Computing Employment Multipliers in the Context of Malaysian Economy

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Abstract:
The aim of this article is to explain the computing of employment multipliers in the context of Malaysian Economy by industry. The data used is sourced from the Input-Output (I-O) Tables, Economic Census Reports, Labour Force Survey Report and the Labour Productivity Report released by Department of Statistics Malaysia in 2015. Computing the employer multipliers uses the Leontief Inverse Model from the I-O Tables, as well as w, physical labour coefficient vector which is computed using the ratio of employment to output. Furthermore, the article will study the figures obtained to interpret the number of new jobs created to meet increased final demand for new output. Lastly, the article seeks to compare the behaviours of industries based on the multipliers obtained using K-means clustering.

Keywords:
Employment Multiplier, Input-Output Table, Labour Productivity, Labour Demand, Job Creation

1. Introduction:

To compute employment multiplier in the context of the Malaysian Economy, the following data were used:

(a) Employment (b) Value-added (c) Inverse Matrix of Domestic Production

While (b) and (c) can be easily obtained from the Input-Output Tables published by DOSM, employment data is difficult to compute.

According to the Labour Force Survey (LFS), DOSM, an employed person is defined as a person, who at any time during the reference week worked at least one hour for pay, profit or family gain either as an employer, employee, own-account worker or unpaid family worker. An employed person can either be in the formal sector or the informal sector, where the formal sector is defined as activities carried out by registered organizations in Malaysia and the informal sector is defined as activities carried out by nonregistered individuals and organizations. These definitions can also be referred from the Employment and Salaries & Wages Statistics Report (2016), which is based on the Economic Census (EC) 2015.

The challenge in computing employment data is due to the multiple sources available. Particularly at DOSM, two approaches are used, which are the household approach (LFS) and the establishment approach (Economic Census, Monthly Manufacturing Statistics (MMS) and Quarterly Services Statistics (QSS)) -- all of which employment data is collected but is referred to different coverage of the labour force. The household approach covers the entire labour force, including those employed in the informal sector whereas the establishment approach covers only registered organizations and hence by definition, those employed only in the formal sector. While the LFS covers more, its data is based on a sample of which the sample stratification does not include industry. Hence there is high possibility of error when using data at a very granular level. For industries of which there is more formal employment such as Finance and Insurance, data from the Census can be more reliable.

In order to compute employment multiplier, which reflects creation of jobs based on the industrial nature, employment data needs to be adjusted and estimated. This study will compute employment multiplier based on employment data estimated using combination of LFS 2015 and EC 2015, by considering the structure of formal-informal employment in the sector.

The employment multiplier is important as it is a way to measure number of jobs created in economy, resulted from an increase of the output. In addition, employment multiplier provides opportunity to the country to reduce widespread unemployment and to improve people's wellbeing (Ntibanyurwa, 2008). There are two types of employment multiplier, Type 1 and Type 2 multiplier. Type 1 multiplier captures the indirect effects, meanwhile Type 2 multiplier captures both indirect and induced effects. According to Cetnarski (2011), direct jobs are related to the specific industry, indirect jobs are those that support the industry while induced jobs are those that are a result of direct or indirect employee's spending money in the community. Generally, industries with a higher multiplier are more desirable (Cetnarski, 2011).

2. Methodology:

There are a few of economic models to estimate employment multiplier, one of them is using Leontief inverse model. According to Siti Rahmah and Nurul Naqiah (2015), the basic equation of Leontief inverse which also known as the basic multiplier model in input-output is written as follows:

$Q_t = (I-A)^{-1} * f_t$

Q = Vector of domestic product

I = Identity matrix

A = Domestic input coefficient matrix

f = Vector of final demand

t = 2015

In this study, we want to examine the employment multiplier. Thus, the physical labour input coefficient, L_t is used instead of monetary labour input coefficient. Mathematically, L_t is e^*x^{-1} which is computed from a vector of employment divided by value added. Hence, the final equation to compute employment multiplier written as follows:

$Q_t = L_t^*(I-A)^{-1} * f_t$

L_t = Vector of employment divided by value-added

t = 2015

As mentioned, employment data here is obtained and estimated from the EC and LFS, reference year 2015. To make the estimates, the industries are first grouped according to formality of employment; if mainly formal, we use the EC and if mainly informal, we use the LFS. The estimates are also compared to employment data in the Labour Productivity Report, however not directly due to the difference in industrial grouping (2-digit level).

The inverse matrix and value-added data are obtained by subtracting Total Input from Total Output from the Domestic Use Table at Basic Prices -- both obtained from the Input-Output Tables, 2015. When all three variables had been obtained, the industrial code used for the employment data (5-digit) needs to be mapped to the I-O Tables (aggregated 5-digit). There are 124 aggregations in total. Then finally, the employment multiplier is computed using the formula.

3. Result:

Table 1: Employment Multipliers Calculated Based on Employment Data Estimated from Labour Force Survey 2015 and Economic Census 2015, by industry

Rank	Industrial Code	Industry	Employment Multiplier
1	122	Non-Profit Institutions Serving Households	0.081
2	5	Rubber	0.081
3	124	Other Private Services	0.079
4	116	Business Services	0.072
5	1	Paddy	0.067
6	23	Bakery Products	0.049
7	33	Wearing Apparel	0.048
8	95	Food and Beverage	0.040
9	88	Sewerage, Waste Management and Remediation Activities	0.037
10	96	Land Transport	0.033
115	30	Preparation, Spinning and Weaving of Textiles	0.006
116	121	Other Public Administration	0.006
117	114	Scientific Research and Development	0.006
118	7	Flower Plants	0.005
119	45	Basic Chemicals	0.005
120	44	Coke and Refined Petroleum Products	0.004
121	29	Tobacco Products	0.004
122	112	Ownership of Dwellings	0.003
123	101	Highway Operation Services, Bridge and Tunnel	0.002
124	13	Crude Oil and Natural Gas	0.002

Table 2: A Snapshot of Groups of Employment Multiplier based on K-Means Clustering, k=4

Group 1	Group 2	Group 3	Group 4
Non-Profit Institutions Serving Households	Finishing of Textiles	Bakery Products	Residential Buildings
Rubber	Rental and Leasing	Wearing Apparel	Specialised Construction Activities
Other Private Services	Steam Generators	Food and Beverage	Wooden Containers and Other Wood Products
Business Services	Footwear	Land Transport	Furniture
Paddy	Arts, Entertainment and Recreation	Sewerage, Waste Management and Remediation Activities	Processing and Preserving of Seafood
	Wiring Devices, Electric Lighting Equipment and Other Electrical		Postal and Courier Activities
	Publishing Activities		Repair & Installation of Machinery and Equipment
	Domestic Appliances		Sawmilling and Planning of Wood
	Soft Drinks, Mineral Waters and Other Bottled Waters		Other Livestock
	Pharmaceuticals, Medicinal Chemical and Botanical Products		Health
	Other Manufacturing		Processing and Preserving of Fruits & Vegetables
	Basic Precious and Other Non-Ferrous Metals		Other Mining and Quarrying
	Services Incidental to Water and Air Transportation		Accommodation
	Computer and Information Services		Oil Palm
	Optical Instruments, Photographic Equipment, Magnetic and Optical Media		Reproduction of Recorded Media
	Fertilizers and Nitrogen Compounds		Veneer Sheets and Wood-based Panels

	Motion Picture, Programming and Broadcasting Activities		Vegetable & Animal Oils and Fats
	Fruits		Prepared Animal Feeds
	Dairy Products		Processing and Preserving of Meat
	Vegetables		Activities Auxiliary to Financial Service and Insurance/ Takaful
	Other Textiles		Professional
	Air Transport		Structural Metal Products, Tanks, Reservoirs and
	Fishing and Aquaculture		Non-Residential Buildings

Table 3: Number of Industries and Estimated Centre in Each K-Means Cluster, k=4

		Number of Cases in each Cluster	Centre
Cluster	1	5.000	.075878
	2	73.000	.009657
	3	5.000	.041341
	4	41.000	.020329
Valid		124.000	
Missing		.000	

4. Discussion and Conclusion:

Table 1 shows the industries with the ten highest and ten lowest employment multipliers.

The largest job creation can be seen in Non-Profit Institutions Serving Households, of which data is sourced from the LFS, whereas the lowest is in Crude Oil and Natural Gas sourced from the Economic Census. According to Anushree, Avantika and Rajesh (2015), larger employment multipliers refer to those labour-intensive, and lower ones refer to capital-intensive industries.

In Malaysia, Agriculture, Manufacturing and Services sectors are generally labour-intensive, whereas Mining & Quarrying and Construction are mostly capital-intensive.

Table 2 shows a snapshot of results of K-means clustering of the employment multipliers. K-means clustering here uses k=4, which is chosen based on a dendogram obtained from hierarchical clustering. This clustering is an attempt to group the industries based on the employment multipliers. Based on Table 3, it can be observed that Group 1 is made up of industries with the highest figures and Group 2 is with those with the lowest figures. As Group 2 is the largest group, it may be concluded that the majority of the industries have low employment multiplier; thereby suggesting that jobs created are mostly in certain industries in Malaysia.

One of the limitations of this study is that the grouping of industries based on the structure of formalinformal employment is largely based on the typical perception of the industry in Malaysia. Informal employment, by its nature, is difficult to measure; and even more so at a granular level of industry. However, in understanding job creation in for formulation of economic policies, informal employment cannot be ignored so as to not leave anyone behind.

To enhance this study, employment multipliers can be conducted by estimating further informal and formal employment at each industry. Furthermore, direct and indirect impacts may be calculated if one were to analyse the I-O tables at a more segregated level.

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