the census, we could generate the total income and total expenditure of any sector, including the three education sectors, based on the standard four digits ISIC code. The spending on labour (wage) and on tax were also included in the questionnaire. Unfortunately, unlike the standard input-output survey, the census did not include the detail of intermediate consumption of each establishment (enterprises). Thus, the intermediate consumption of each activities on education was disaggregated based on the total incomes ratios of the three education sector. On the other hands, the intermediate consumption of the three education sector on each commodities was disaggregated based on the expenditure ratios of the three education sectors. As it is the intermediate consumptions, the Wage and Capital were excluded from this expenditure before calculating the ratio[3].

The three education commodities sold it services only in its own market. Simply said, Primary, Secondary and Higher Education sold their services only in Primary, Secondary, and Higher education in 'Activities', respectively. Therefore, it will be a diagonal matrix relationship between three education commodities and the three education activities as indicated in table 3.

**Table 3: Disaggregated Education income in Activities**

| Activities | Sector | Commodity | | | Total |
|---|---|---|---|---|---|
| | | Primary Education | Secondary Education | Higher Education | |
| | Primary Education | 158.5 | | | 158.5 |
| | Secondary Education | | 140.3 | | 140.3 |
| | Higher Education | | | 87.8 | 87.8 |

**Source: Author's calculation using Cambodia Economic Census and SAM (2011)**

The other crucial agent that also consume the education service is the government, who consumed through their recurrent expenditure. The government spending on education was also disaggregated into three sectors based on the data obtained from the Education Strategic Plan, ESP (2009), which consisted of the recurrent government expenditure on Primary, Secondary and Higher Education (See Annex 3)[4].

[3] Please see Annex 3 for the disaggregated matrix (intermediate consumption of each activities on the three education commodities)

[4] The demand of education service from household or household spending on education will be detailed in section 5.5.

## 5.4 Labour Market Disaggregation

In the previous SAM, labour was categorized into three types based on their education attainment: Low-Skilled labour (grade 0 to 5), Mid-Skilled labour (grade 5 to 10), and High-Skilled labour (above grade 10). However, this categories is different from the education system in Cambodia which higher education started from the finished grade twelve. Higher education is believed to produce a high-skilled labours that are able to work in the management and decision level. More importantly, in this study, education sector was disaggregated into three different level: primary, secondary and higher education. Therefore, to be consistent with education sectors disaggregation, the labour in the SAM was re-disaggregated based on a different level of education attainment: Low Educated Labour (bellow grade 6), Fairly Educated Labour (from grade 6 to grade 12) and Highly Educated Labour (above grade 12).

The income of each type of labour was disaggregated by employing the Cambodia Socio-Economic Survey CESES 2009 – known as the household survey. CESES has recorded in detail about the level of education, working hour, occupation, sector, and the wage of labour in the country. Yet, it is remarkable that in CESES 2009, wage was recorded only for the labours who are working as the employee but not for those who worked as the employers, own-account workers or unpaid family workers. Excluding those non-employees workers could cause the underestimation of the labour income in the economy. To tackle this, the average wage per hour per person by sector was generated from the wage of employees. Finally, the estimated average wage per hour of the employees was multiplied with the working hours of the non-employee in order to estimate income for the non-employee labour force. Noticeably, in CESES, each labour could have up to two jobs: main occupation and the secondary occupation. That can be the case, especially for the developing country, where the income from the main occupation is not sufficient for them to survive. Therefore, to estimate the labour income from each sector (activities in SAM), the authors adopted only the sector of the main occupation in spite of the different sector between the main and secondary occupation in some observations. Finally, the labour income from rest of the world was disaggregated based on the incomes of those who works in the foreign company, embassy, and the international NGO. This data was also recorded in CESES 2009[5].

## 5.5 Household Disaggregation

There are up to 24 household types in the existed SAM which was categorized based on the administrative location – province in Cambodia. Thus, in order to access the impacts of the policy changes to the poor or non-poor household, we have to re-disaggregate the households. In this study, household was disaggregated based on their geographical location and their poverty level. As a result, we obtained four types of household: Urban non-poor, Urban poor, Rural non-poor, and Rural poor.

[5] Please see Annex 4 for disaggregated labour Income from each activities based on their education level. Since labours give all of their income to households, the labour expenditure will be explained in the household incomes.

In order to categorize poor and non-poor households, we employed the Cambodia national poverty line (see table 7), which used daily expenditure, as the criteria for household poverty classification. In short, in order to classified household into poor and non-poor, their daily expenditure was estimated from CESES 2009, in accordance with poverty line calculation method, used by Ministry of Planning to estimate the poverty line in Cambodia. As a result, we could obtain poor and non-poor household categorization.

**Table 4: Poverty lines (based on CSES 2009 data), Riels/day at 2009 prices (daily expenses)**

| Location | Phnom Penh | Other urban areas | Rural areas | Cambodia |
|---|---|---|---|---|
| Daily expenditure (Riel) | 6,347 | 4,352 | 3,503 | 3,871 |

**Source: Ministry of Planning (2013)**

*Household Income Disaggregation*

According to the original micro-SAM, the household obtained income from three different sources: from factor markets (Labour and Capital), Government transfer and rest of the world transfer. Firstly, the labour distributed their incomes mainly to households that they are belong to. Then we obtained data on household income from labour. Secondly, the household incomes from government and rest of the world were disaggregated based on the CESES 2009, which recorded the household incomes from government transfer and abroad. Thirdly, while it is impossible to esticate the household gross profit from CESES, the data on gross properties income was used as a proxy for disaggregating household capital income. In CESES, only the data on working hours of the self-employed workers were collected while the data on income of self-employed workers were not recorded. Therefore, we can calculate the gross profit of self-employment. It is worth noted, only the ratio of gross property income (not the real value) of each household was employed for this disaggregation. We actually have done the other way round in order check the robustness of this proxy (gross property income) by keeping the household capital income as a residual (balancing item) as we have the data on total household income in CSESS 2009. As a result, the data did not show much different between employing the gross properties income and keeping it as the residual. Therefore, we decided to use household gross property income (the ratio) as the proxy of household capital income[6].

*Household Expenditure Disaggregation*

In CESES 2009, each household was questioned about their food, non-food and housing expenditures. Up to 20 items of food, 13 items of non-food expenditure and the 6 housing expenditures (utility expenditures) were included in the questionnaire. Those items were categorized into 12 commodities in accordance with the SAM. Due to the fact that those items were not systematically set either in ISIC or CPC standard code, the classification was done based on the discussion among the team members as well as with the National Institute of Statistics.

[6] Please see Annex 5 for disaggregated Household Income from different sources.

It is worth noticed that household spending on education was separately documented in detail in the CESES questionnaire. The household spending on each of the three education sector was categorized based on the level of grade that each household members is attending. Interestingly, CSESS also recorded the household transfers to abroad and their tax payment. Therefore, those two expenditure were used for disaggregating the household expenditure to rest of the world and tax payment.

In order to balance the household expenditure and household income, the total household expenditure was used as the control total, leaving household saving as the residual for balancing the household expenditure and household income[7].

## 6. Adaptation of SAM in the Model

The capital of the three education sector 'Kedu' were set to be endogenous in the model. This means that in order to develop education sector, the government needs not only to increase her current expenditure but also to invest a certain amount of capital; so that it will not have a big impact on the price of education. A separated row and column named 'Kedu' needed to be inserted in the SAM under the category of Capital 'K'. 'Kedu' received all the three education capitals. Households, who initially received most of the capital endowment, received all the capital endowment from 'Kedu'. Thus, a certain amount of household incomes from Capital were needed to be extracted and complimented by the capital endowment from 'Kedu'. By doing so, it is neither affected the Capital income of households nor their expenditure pattern.

## 7. Structure of the Economy in Based Scenario

It is worth learning the structure of the economy before starting the simulation scenarios. As this study focuses more on the impact of public education spending on Cambodia macroeconomics, particularly the household's welfare and labour market, we will briefly look at some important parts of the whole structure such as the source of household income, factor endowment in household income, and structure of government budget.

Table 5 indicated the incomes that the four households received from different sources. According to the table, households that located in the urban area, HUNP and HUP, received incomes mostly from Capital, accounted 66% and 40% of their total income, respectively. Markedly, only 2% of the HRP's income was obtained from Capital, which means HRP earned income mostly from their labour (67% from LEL and 28% from FEL). Different from HRP, only 7% of HUNP income was earned from LEL, while it was 24% of the HUP income and 38% of HRNP income obtained from this LEL. Interestingly, households who resides in the rural area (HRP and HRNP) earned almost nothing from HEL, whereas those who live in urban area, earned from four to five percent from HEL.

[7] Please see Annex 6 for disaggregated household expenditure on each commodities, and their expenditures on other items.

**Table 5: Source of Household Income (%)**

| Households | LEL | FEL | HEL | CAP | Kedu | GVT | ROW | Total |
|---|---|---|---|---|---|---|---|---|
| HUP | 0.24 | 0.29 | 0.04 | 0.40 | 0.01 | 0.00 | 0.01 | 1.00 |
| HUNP | 0.07 | 0.17 | 0.05 | 0.66 | 0.02 | 0.01 | 0.02 | 1.00 |
| HRP | 0.67 | 0.28 | 0.00 | 0.02 | 0.00 | 0.01 | 0.02 | 1.00 |
| HRNP | 0.38 | 0.28 | 0.01 | 0.29 | 0.01 | 0.01 | 0.02 | 1.00 |

**Source: Authors' calculation**

Table 6 presented the factor endowment to the household income. Regarding the table, HEL gave their income mostly to HUNP, accounted for 85%, while LEL and FEL provided mainly to HRNP. Noticeably, Capital market endowed most of the income to HUNP and HRNP, up to 65% and 33%, respectively.

**Table 6: Factor Endowment in Household income (%)**

| Households | LEL | FEL | HEL | CAP | Kedu |
|---|---|---|---|---|---|
| HUP | 0.02 | 0.03 | 0.04 | 0.02 | 0.02 |
| HUNP | 0.11 | 0.30 | 0.85 | 0.65 | 0.65 |
| HRP | 0.21 | 0.10 | 0.00 | 0.00 | 0.00 |
| HRNP | 0.67 | 0.57 | 0.11 | 0.33 | 0.33 |
| Total | 1.00 | 1.00 | 1.00 | 1.00 | 1.00 |

**Source: Authors' calculation**

Table 7 displayed the factor endowment in each industry. According to the table, around 76 percent of agriculture's product was endowed by Labour (50% is a low educated labour) while almost 70% of manufacturing sector was endowed by Capital. Primary Education sector was endowed mainly by FEL, whereas SCE and HIE utilized around 15.5% of HEL out of their total factor endowment. HIE was endowed much more capital that labour up to 83%.

**Table 7: Factor Endowment in each industry (%)**

| | LEL | FEL | HEL | CAP | Kedu | Total |
|---|---|---|---|---|---|---|
| AGR | 0.50 | 0.26 | 0.00 | 0.24 | 0.00 | 1.00 |
| MIN | 0.19 | 0.10 | 0.00 | 0.70 | 0.00 | 1.00 |
| MAN | 0.16 | 0.15 | 0.00 | 0.69 | 0.00 | 1.00 |
| EGW | 0.15 | 0.14 | 0.02 | 0.69 | 0.00 | 1.00 |
| CON | 0.16 | 0.18 | 0.00 | 0.66 | 0.00 | 1.00 |
| WRT | 0.34 | 0.37 | 0.01 | 0.27 | 0.00 | 1.00 |
| HTR | 0.17 | 0.15 | 0.01 | 0.67 | 0.00 | 1.00 |
| TRC | 0.14 | 0.21 | 0.00 | 0.65 | 0.00 | 1.00 |
| FIN | 0.07 | 0.22 | 0.09 | 0.62 | 0.00 | 1.00 |
| REAL | 0.06 | 0.15 | 0.11 | 0.69 | 0.00 | 1.00 |
| ADM | 0.06 | 0.28 | 0.09 | 0.57 | 0.00 | 1.00 |
| PRE | 0.02 | 0.74 | 0.05 | 0.00 | 0.19 | 1.00 |
| SCE | 0.02 | 0.30 | 0.15 | 0.00 | 0.53 | 1.00 |
| HIE | 0.00 | 0.01 | 0.16 | 0.00 | 0.83 | 1.00 |
| HSW | 0.05 | 0.27 | 0.16 | 0.52 | 0.00 | 1.00 |
| OTC | 0.05 | 0.25 | 0.15 | 0.56 | 0.00 | 1.00 |

**Source: Authors' calculation**

**Note: The table was transposed from the SAM**

Table 8 indicated that government consume some of the available commodities. Most of the spending was spent on Administration, around 71%, while only 9%, 8% and 1% were spent on Primary, Secondary and Higher Education. The other 10% was spent on Health.

**Table 8: Structure of government consumption on each commodities (%)**

| Commodity i | Government |
|---|---|
| AGR | 0.00 |
| MEGW | 0.00 |
| FOOD | 0.00 |
| TRG | 0.00 |
| MPME | 0.00 |
| CONS | 0.00 |
| TRS | 0.00 |
| FINREA | 0.00 |
| ADM | 0.71 |
| PRE | 0.09 |
| SCE | 0.08 |
| HIE | 0.01 |
| HEALTH | 0.10 |
| OTHS | 0.01 |
| Total | 1.00 |

**Source: Authors' Calculation**

Table 9 breakdown the education consumption of the government. According to the table, government spent up to 50% of her education spending on primary education, 45% on secondary education, and only 6% on higher education.

**Table 9: Structure of government consumption on education commodities (%)**

| Edu Commodity | Gvt. Consumption |
|---|---|
| PRE | 0.50 |
| SCE | 0.45 |
| HIE | 0.06 |
| Total | 1.00 |

**Source: Authors' calculation**

Table 10 specified the various source of government income. According to the table government earned income from five different sources, Capital, Indirect tax, import tax, direct tax, and transfer from rest of the world. Indirect tax income contributed up to 42% of the total income while TD and ROW shared 20% and 24%, respectively.

**Table 10: Source of government income (%)**

| GVT Income | CAP | TI | TM | TD | ROW | Total |
|---|---|---|---|---|---|---|
| GVT | 0.01 | 0.42 | 0.14 | 0.20 | 0.24 | 1.00 |

**Source: Authors' calculation**

## 8. Simulation Scenarios

There will be five simulation scenarios in this study in order to figure out the different impacts of public spending on education on the Cambodia Macroeconomics, factor market and households' welfare. According to table 1 in the section 1, government is planning to increase their spending from around 2% of GDP in 2011 to 2.4% in 2016, which means around 53 million USD will be added to current spending of the three education sector. Due to the broad consensus from development partners, private sector, researchers, and civil society about the high demand of skilled and highly educated labour; plus the amount of recurrent budget allocated to higher education is largely relatively small comparing to the primary and secondary education, more spending will be allocated to higher education. In short, 50% of the 53 million USD will be allocated to higher education while primary and secondary education will obtain 25% each.

**Simulation Design and Assumption in the model for all scenarios**

- Labour is mobile across sector within its categories.
- Labour in the economy is not full-employed. There are unemployment rate in each categories of labour.
- Non-education capital is fixed and immobile across sectors.
- The volume of education capital ($KEDU_{PRE}$, $KEDU_{SCE}$, $KEDU_{HIE}$) is endogenous and immobile across the sectors.
- The rate of return of KEDU is exogenous.

| Scenarios | Description | Specific simulation design |
|---|---|---|
| Scenario1 | Government will not change their spending on education. More resource will be allocated to Higher Education by reducing the spending from Primary and Secondary Education. The spending on Higher Education will be doubled from the based scenario. Fifty percent of that spending will be subtracted from Primary and another 50% will be from Secondary Education spending.<br><br>By doing so, we could see that without changing the spending on education, how the reallocation of resource in education sector would impact on the economy. | |
| Scenario2 | The government would like to increase their current education expenditure to 2.4% of GDP, which is equal to 53 million USD. (ESP 2014-2018).<br><br>Without increasing their total recurrent spending, the government could reallocate their consumption spending pattern. Assuming that the government could improve their working efficiency and reduce the spending on administration, the spending would be shifted from Administration to Education sector. 50% of the 53 million USD will be allocated to higher education | |

| | | |
|---|---|---|
| | while primary and secondary education will obtain 25% each. | |
| Scenario3 | 53 million USD will be injected to education sector. 50% of the 53 million USD will be allocated to higher education while primary and secondary education will obtain 25% each.<br><br>This amount will be financed mainly by government saving. | - Total government consumption is endogenous.<br>- Composite government consumption is exogenous. |
| Scenario4 | 53 million USD will be injected to education sector. 50% of the 53 million USD will be allocated to higher education while primary and secondary education will obtain 25% each.<br><br>This amount will be financed mainly by indirect tax (VAT). | - Total government consumption is endogenous.<br>- Composite government consumption is exogenous.<br>- Government Saving is fixed. |
| Scenario5 | 53 million USD will be injected to education sector. 50% of the 53 million USD will be allocated to higher education while primary and secondary education will obtain 25% each.<br><br>This amount will be financed mainly by transfer from rest of the world (ODA). | - Total government consumption is endogenous.<br>- Composite government consumption is exogenous.<br>- Government Saving is fixed. |

# 9. Simulation Results

## 9.1 Macroeconomics Impacts

The increase of public consumption on education services will simply increase the final consumption in the economy, which could create a positive impacts on the output, GDP, and reduce the unemployment. According to the bellow table11, Real GDP increased in the all scenario, except scenario1 that fell almost zero percent. Scenario 5 provides the best result for GDP growth, Output growth and the reduction of unemployment.

The fell of GDP and the CPI in scenario 1 due to several factors. Higher education is the sector that employed mostly HEL while primary and secondary education employed more FEL and LEL. Even so, this sector, higher education, utilized much more capital than labour (around 83% of the HIE output was endowed from Capital). Then, the increase of demand for its service will demand more for Capital, Kedu, comparing to the demand for highly educated labour. The decreased of demand in primary and secondary education would reduce more demand for LEL and FEL. While higher education does not demand much for LEL and FEL, these two types of labour is likely to reduce their wage rate or become unemployed. Thus, simulation 1 tends to put a

heavy negative pressure on the wage rate of LEL and FEL, but little positive pressure on wage rate of HEL. Therefore, the price would decrease in the industries that employed lots of LEL and FEL such as agriculture, construction, primary and secondary education. As a result, the real GDP would decrease.

**Table 11: Basic Economic Indicators (% change)**

| Indicators | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| GDP at Market Price | -0.02 | 0.14 | 0.29 | 0.60 | 0.82 |
| Real GDP | -0.003 | 0.10 | 0.20 | 0.28 | 0.56 |
| Consumer Price Index | -0.02 | 0.03 | 0.09 | 0.32 | 0.26 |

**Source: Authors' calculation from the model**

**Table 12: Unemployment rate by type of labour ((% change)**

| Unemployment rate (% change) | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| LEL | 0.00 | 0.00 | 0.00 | 0.00 | -0.02 |
| FEL | 0.01 | -0.01 | -0.02 | -0.01 | -0.04 |
| HEL | -0.01 | -0.03 | -0.09 | -0.07 | -0.11 |

**Source: Authors' calculation from the model**

**Table 13: Output by industry (% change)**

| Sectoral Output | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| AGR | 0.00 | 0.07 | 0.11 | -0.01 | 0.33 |
| MIN | 0.01 | -0.05 | 0.01 | 0.14 | 0.11 |
| MAN | 0.02 | -0.01 | -0.04 | -0.38 | -0.06 |
| EGW | 0.00 | -0.15 | 0.00 | -0.18 | 0.36 |
| CON | 0.03 | -0.21 | -1.26 | 0.05 | 0.10 |
| WRT | 0.02 | 0.02 | 0.05 | 0.05 | 0.02 |
| HTR | -0.01 | 0.01 | 0.02 | -0.07 | 0.03 |
| TRC | 0.00 | 0.02 | 0.04 | -0.14 | 0.07 |
| FIN | 0.02 | 0.16 | 0.20 | 0.14 | 0.41 |
| REAL | 0.00 | 0.10 | 0.13 | 0.05 | 0.28 |
| ADM | 0.02 | -5.80 | 0.00 | -0.01 | 0.00 |
| PRE | -4.74 | 8.39 | 8.53 | 8.46 | 8.63 |
| SCE | -5.37 | 9.47 | 9.70 | 9.48 | 10.01 |
| HIE | 15.70 | 27.31 | 27.67 | 27.51 | 27.87 |
| HSW | -0.02 | 0.11 | 0.24 | 0.12 | 0.40 |
| OTC | 0.00 | -0.11 | -0.01 | -0.13 | 0.09 |

**Source: Authors' calculation from the model**

Table 14: Price Level by commodity (% change)

| | Sim1 | | Sim2 | | Sim3 | | Sim4 | | Sim5 | |
|---|---|---|---|---|---|---|---|---|---|---|
| Price Level | PC | PD | PC | PD | PC | PD | PC | PD | PC | PD |
| AGR | -0.03 | -0.03 | 0.03 | 0.03 | 0.07 | 0.07 | 0.06 | 0.06 | 0.28 | 0.29 |
| ADM | -0.01 | -0.01 | -2.17 | -2.22 | 0.16 | 0.16 | 0.37 | 0.37 | 0.33 | 0.34 |
| PRE | -0.04 | -0.04 | 0.04 | 0.04 | 0.13 | 0.13 | 0.20 | 0.21 | 0.31 | 0.32 |
| SCE | -0.01 | -0.01 | 0.06 | 0.06 | 0.15 | 0.15 | 0.24 | 0.25 | 0.29 | 0.29 |
| HIE | 0.01 | 0.01 | 0.05 | 0.06 | 0.12 | 0.13 | 0.24 | 0.26 | 0.20 | 0.22 |
| MEGW | -0.01 | -0.02 | -0.04 | -0.04 | 0.05 | 0.06 | 0.46 | 0.51 | 0.27 | 0.33 |
| FOOD | 0.00 | -0.02 | 0.01 | 0.03 | 0.03 | 0.10 | 0.55 | 0.61 | 0.08 | 0.30 |
| TRG | 0.00 | -0.02 | 0.01 | 0.04 | 0.02 | 0.07 | 0.36 | 0.52 | 0.08 | 0.29 |
| MPME | 0.00 | -0.01 | 0.00 | -0.03 | -0.01 | -0.07 | 0.56 | 0.73 | 0.04 | 0.27 |
| CONS | -0.01 | -0.01 | -0.11 | -0.12 | -0.72 | -0.75 | 0.30 | 0.31 | 0.26 | 0.28 |
| TRS | -0.03 | -0.03 | 0.04 | 0.04 | 0.11 | 0.12 | 0.36 | 0.38 | 0.32 | 0.34 |
| FINREA | -0.01 | -0.01 | 0.20 | 0.22 | 0.39 | 0.42 | 0.42 | 0.45 | 0.73 | 0.79 |
| HEALTH | -0.02 | -0.02 | 0.15 | 0.15 | 0.38 | 0.39 | 0.41 | 0.42 | 0.63 | 0.65 |
| OTHS | -0.02 | -0.02 | 0.02 | 0.03 | 0.37 | 0.39 | 0.35 | 0.37 | 0.70 | 0.73 |

Source: Authors' calculation from the model

## 9.2 Factor Market Impacts

Aiming for building more skilled labour as well as highly educated labour, the government of Cambodia is going to increase public spending on education by concentrating more one higher education, expecting that higher education will substantially demand more for highly educated labour and at the same time could produce more highly educated labour. As a results, indicated in table 15, there is a slightly change of labour demand in all categories. The reason why the demand for HEL increased slightly is due to the fact that Cambodia higher education as well as secondary education were endowed by more capital than FEL and HEL. The increase in spending on secondary and higher education would require more capital than labour to increase their service. As indicated in table 18, in scenario 5, the capital demand for higher education increase by 28 percent and around 10 percent for the primary and secondary education.

Even so, the demand for highly educated labour increased in all scenario, scenario 5 displayed the highest percentage change (0.014%). This also causes the wage rate to increase as well. In scenario 5, the wage rate of HEL increase around 1.2%, higher than the increase in LEL and FEL. More interestingly, according to table 17, the wage rate in all sector increased in all scenarios, except scenario1. This could be a good motivation for student to pursue their study in higher education and work in any sector.

Table 15: Labour Demand by type of Labour (% change)

| Labour Demand | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| LEL | -0.0002 | 0.0001 | 0.0002 | -0.0009 | 0.0037 |
| FEL | -0.0014 | 0.0006 | 0.0023 | 0.0015 | 0.0058 |
| HEL | 0.0011 | 0.0048 | 0.0119 | 0.0101 | 0.0146 |

Source: Authors' calculation from the model

Table 16: Wage rate by labour type (% change)

| Wage rate (WC) | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| LEL | -0.008 | 0.004 | 0.012 | -0.044 | 0.188 |
| FEL | -0.082 | 0.035 | 0.141 | 0.089 | 0.353 |
| HEL | 0.081 | 0.374 | 0.946 | 0.804 | 1.172 |

Source: Authors' calculation from the model

Table 17: Wage rate by industry (% change)

| Sectoral wage | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| Agriculture | -0.03 | 0.02 | 0.06 | 0.00 | 0.25 |
| Mining and Quarrying | -0.03 | 0.01 | 0.06 | 0.00 | 0.24 |
| Manufacturing | -0.04 | 0.02 | 0.08 | 0.03 | 0.28 |
| Electricity, Gas, and Water Supply | -0.04 | 0.04 | 0.13 | 0.07 | 0.33 |
| Construction | -0.05 | 0.02 | 0.08 | 0.03 | 0.28 |
| Wholesale and Retail Trade; and Repair of Motor Vehicles | -0.04 | 0.03 | 0.09 | 0.04 | 0.29 |
| Hotels and Restaurants | -0.04 | 0.03 | 0.10 | 0.04 | 0.29 |
| Transport, Storage and Communications | -0.05 | 0.03 | 0.10 | 0.05 | 0.30 |
| Financial intermediation | -0.03 | 0.11 | 0.31 | 0.24 | 0.52 |
| Real estate, renting and business activities | -0.01 | 0.15 | 0.40 | 0.31 | 0.61 |
| Public Administration and Defense | -0.04 | 0.10 | 0.30 | 0.22 | 0.51 |
| Primary Education | -0.07 | 0.05 | 0.19 | 0.13 | 0.40 |
| Secondary Education | -0.03 | 0.15 | 0.40 | 0.32 | 0.62 |
| Higher Education | 0.07 | 0.35 | 0.88 | 0.75 | 1.11 |
| Health and Social Work | -0.02 | 0.14 | 0.39 | 0.31 | 0.61 |
| Other Community Service Activities | -0.02 | 0.14 | 0.39 | 0.31 | 0.61 |

Source: Authors' calculation from the model

Table 18: Capital Demand of Education sector (% change)

| Capital Demand for Education | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| PRE | -4.82 | 8.46 | 8.78 | 8.63 | 9.16 |
| SCE | -5.39 | 9.58 | 10.00 | 9.72 | 10.49 |
| HIE | 15.72 | 27.43 | 27.95 | 27.75 | 28.23 |

Source: Authors' calculation from the model

## 9.3 Impacts on Government income

There is a slightly change of government income in scenario 1, 2, and 3 as the government just reallocated their consumption spending, and reduce their saving (scenario 3). As presented in table 19, in order to finance 53 million USD increase to the three education sectors, the government needs to raise their income around 3.14% as shown in simulation 4 and 5. In simulation 3, the government needs to reduce their saving up to 23% in order to finance the plan. In simulation 4, government need to increase their indirect tax income by 7.34% to finance this expenditure. In simulation 5 more budget is needed from rest of the world transfer, by increasing around 11.6%.

Table 19: Government income from different sources and government saving ((% change)

| Government Income | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| Total Gvt. Income_YG | -0.01 | 0.03 | 0.07 | 3.13 | 3.14 |
| Gvt. income from Capital_YGK | -0.02 | -0.17 | -0.04 | -0.16 | 0.49 |
| Gvt; income from Transfer_YGTR | -0.02 | 0.03 | 0.09 | 0.32 | 11.59 |
| Gvt. Income from indirect tax_TICT | 0.01 | 0.00 | -0.01 | 7.33 | 0.49 |
| Gvt. Income from direct tax_TDHT | -0.04 | 0.13 | 0.28 | 0.14 | 0.80 |
| Gvt. Income from import tax_TIMT | -0.01 | -0.02 | -0.03 | -0.18 | 0.48 |
| Gvt. Income from export tax_TIXT | 0.01 | 0.01 | 0.00 | -0.10 | 0.01 |
| Gvt. Saving_SG | -0.06 | 0.20 | -23.00 | 0.00 | 0.00 |

Source: Authors' calculation from the model

## 9.4 Household's welfares

The final indicator to study the impact of public spending on education is to look at the households' income. The increase of final government consumption on the three education sectors has boosted the demand for the service from the three education sectors, which required more intermediate consumption as well as more factor of production. As each household obtained the factors endowment from labour and capital differently, the impact on households' welfare will be different from one simulation to another. The simulation that could maximize the households' income the most, especially the income of the rural households, particularly the rural poor household, can be considered as the best scenario for policy option.

Table 20 indicated that the income of all the household types increased in all scenarios, except scenario 1. Hence, the idea that shift the spending from primary and secondary education is not good policy option. Simulation 2, where the government reallocated her spending from administrative to the three education sectors showed a positive results to all households' income; however, it is relatively small comparing to the other three scenarios. More importantly, the increase of income of the HRP is very small, only 0.04%. Scenario 3 revealed a better positive impacts than scenario 4 that impacts negatively on the HRP's income. Raising the indirect tax in scenario 4 would significantly reduce the household consumption on each commodity. As indicated in table 21, the four type of households significantly reduce their consumption, especially household in the rural area (HRP and HRNP), who decrease their spending on all commodities. Thus, the policy that raising indirect tax to finance the education spending may not as a good policy option as reducing the government saving. Lastly, among the five scenarios, scenario 5 revealed the best results for all types of households' income. The income of households in the urban area increased around 1% while those in the rural area rose around 0.7%.

Table 20: Household Income by Type of Household (% change)

| Household | Sim1 | Sim2 | Sim3 | Sim4 | Sim5 |
|---|---|---|---|---|---|
| HUP | -0.03 | 0.17 | 0.38 | 0.23 | 0.91 |
| HUNP | 0.02 | 0.24 | 0.45 | 0.32 | 0.97 |
| HRP | -0.08 | 0.04 | 0.14 | -0.01 | 0.67 |
| HRNP | -0.05 | 0.11 | 0.25 | 0.12 | 0.78 |

Source: Authors' calculation from the model

**Table 21: Household Expenditure by commodity (% change)**

| | Sim1 | | | | Sim2 | | | | Sim3 | | | | Sim4 | | | | Sim5 | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ValC | HUP | HUNP | HRP | HRNP | HUP | HUNP | HRP | HRNP | HUP | HUNP | HRP | HRNP | HUP | HUNP | HRP | HRNP | HUP | HUNP | HRP | HRNP |
| AGR | 0.00 | 0.03 | -0.04 | -0.02 | 0.11 | 0.14 | 0.01 | 0.07 | 0.23 | 0.26 | 0.06 | 0.14 | 0.09 | 0.13 | -0.09 | 0.00 | 0.48 | 0.48 | 0.31 | 0.38 |
| ADM | -0.02 | 0.04 | -0.07 | -0.04 | 1.91 | 1.83 | 1.83 | 1.82 | 0.28 | 0.32 | 0.01 | 0.14 | -0.09 | -0.03 | -0.37 | -0.22 | 0.68 | 0.68 | 0.43 | 0.54 |
| PRE | 0.00 | 0.06 | -0.05 | -0.02 | 0.15 | 0.20 | 0.01 | 0.09 | 0.30 | 0.35 | 0.04 | 0.17 | 0.03 | 0.09 | -0.24 | -0.10 | 0.70 | 0.70 | 0.45 | 0.56 |
| SCE | -0.02 | 0.04 | -0.07 | -0.04 | 0.14 | 0.19 | -0.01 | 0.08 | 0.28 | 0.33 | 0.02 | 0.15 | 0.00 | 0.06 | -0.27 | -0.13 | 0.71 | 0.72 | 0.47 | 0.58 |
| HIE | -0.03 | 0.02 | -0.09 | -0.05 | 0.15 | 0.20 | 0.00 | 0.08 | 0.31 | 0.35 | 0.05 | 0.17 | 0.00 | 0.06 | -0.27 | -0.13 | 0.78 | 0.78 | 0.54 | 0.65 |
| MEGW | -0.01 | 0.02 | -0.05 | -0.02 | 0.14 | 0.17 | 0.05 | 0.10 | 0.24 | 0.27 | 0.07 | 0.15 | -0.11 | -0.06 | -0.29 | -0.20 | 0.48 | 0.49 | 0.32 | 0.39 |
| FOOD | -0.03 | 0.03 | -0.08 | -0.05 | 0.19 | 0.24 | 0.04 | 0.12 | 0.40 | 0.44 | 0.13 | 0.26 | -0.25 | -0.17 | -0.55 | -0.39 | 0.92 | 0.91 | 0.66 | 0.77 |
| TRG | -0.03 | 0.03 | -0.08 | -0.05 | 0.19 | 0.24 | 0.03 | 0.12 | 0.40 | 0.44 | 0.13 | 0.26 | -0.10 | -0.03 | -0.39 | -0.23 | 0.92 | 0.91 | 0.66 | 0.77 |
| MPME | -0.03 | 0.03 | -0.08 | -0.05 | 0.20 | 0.25 | 0.05 | 0.13 | 0.43 | 0.46 | 0.16 | 0.29 | -0.25 | -0.17 | -0.55 | -0.39 | 0.95 | 0.94 | 0.70 | 0.80 |
| CONS | -0.02 | 0.03 | -0.08 | -0.04 | 0.29 | 0.33 | 0.14 | 0.22 | 1.01 | 1.00 | 0.76 | 0.86 | -0.04 | 0.02 | -0.33 | -0.18 | 0.76 | 0.77 | 0.51 | 0.62 |
| TRS | 0.00 | 0.05 | -0.06 | -0.02 | 0.16 | 0.21 | 0.01 | 0.09 | 0.31 | 0.35 | 0.05 | 0.18 | -0.09 | -0.02 | -0.36 | -0.22 | 0.69 | 0.70 | 0.44 | 0.55 |
| FINREA | -0.02 | 0.03 | -0.07 | -0.04 | 0.03 | 0.09 | -0.12 | -0.03 | 0.10 | 0.16 | -0.17 | -0.03 | -0.13 | -0.06 | -0.41 | -0.27 | 0.37 | 0.40 | 0.11 | 0.24 |
| HEALTH | -0.01 | 0.04 | -0.06 | -0.03 | 0.07 | 0.13 | -0.08 | 0.01 | 0.10 | 0.16 | -0.16 | -0.03 | -0.12 | -0.05 | -0.40 | -0.26 | 0.45 | 0.47 | 0.19 | 0.31 |
| OTHS | -0.01 | 0.04 | -0.06 | -0.03 | 0.17 | 0.22 | 0.02 | 0.10 | 0.11 | 0.17 | -0.16 | -0.02 | -0.08 | -0.02 | -0.36 | -0.22 | 0.39 | 0.42 | 0.13 | 0.26 |

**Source: Authors' calculation from the model**

## 10. Conclusion

In conclusion, with different simulation scenarios, the increase of public spending on education generates a better result than reallocation of education spending, either among the education sector (scenario1) or from other sector (scenario2). The reallocation of spending structure among the education sectors by concentrating only on higher education revealed a negative results to the macroeconomics, labour demand, wage rate as well as the households' income. Without increasing the government consumption, the reallocation of spending from Administration to the three education sectors generates some positive impacts but relatively small comparing to the injection of new financial resource to the education sectors. Among the three scenarios of increasing the final consumption on education, simulation 5 provides the best results, followed by simulation 3, and then simulation 4.

In short, for the short-term, the increase of public consumption on education by concentrating on higher education generate a lot more positive impacts for Cambodia macroeconomics by increasing the wage rate of all industries; increasing the wage rate all type of labour, especially the highly educated labour; decreasing the unemployment rate and increasing all type of household income. The government should consider increase more spending on higher education. Concerning the source of incomes, the best source that yields the best positive impacts is from transfer from rest of world such as the ODA from the development partners. The second better alternative is reducing the saving.

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# Annex

### Annex 1: Aggregated Activities, Labour and Household

| No | Previous Activites | Aggregated Activities | Total (Million USD) |
|---|---|---|---|
| 1 | Agriculture, Hunting, Forestry, and Related Service Activities | Agriculture | 5246.34 |
| 2 | Fishing, Aquaculture, and Service Activities Incidental to Fishing | | |
| 3 | Mining and Quarrying | Mining and Quarrying | 74.62 |
| 4 | Manufacture of Food Products, Beverages, and Tobacco | Manufacturing | 7353.53 |
| 5 | Manufacture of Textiles, Wearing Apparel, and Footwear | | |
| 6 | Manufacturing of Wood, Wood Products, Paper, and Paper Products | | |
| 7 | Manufacture of Rubber and Plastic Products | | |
| 8 | Manufacture of Basic Metals | | |
| 9 | Manufacture of Fabricated Metal Products; and Office and Computing Machinery | | |
| 10 | Manufacture of Motor Vehicles and Other Transport Equipment | | |
| 11 | Other Manufacturing | | |
| 12 | Electricity, Gas, and Water Supply | Electricity, Gas, and Water Supply | 244.04 |
| 13 | Construction | Construction | 1660.48 |
| 14 | Wholesale and Retail Trade; and Repair of Motor Vehicles | Wholesale and Retail Trade; and Repair of Motor Vehicles | 1995.96 |
| 15 | Hotels and Restaurants | Hotels and Restaurants | 1402.87 |
| 16 | Transport Services and Storage | Transport, Storage and Communications | 1939.94 |
| 17 | Post and Telecommunications | | |
| 18 | Financial Intermediation and Insurance | Financial intermediation | 241.96 |
| 19 | Real Estate, Renting, and Business Services | Real estate, renting and business activities | 1254.22 |
| 20 | Public Administration and Defense | Public Administration and Defense | 521.84 |
| 21 | Education | Education | 386.54 |
| 22 | Health and Social Work | Health and Social Work | 260.30 |
| 23 | Other Community Service Activities | Other Community Service Activities | 928.24 |
| 24 | High-skill Labour | Labour | 11583.5 |
| 25 | Medium-skill Labour | | |
| 26 | Low Skill Labour | | |
| 27 | 24 Household based on Province | hhd | 6248.6 |

**Source: Author's calculation from SAM (2011)**

**Annex 2: Aggregated Commodity**

| No | Previous Commodities | Aggregated Commodities | Total (Million USD) |
|---|---|---|---|
| 1 | Agriculture, Forestry, and Logging Products | Agriculture | 5287.4 |
| 2 | Fish and Other Fishing Products | | |
| 3 | Coal and Lignite; Peat, Crude Petroleum, and Natural Gas | Ores and minerals; electricity, gas and water | 399.9 |
| 4 | Other Minerals, n.e.c. | | |
| 5 | Electricity, Gas, and Water | | |
| 6 | Food, Beverages, and Tobacco | Food products, beverages and tobacco; textiles, apparel and leather products | 9599.1 |
| 7 | Clothing and Wearing Apparel; and Leather and Leather Products | | |
| 8 | Products of Wood, Paper, and Paper Products | Other transportable goods, except metal products, machinery and equipment | 1692.2 |
| 9 | Basic Chemicals and Other Chemicals | | |
| 10 | Rubber and Plastics Products | | |
| 11 | Furniture and Other Transportable Goods, n.e.c. | | |
| 12 | Basic Metals | Metal products, machinery and equipment | 4380.0 |
| 13 | Fabricated Metal Products, Except Machinery and Equipment | | |
| 14 | General and Special Purpose Machinery | | |
| 15 | Office, Accounting, and Computing Machinery | | |
| 16 | Transport Equipment | | |
| 17 | Other Manufacturing | | |
| 18 | Construction Services | Constructions and construction services | 1740.7 |
| 19 | Wholesale and Retail Trade Services | Distributive trade services; accommodation, food and beverage serving services; transport services; and electricity, gas and water services; and electricity, gas and water distribution services | 5658.5 |
| 20 | Lodging, Food, and Beverage Serving Services | | |
| 21 | Transport Services, and Supporting and Auxiliary Transport Services | | |
| 22 | Postal, and Courier and Telecommunications Services | | |
| 23 | Financial Intermediation, Insurance, and Auxiliary Services | Financial and related services; real estate services; and rental and leasing services | 1678.4 |
| 24 | Real Estate, Leasing Services, and Other Business Services | | |
| 25 | Public Administration and Compulsory Social Security Services | Public Administration and Compulsory Social Security Services | 535.8 |
| 26 | Education Services | Education Services | 403.1 |
| 27 | Health and Social Services | Health and Social Services | 270.2 |
| 28 | Other Services, n.e.c. | Other Services, n.e.c. | 956.5 |

**Source: Author's calculation from SAM (2011)**

**Annex 3: Intermediate consumption each activities on the three education commodities (Million USD)**

| | Disaggregation Education Commodity | Commodity | | |
|---|---|---|---|---|
| | | Primary Education | Secondary Education | Higher Education |
| Activities | Agriculture | 0.02 | 0.02 | 0.01 |
| | Mining and Quarrying | 0.01 | 0.00 | 0.00 |
| | Manufacturing | 0.24 | 0.21 | 0.12 |
| | Electricity, Gas, and Water Supply | 0.09 | 0.08 | 0.05 |
| | Construction | 0.07 | 0.06 | 0.04 |
| | Wholesale and Retail Trade; and Repair of Motor Vehicles | 0.51 | 0.44 | 0.26 |
| | Hotels and Restaurants | 0.19 | 0.17 | 0.10 |
| | Transport, Storage and Communications | 0.23 | 0.20 | 0.12 |
| | Financial intermediation | 0.00 | 0.00 | 0.00 |
| | Real estate, renting and business activities | 0.17 | 0.15 | 0.08 |
| | Public Administration and Defense | 2.11 | 1.85 | 1.06 |
| | Primary Education | 1.55 | 1.36 | 0.78 |
| | Secondary Education | 1.33 | 1.16 | 0.67 |
| | Higher Education | 0.70 | 0.61 | 0.35 |
| | Health and Social Work | 0.77 | 0.67 | 0.39 |
| | Other Community Service Activities | 0.23 | 0.20 | 0.12 |
| Government | | 128.11 | 115.15 | 15.38 |

**Source: Author's calculation using Cambodia Economic Census (2011), ESP (2011) and SAM 2011**
**Note: This table was transposed from the original matrix in SAM.**

**Annex 4: Labour Income from each activities based on their education level (Millions USD)**

| | Activities | Low Educated Labour | Fairly Educated Labour | Highly Educated Labour |
|---|---|---|---|---|
| Activities | Agriculture | 2021.5 | 963.2 | 3.4 |
| | Mining and Quarrying | 9.6 | 4.6 | 0.0 |
| | Manufacturing | 317.0 | 384.3 | 5.0 |
| | Electricity, Gas, and Water Supply | 8.2 | 9.2 | 1.3 |
| | Construction | 123.1 | 147.5 | 0.5 |
| | Wholesale and Retail Trade; and Repair of Motor Vehicles | 396.4 | 419.5 | 12.4 |
| | Hotels and Restaurants | 89.6 | 79.3 | 6.4 |
| | Transport, Storage and Communications | 124.3 | 194.1 | 5.4 |
| | Financial intermediation | 7.7 | 29.0 | 18.5 |
| | Real estate, renting and business activities | 42.5 | 120.2 | 97.8 |
| | Public Administration and Defense | 10.8 | 60.6 | 24.1 |
| | Primary Education | 2.2 | 79.3 | 5.6 |
| | Secondary Education | 1.5 | 28.6 | 14.7 |
| | Higher Education | 0.2 | 0.6 | 10.2 |
| | Health and Social Work | 8.3 | 42.9 | 26.2 |
| | Other Community Service Activities | 30.8 | 158.5 | 96.8 |
| | Rest of The World | 1.4 | 3.3 | 0.3 |
| Total | | 3195.2 | 2724.7 | 328.7 |

**Source: Author's calculation from CESES 2009 and SAM (2011)**

**Annex 5: Household Incomes estimation (Million USD)**

| Household | Low Educated Labour | Fairly Educated Labour | Highly Educated Labour | Capital | Government | Rest of the World | Total |
|---|---|---|---|---|---|---|---|
| Urban poor | 64.3 | 78.8 | 8.2 | 112.5 | 1.3 | 3.1 | 268.2 |
| Urban non-poor | 336.5 | 815.8 | 180.6 | 3318.2 | 54.4 | 95.5 | 4801.0 |
| Rural poor | 659.8 | 268.8 | 0.1 | 19.0 | 11.3 | 14.9 | 973.8 |
| Rural non-poor | 2124.0 | 1558.2 | 23.9 | 1668.1 | 65.0 | 101.2 | 5540.5 |

**Source: Author's calculation using CESES 2009 and SAM (2011)**

**Annex 6: Household Expenditure Estimation (Million USD)**

| Agents | | Urban poor | Urban non-poor | Rural poor | Rural non-poor |
|---|---|---|---|---|---|
| Commodity | Agriculture | 66.8 | 810.1 | 386.7 | 2335.7 |
| | Ores and minerals; electricity, gas and water | 5.0 | 66.8 | 21.2 | 111.5 |
| | Food products, beverages and tobacco; textiles, apparel and leather products | 30.7 | 586.3 | 138.2 | 1210.2 |
| | Other transportable goods, except metal products, machinery and equipment | 7.6 | 161.0 | 37.4 | 368.8 |
| | Metal products, machinery and equipment | 10.0 | 434.4 | 68.5 | 677.2 |
| | Constructions and construction services | 0.6 | 11.5 | 6.2 | 57.9 |
| | Distributive trade services; accommodation, food and beverage serving services; transport services; and electricity, gas and water services; and electricity, gas and water distribution services | 7.5 | 221.4 | 19.1 | 292.2 |
| | Financial and related services; real estate services; and rental and leasing services | 17.7 | 811.5 | 2.1 | 40.8 |
| | Public Administration and Compulsory Social Security Services | 0.2 | 4.3 | 0.0 | 0.2 |
| | Primary Education | 1.6 | 20.2 | 3.8 | 17.4 |
| | Secondary Education | 1.8 | 57.6 | 3.2 | 48.1 |
| | Higher Education | 0.2 | 32.8 | 0.1 | 13.8 |
| | Health and Social Services | 0.8 | 21.2 | 5.7 | 98.1 |
| | Other Services, n.e.c. | 6.0 | 112.2 | 30.8 | 263.8 |
| | Rest of the World | 0.0 | 19.8 | 0.3 | 10.3 |
| | Direct tax | 2.5 | 63.7 | 38.7 | 259.8 |
| | Savings | 109.1 | 1366.1 | 211.8 | -265.5 |
| | Total | 268.2 | 4801.0 | 973.8 | 5540.5 |

**Source: Author's calculation using CESES 2009 and SAM (2011)**