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COAL MINING OPERATIONS AND ITS IMPACT ON SECTORAL AND REGIONAL AREA: EVIDENCE OF EAST KALIMANTAN, INDONESIA

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ABSTRACT

Mining sector plays important roles for Indonesian economic performance, especially in East Kalimantan. This study investigates: (a) whether economic linkages of the mining sector related with other economic sectors in East Kalimantan, (b) who gets benefit from such mining activities; (c) how is the impact of mining sector for rural and urban households; and (d) what happens if coal mining, oil and gas productions are completely depleted. The quantitative analysis framework using Input-Output and Social Accounting Matrix Tables in period 2009-2010 has been implemented as main data set. The result shows that mining sector was underdeveloped sector in East Kalimantan, including Kutai Kartanegara district. Activities from mining sector tended to give benefit for the owners of capital, which is larger than that benefit for workers employed. Structural Path Analysis (SPA) shows that urban households gain the greatest advantages from the activities of this sector. The result also shows that the total output decreased by 65.12% when the mining, oil and gas dissapeared. A drastic reducing income after mining and oil and gas era will have an impact on the decline in the purchasing power in the region. However, the interesting finding of this research shows that the loss of mining and oil or gas sectors actually increases the strength of employment multiplier by 19%.

Keywords: mining sector, coal, linkage, extraction, rural and urban households

JEL Classifications: Q33, Q43

INTRODUCTION

Indonesia is the world's largest archipelago divided into 5 major island-groups (Java-Bali, Kalimantan, Sulawesi, Sumatra, and Eastern Indonesia), and has 34 provinces, with an approximately 230 million population. Indonesia is also the largest member of the Association of Southeast Asian Nations (ASEAN), according to population

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and Gross Domestic Product/GDP (ASEAN, 2010). Since 2001, Indonesia has applied the principles of power decentralization in politics, administrations, and economy. In such decentralized system, discussing recent development in Indonesia through regional dynamics, which is derivated into provincial or district/city level, will be more relevant.

Mining sector played important roles in Indonesian economic performance. Coal, specifically, plays as strategic and booming commodities (Burke and Resosudarmo, 2012). By 2007, coal had probably become the most important mining operation in the country (Resosudarmo, et al., 2010). In Indonesia, coal mining are found only in two islands: Sumatra and Kalimantan, where South Sumatra, South Kalimantan and East Kalimantan are the main exploration regions.

East Kalimantan was the dominant player among Indonesian coal producers with a total production approximately 184 million metric tones (MT) in 2012 (see tables 1 and 2). With those contribution, East Kalimantan contributed at least 65% compared to total coal production in Indonesia. During the period 2009-2010, the average government royalty revenue from coal earned by province and district/city in East Kalimantan were IDR 786 billion and IDR 3 trillion, respectively. Coal has always had positive impact for the local budget, where in 2012 the coal royalty income reached IDR 10 trillion. Consequently, East Kalimantan placed as the fourth of Indonesia's wealthiest regions.

This fact influences the landscape of regional economic structure in East Kalimantan. During the period 2000-2012, the mining sector has dominated an average of 37% share of Gross Regional Domestic Product (GRDP) at constant prices (real GRDP), while oil and gas industry also controls around 34%. The rest was distributed to other sectors with a relatively small share. However, almost all of coal mining production result has been directly used for export purposes. Less than 10-15% income used to meet domestic needs. This little amount of domestic needs is generally utilized for electricity power plants, cement activities and other industries (JATAM, 2002).

East Kalimantan's economy is vulnerable from external shocks since fluctuation of coal demand in the world brings broad impacts on the mining business sustainability. During the 2003-2011 periods, East Kalimantan economic growth rised at an average rate of 4.95%. Such growth rates is still lower than Indonesia's economic growth, which

is ranging from 6.2-6.5%. This growth has also generally driven by the demand side, specifically in form of non-renewable resources exports such as coal mining, oil and gas.

Table 1. Coal contribution from PKP2B – in Metrik Tonnes (MT)

Year	Province	National	% from National
2008 (MT)	104,243,077.17	187,136,343	55.7
2009 (MT)	118,240,983.68	208,420,235	56.7
2010 (MT)	134,710,693.63	221,469,954	60.8
2011 (MT)	145,000,000.00	220,000,000	65.9
2012 (MT)	130,037,204.27	-	-
Average	126,446,391.75	209,256,633	

Source: Bureau of Central Statistics (BPS), East Kalimantan Province

Table 2. Coal contribution from IUP – in Metrik Tonnes (MT)

Year	Province	National	% from National
2008	18,474,856	187,136,343	9.87
2009	28,224,000	208,420,235	13.54
2010	42,040,230	221,469,954	18.98
2011	45,000,000	220,000,000	20.45
2012	54,124,000	-	-
Average	37,572,617	209,256,633	

Source: Bureau of Central Statistics (BPS), East Kalimantan Province

Table 3. Tax Sharing (Royalty) of Coal in East Kalimantan Province and District/City Level

Year	Revenue of Province (IDR)	Revenue in District Level (IDR)
2009	638,930,697,189.00	3,194,653,485,945.00
2010	692,305,162,910.00	3,461,525,814,550,00
2011	1,017,871,254,941.00	5,089,356,274,700,00

Source: Bureau of Central Statistics (BPS), East Kalimantan Province

Therefore, the economic growth in East Kalimantan reflects and is determined by mining, oil and gas performance. Since all those natural resource commodities are heavily dependence on world prices, it is, then, not surprising to see that coal growth

has suffered a sharp decline in recent years. This condition has significantly affected companies performances and revenues.

East Kalimantan has been situated as heaven for mining activities, especially of coal in Indonesia. This is due to natural conditions and adequate infrastructures for such activities. The infrastructure provided are ranged from production stages to distribution activity channels. For instance, the Mahakam River carried out coal through giant boats ("Ponton"). Total company operations through 2012 amounted to 1,419 companies, they can be divided generally into two types. First, the companies that hold coal mining work agreement (PKP2B license) consisting of 33 companies. These companies generally have a large-scale exploration. For example, PT. Adaro Energy Tbk, PT. Kaltim Prima Coal (KPC), PT. Kideco Jaya Agung and PT. Berau Coal. These large-scale enterprises dominated the economic scale in Indonesia and even the world since the quality of coal produced was high (Metalurgi types), containing with high calorie (> 5,500 kilo calories). Second, firms with IUP (mining operation) license consisting up to 1,386 companies. A large number of IUP license was issued by the regions leader (*Bupati* or *Wali Kota*) and is not under Governor's territory.

Highly activities of coal mining operations led to the least availability of mineral and energy in the region, which has threatened domestic reserves. The nature of mineral resources is not renewable and because of the magnitude of coal mining, East Kalimantan's economy is heavily dependent on non-renewable resource-based activities. Such mentioned fact is close to a so called natural resources curse terminology and raises crucial question such as the future of local economy when these mining resources was completely depleted.

Table 4. Dominant Sector in 1970-2012 periods

Periods	Dominant Sector	Maximum Economic Growth
1970 – 1990	Forestry	7.42 % (1990)
1990 – 2000	Oil and Gas Mining	5.71% (2000)
2000 – 2012	Coal Mining	3.94 % (2012)

Source: East Kalimantan's Regional Planning and Development Agency/Bappeda(2013)

It is important to note that the region's economy had been transformed from a mostly forestry dominated economy into mining dominated one. Forestry sector with wood commodity dominated over the period 1970-1990. Almost 11 million acres forest consesions were released during the period 1969-1974. Whereas in 2000-2012 periods it dropped from 27% in 2000 to only 7% in 2012. Unfortunately, in 1970 until 2012, economic structure still concentrated on primary sector (Bappeda, 2013).

This paper analyses issues related with specifically the following questions:(1) Whether the mining sector, especially coal, has strong economic linkages with other economic sectors, (2) Who get benefits from mining exploration activities, (3) How is the impact of the mining sector for rural and urban households, and (4) What happens if the mining, oil and gas are completely depleted.

The paper is organised as follows. The second section reviews some literature. The third section introduces data sources and methods utilized. The fourth section reports the empirical analysis, which consists of four parts: first, we explain on linkages evidence of coal; secondly, multiplier of Social Accounting Matrix (SAM); thirdly, the Structural Path Analysis (SPA); lastly, the extraction simulation finding. This is followed by concluding and some policy implications.

LITERATURE REVIEW: CONCEPT AND DEFINITIONS

The Curse of Resources

The concept of natural resource curse applied in resource-rich countries in Africa and Asia, which are generally poor. This term was firstly proposed by Richard M. Auty in 1993. According to this concept, there is a link between natural resource management and political instability in countries with rich endowment in natural resources. Residents from natural resources wealthy areas tend to be ignorance because they are seduced by abundance availability of natural resources. Consequently they have been cursed in poverty

Several studies supported hypotheses of resource curse. For example, McMillan and Rodrik (2012) conducted 38 countries data where 25 of those countries are low or middle-income. The research findings showed that there were "natural resource curse" elements found in the countries studied. Pegg (2006) examined this hypothesis in Africa. Many western policy makers believe that natural resources will eventually give

ways to development future in Africa. They argued that resource curse is something to be experienced, especially if there is no good governance, good economic policies and strong commitment that are aimed to reduce the ill effects of such curse. The study conducted by Pegg critically evaluated economic construction in Cameroon to assess whether the presence or absence of policy intervention within a nation supports "resource curse" hypothesis or not. In conclusion the author mentions that policy interventions may not work well to alleviate the causes of poverty and shows that there is a positive correlation between natural resources exploitation and increasing poverty in Africa

Sanglimsuwan (2008) addressed question whether the abundance of natural resources in the countries of Asia-Pacific is a curse or a blessing. The data presented by Auty (1993) and Sachs and Warner (1995, 1997) are based on a consistent negative correlation between economic performance (growth rate of GDP per capita) and the abundance of natural resources (share of exports of natural resource-based products). The study examines the relationship between natural resource abundance and economic growth by using Asia-Pacific countries data. Agriculture, forest, and metals assets were used to measure the proxy of natural resources. Explaining the correlation between natural resource abundance and economic growth, the authors proved that the resource curse hypothesis exists in the countries of Asia-Pacific. In addition, the role of institutions as measured by government effectiveness and regulatory quality was considered as an important factor of economic growth indicators in the countries of Asia-Pacific. Variables such as institutions and economic growth showed a positive trend line. This suggested that institutional quality is very important to determine economic growth in order to remove the resource curse from those countries

Iimi (2007) also confirmed that efective management of good governance in natural resources wealthy regions will make the resource curse become ammunition for economic growth. Transparency and accountability are key factors that must be improved in developing countries to transform their economy in the future

This fact was also strengthened by the findings of Kolstad and Wiig (2009). They found that areas with natural resource-based economy tend to be trapped in a four phenomena: (a) a great wealth of natural resources make the country miss economic activity variations, which brings them into natural resources loss. This phenomenon is

often called "Dutch Disease". (b) the arrangement model of centralized political economy patronage practices, generally permit exploitation of natural resources to a group of people close to the vortex of power; (c) rent seeking practices often occur because of decentralized economy into the smallest area (district / city); (d) trade liberalization policies that provide large space for foreign economic actors exploited natural wealth.

Economic experiences of Indonesian regions such as Bangka Belitung, Sawah Lunto, and West Kutai can be a valuable lesson. Bangka Belitung, for example, was a rich area of tin natural resources. However, because of the future development plan absences in this region, Bangka Belitung failed to anticipate the depletion of resource stocks lead has now became poor. Other than that, the region has also been facing job vacancies availablity problems that bring different social disasters. In East Kalimantan, the case of PT. Kelian Equatorial Mining (KEM) is also a great lesson to learn in term of natural resources curse. In early 1992s, PT. KEM started to exploit gold from West Kutai lands, and ended operations in 2003. They left only traces of the giant holes, mercury contaminated river, and rural poverty. Estimated gold taken from East Kalimantan land were 130-150 tones (Bappeda, 2013). This fact has also become a distinct evidence that the resource curse was really happening.

Impact of Mining Operation: Economy, Environment, and Social

Empirical studies on the effect of mining operation on development issues such as socio-economic, environment, and particularly on the exploration of coal mining in the developed and ASEAN countries, are very limited. Among those fews are Fatah (2007). In his work, Fatah explored how the impact of coal mining activities affect the region's economy and the livelihoods of local residents in the province of South Kalimantan. This province, as a further note, is three of the main areas of Indonesian coal exploration besides South Sumatra and East Kalimantan. Fatah found that South Kalimantan province's economy depends heavily on mining, yet he also found that this dependency gives destructive impacts on the environment. There is always a trade-off between economic benefits and environmental loss due to the burden of mining explorations. Fatah’s research revealed that the mining sectors do not open huge job opportunities and tend to marginalize the poor. He also argued that there are urgent needs in the region to govern policy that reduce the rate of growth from coal mining sector through

regulations on small-scale mining companies. He recommended that agricultural investment must be increased to improve the employment prospects and help the poor.

In Appalachia, USA, Roenker (2002) pointed out that more than 300,000 acres of forest have been cleared because of the mining activities. Regrettably, forest loss is not the only cause of land degradation, but also floods, ecosystem imbalance and rising temperatures that lead to global warming. JATAM's research in East Kalimantan, proved that the local government (district/city) tend to make decision to support short-term economic gains without considering environmental impact (Tribun Kaltim, 2013). This argumentation is analyzed through different evidences in case of issuing mining business license (IUP) without attending environmental impact assessment procedures. Eventhough there is Moratorium in License of Mining Activity (IUP), that accepted Governor and 10 districts, and 1 town, Samarinda, the destruction of environment is still on going problems. Coal mining companies tend to neglect any regulations, for instance, doing the exploration near resident and with worse management of mining waste. Companies also often do not pay Reclamation Guarantee Fund (JAMREK) which was regulated by local government. Unfortunately, local governments do not take firm actions to punish such mining companies (JATAM, 2012).

Figure 1. Flood in East Kalimantan

Note: The picture of flood in East Kalimantan capital city, Samarinda, which surrounded by Kutai Kartanegara mining operations. This picture captures one of the impacts from mining activities in urban resident – picture was taken 29th January 2013).

Although there are bad impacts from coal activities, there is a tendency that government gives lots of supports for mining companies without considering public aspirations and enviromental impact from those mining operations. Figure 1 basically tells us that in the end, mining operations can damage public infrastructure and reduce social welfare. This case includes coal activities that are closed by residential area, which bring contaminated water and flood in urban areas.

DATA AND METHODS

The Input-Output (IO) and Social Accounting Matrix (SAM) table of East Kalimantan Province in 2009 was conducted as main data for this analysis. Those data are the last publication issued by the Central Bureau of Statistics (BPS) of East Kalimantan Province. To emphasize analysis to the district level, we also utilize Kutai Kartanegara IO tables in 2010, without using SAM tables, because of its unavailability in this region. Kutai district is chosen because its one of the main exploration area of coal mining in the province.

We used the standard IO framework to get the Rasmussen index, so it can answer power linkages of mining and explain their position in the economic system. Rasmussen has been improved method of Chenery-Watanabe, in which the inverse matrix of rows and columns summed to obtain the value of the forward and backward (Miller and Blair, 2009). Further value was transformed into the form of an index called the Power of Dispersion and Sensitivity of dispersion. It can be written as follow.

$$\alpha_j = \frac{\sum_{i=1}^{n} g_{ij}}{\frac{1}{n}\sum_i \sum_j g_{ij}} \quad (1)$$

and,

$$\beta_j = \frac{\sum_{i=1}^{n} g_{ij}}{\frac{1}{n}\sum_i \sum_j g_{ij}} \quad (2)$$

where α_j is Rasmussen Backward Linkages (RBL); and β_j is Rasmussen Forward Linkages (RFL).

The extraction method aims to look at the impact that occurs when a particular sector was eliminated. Extraction method was first introduced by Strassert (1968), then applied by several research, i.e. by Cella (1984), Sonis et al., (1995), and refined in the

form of taxonomy by Miller and Lahr (2001). Basic meanings of this extraction method is how much output will be changed in the economy of a region when some sectors are lost or completely depleted (Nazara and Rosmiansyah, 2008).

Nazara (2005) explained if a sector has lost or exhausted, sometimes it was difficult to accept when referring to the national economic system. However, in the regional economy area this method is compatible. This is because the regional economy, in general, perform export and import intensity, was higher than the economy of a country. It seems logically true, for example, in the coal mining sector that continue to exploit, thereby reducing the volume of mineral reserves and is very likely to run out availability.

The methods of extraction is done by modifying the technology coefficient, which eliminates the rows and columns that will be simulated in the sector of IO Tables. Simulation results will be affected the linkages and multiplier on the economy. Input coefficient matrix (A) and the inverse Leontief (L) can be written:

$$\mathbf{A} = \begin{bmatrix} \mathbf{A}^{11} & \mathbf{A}^{1R} \\ \mathbf{A}^{R1} & \mathbf{A}^{RR} \end{bmatrix}$$

$$\mathbf{L} = \begin{bmatrix} \mathbf{L}^{11} & \mathbf{L}^{1R} \\ \mathbf{L}^{R1} & \mathbf{L}^{RR} \end{bmatrix} \qquad (3)$$

Extraction means A^{1R} and A^{R1} component be forced to zero or omitted. Output in this system to be:

$$\bar{\mathbf{x}} = \begin{bmatrix} (\mathbf{I} - \mathbf{A}^{11})^{-1} & 0 \\ 0 & (\mathbf{I} - \mathbf{A}^{RR})^{-1} \end{bmatrix} \begin{pmatrix} \mathbf{f}^{1} \\ \mathbf{f}^{R} \end{pmatrix} \qquad (4)$$

Simulation will be done by removing the rows and columns of targeted sectors i.e. coal mining and oil and gas. These results will ultimately affect the value of the multiplier in the economy sector. Mining sector, where consists of oil and natural gas, coal, and other non-oil mining, and also quarrying. Oil and gas sectors consists of petroleum refining and Liquefied Natural Gas (LNG) industry. To get how much labor is employed in each sub-sector, the data also used Indonesian National Labor Force Survey (SAKERNAS) in 2010.

Unlike the IO framework, SAM Table is a matrix which is summarizes the social and economic balance overall. Balance-sheet (accounts) were separated into two groups, namely endogenous and exogenous group balance-sheet. Broadly, the endogenous balance-sheet group is divided into three blocks: production factors, institution and balance sheet activity production. To abbreviate, the third block will then be referred to as a block factor of production, institutional and production activity. In simple terms the basic framework of the SAM can be seen in table 5.

The basic framework of SAM formation is shaped partition matrix measuring 4 x 4. Line indicates income, while column shows expenditure. In table 5, the submatrix T_{IJ} used to indicate income of the balance sheet of the i-$_{th}$ row and j-$_{th}$ column of the balance sheet. Vector y_i showed total receipts balance sheet of the i-$_{th}$ row, otherwise the vector y'_j showed total expenditures balance sheet for column j. In accordance with the provisions of the SAM, the vector y_i equal to vector y'_j, (i.e.,y'_j is the transpose of the vector y_i, for every i = j).

Table 5. SAM Framework

			Expenditure				
			Exogenous			*Exogenous*	TOTAL
			Production factors	Institution	Activities		
INCOME	*Endogenous*	Production factors	0	0	T_{13}	T_{14}	y_1
		Institution	T_{21}	T_{22}	0	T_{24}	y_2
		Activites	0	T_{32}	T_{33}	T_{34}	y_3
	Exogenous		T_{41}	T_{42}	T_{43}	T_{44}	y_4
	TOTAL		y'_1	Y'_2	y'_3	y'_4	

Source: Defourney and Thorbecke (1984).

In the SAM analysis, the approach used is the conventional approach which calculating the matrix multiplier. Matrix multiplier balance $M_a = (I - A)^{-1}$ was essentially trying to capture the impact of changes in one sector to another sector of the

economy. In addition to the multiplier, Structural Path Analysis (SPA) is also used to track the interactions within an economy (Daryanto and Hafizrianda, 2010). Starting from the origin point, e.g. sector A, and ending in other sectors as a destination. SPA method able to show the transmission effect from one sector to another. Each of these elements can be decomposed into a direct, total, and global influence.

Direct influence (DI) from i to j $(DI_{i\rightarrow j})$ show changes of production or income j which is caused by change of one unit i. According with this definition, we can expressed:

$$DI_{(i\rightarrow j)} = a_{ij} \tag{5}$$

The total influence (TI) from i to j show changes which brought from i to j, through origin path or circuit which connect them. The value of TI is multiplication between direct influence and path multiplier (PM). We can express:

$$TI(i \rightarrow j) = ID(i \rightarrow j)M_p \tag{6}$$

$$TI(i \rightarrow j) = a_{xi}a_{yx}a_{jy}[1 - a_{yx}(a_{xy} + a_{zy}a_{xz})]^{-1} \tag{7}$$

where,

$$PM = [1 - a_{yx} + (a_{xy} + a_{zy}a_{xz})]^{-1} \tag{8}$$

The global influence (GI) from i to j measuring whole effect on income and production j caused by one unit change from i. We can express:

$$GI(i \rightarrow j) = \sum_{p=1}^{n} TI(i \rightarrow j) = \sum DI_{(i\rightarrow j)}PM \tag{9}$$

Where $GI(i \rightarrow j)$ is global influence from columns i in SAM for row j; $TI(i \rightarrow j)$ is total influence from i to j; $DI_{(i\rightarrow j)}$is direct influence from i to j; and PM is multiplier within path way. To calculated all of these elements, we utilized SimSIP SAM program which was released by World Bank (Paraa and Woodon, 2010).

EMPIRICAL RESULTS AND DISCUSSION

Rasmussen Dual Index

From the analysis using Rasmussen linkages index, the position of the coal is low. It means that coal has absolutely weak linkages relevance to the rear and to the front dispersion. While the other non-oil and gas mining sector also has the Rasmussen Forward Linkage (RFL) and Rasmussen Backward Linkage (RBL), the values less than average (<1). Thus, the mining sector is an underdeveloped position. This fact strengthens the evidence that a sector which contributed greatly to the GRDP does not automatically positioned it to the leading sector. Mining is not strong able to develop other sectors and is not sensitive to changes in other sectors. Coal is export-oriented commodities and does not give strong linkages to push and pull domestic economic sector (both upstream and downstream).

Based on the results of the analysis, the agricultural manufacturing industry, trade, construction, and transportation as well as warehousing support services, can be placed as a leading sector in East Kalimantan. This is due to the RFL and RBL value which was greater than average (> 1) (see table 6).

Table 6. Underdeveloped and Leading Sector in East Kalimantan

Weakness Linkages Sector (Underdeveloped)		
Sector	**RBL**	**RFL**
Others non-oil and gas mining	0.913	0.770
Coal	0.892	0.900
Oil and gas mining	0.816	1.558
Leading Sector		
Sector	**RBL**	**RFL**
Electricity	1.222	1.067
Construction	1.022	1.140
Warehousing and transport support services	1.080	1.142
Agricultural manufacturing industry	1.256	1.232
Trade	1.002	1.671

Notes: RBL: Rasmussen Backward Linkages; RFL: Rasmussen Forward Linkage
Source: Authors' Calculations, based on Input-Output Table, with 33 sub-sector

As shown above, parallel with the results of the Rasmussen analysis in East Kalimantan, table 7 shows that the mining sector, particularly in Kutai Kartanegara district, did not have a clear link with other sectors. In other words, this sector is also

underdeveloped sector, because the value of RBL and RFL is less than average(<1). The only sector that can be positioned as leading sector in this region is manufacturing, because it has the RBL and RFL more than average (> 1). In addition, manufacturing, electricity, gas, and water, as well as construction, transportation and communications, are based sectors with domestic input side. In terms of output, agriculture and manufacturing was domestic-oriented.

Table 7. Linkages in Kutai Kartanegara District

Sector	RBL	RFL
Agriculture, Livestock, Forestry, and Fishery	0.87	1.58
Mining	0.73	0.84
Manufacturing industries	1.21	1.95
Electricity, Gas, and Water Supply	1.31	0.70
Construction	1.30	0.66
Trade, Hotel, and Restaurant	0.94	0.97
Transport and Communication	1.15	0.82
Finance, Real Estate, and Business Services	0.82	0.78
Services	0.67	0.70

Source: Authors' Calculations, using Kutai Kartanegara IO Table with 9 sector

Multiplier of Social Accounting Matrix (SAM)

Table 8 shows the SAM multiplier analysis results of East Kalimantan. Mining sector has low Value Added Multiplier (VAM) of about 0.900. If we decompose this value and then divide it into labor and capital multiplier, each have value of 0.160 and 0.740 respectively. It should be noted that the injection expenditure in the mining sector, tends to give benefit to the owners of capital much larger than the benefit to the workers employed. Agriculture and services sector actually has the highest VAM value of 1.020 and 1.066 respectively. Decomposition of VAM in the agricultural sector is still dominated by the owners of capital rather than labor. Finally, different results shown in the service sector, where the injection in this sector more enjoyed by the labor rather than the owners of capital.

In terms of household income, mining sector has very small impact on changes in household income in East Kalimantan with a multiplier value of only 0.196. In other words, when the exogenously balance of the mining sector injected by IDR 1 billion, it increases total domestic revenue by IDR 0.196 billion. If we decompose, urban households gain the greatest advantage from the activities of this sector with multiplier value of 0.114, compared to farm households (0.014) and rural areas (0.068).

Table 8. Multiplier SAM of East Kalimantan

	Labor	Capital	VAM	Agric	Rural	Urban	ARU	Comp	Gov
Agriculture	0.360	0.660	1.020	0.304	0.025	0.056	0.384	0.300	0.040
Mining	0.160	0.740	0.900	0.014	0.068	0.114	0.196	0.331	0.042
Industry	0.131	0.620	0.751	0.013	0.037	0.091	0.141	0.277	0.035
Water, Gas, and Electricity	0.132	0.723	0.855	0.015	0.041	0.119	0.175	0.324	0.041
Construction	0.228	0.293	0.521	0.011	0.052	0.161	0.223	0.132	0.019
Trade, Hotel, and Restaurant	0.306	0.578	0.883	0.016	0.069	0.227	0.313	0.259	0.035
Transport	0.364	0.417	0.782	0.017	0.087	0.273	0.377	0.188	0.028
Banking and Finance Institution	0.214	0.682	0.896	0.014	0.049	0.151	0.214	0.305	0.039
Services	0.881	0.185	1.066	0.017	0.146	0.567	0.730	0.087	0.021

Notes: VAM is total multiplier from labor and capital; ARU is total multiplier from agriculture, rural and urban household; comp is multiplier of institutionof company; gov is government multiplier
Source: Authors' Calculations.

Services and agricultural sector gives precisely the greatest impact on changes in household income with the values of 0.730 to services and of 0.384 to agricultural. That is, in the other words, if there is a IDR 1 billion injection in the service sector and agriculture, it will have an impact on the increase in household incomes of IDR 0.730 billion and IDR 0.384 billion respectively. If we decompose the activity in the services sector, the income flow is enjoyed by urban households (0.567) and also rural households (0.146). While most of the agricultural activities enjoyed by the farm households (0.304).

Structural Path Analysis (SPA)

Table 9 shows the Structural Path Analysis (SPA) result which is able to search for the underlying original paths and destination point. In this analysis, we track the

transmission pattern of mining and compared to agricultural activities for rural and urban households. Based on the SPA, urban households receive the highest global impact from agriculture and mining sectors, which amounted of 0.070 and 0.0114 respectively. The mining sector has a direct impact for urban households where transmission lines only arrived to urban households, without going through other pathways, that is equal to 0.020.

In contrast to the rural households, the mining sector has global influence only 0.068, with a direct influence only 0.001. Thus, the activities of the mining sector make profitable to the urban households rather than rural households. If we look at the agricultural sector, the group receive a strong enough benefit is urban households. We can see from global influences to rural households amounted to only 0.029, which has a high gap compared to urban households. According to this situation, agricultural sector in East Kalimantan has a potential impact for making income distribution more equitably and also reduce disparity between rural and urban of the province.

Table 9. Structural Path Analysis

Origin-Destination	Elementary Path	GI	DI	PM	TI (DI*PM)
Agriculture - Rural Household	Agric/Agric Household/Domestic/ Industry/Rural Household	0.029	0.003	1.330	0.003
Agriculture - Urban Household	Agric/Agric Household/Domestic/ Industry/Urban household	0.070	0.007	1.321	0.010
Mining - Rural Household	Mining/Urban household/Rural Household	0.068	0.001	1.141	0.002
Mining -Urban Household	Mining/Capital/Urban household	0.114	0.020	1.112	0.023

Notes: GI : Global Influence; DI: Direct Influence; TI: Total Influence; PM: Path Multiplier
Source: Authors' Calculations.

Extraction Simulation

The simulations performed using extraction method show a total output of East Kalimantan decrease by 65.12 % if the mining and oil and gas sector was completely depleted. It means that, during this time, more than half of economic power in the region held by the mining and oil and gas sectors. This condition was followed by a decline in total primary input, which is the sum of the total revenues receipt by economic actors (such as wage and surplus.), amounting of 69.66% (see table 10).

The linkages side is also declined with the magnitude of the index decreased by 10.35. The position of leading or key sectors (which has the largest linkage) after extraction place palm oil sub-sector and trade is moving into key sectors with Rasmussen index more than average (> 1).

Table 10. Impact on Output and Income After Extraction (in IDR)

Remarks	Before	After	Gap	%
Total Output/Input	457,721,526,594	159,373,965,538	298,347,561,056	65.12
Primary Input (Value Added)	288,717,065,375	87,589,145,285	201,127,920,091	69.66

Source: Authors' Calculations .

Figure 2. Mining Operations in Samboja and Loa Janan subdistrict

Extraction simulation by eliminating the role of mining and oil/gas sector gives room to palm oil and trade support East Kalimantan's economy in the middle and long term future. The increasing role of palm oil, also caused by the East Kalimantan government policies to promote this sector as a key regional commodity since 2006. However, palm oil priority should be ran along with wisdom policies. Because the expansion of palm oil has large implications for the decline of forest (deforestration) which give a greater impact to environment. Forest defoliation was destructed because conversion land policy from forest to oil palm plantation. For example in figure 2, that is a picture of mining activity in Samboja and Loa Janan Disctrict, Kutai Regency, that destroyed pineapple plantations.

In the post-mining and oil/gas era, through simulations, the difference in the average change in income multiplier is insignificant, that is only decreased by 0.0055 (2.47%) (see table 11). This evidence shows the weakness of income multiplier effects arising from the activities of mining and oil/ gas sector for the economy of East Kalimantan over the years.

This is due to the low relevance of this sector with other sectors in context of regional economy system, where the results tend to still directly exported in the form of raw materials and not utilized by domestic consumers and businesses. This fact also concludes that the ratio of revenues (profits) from the large mining and oil and gas activities are enjoyed and only accessible to a small group/community in East Kalimantan. This is because the characteristics of such sector requires experienced workforces (experienced labors) and highly educated (educated labors), so the mobility of factors of production (labor) is difficult and not flexible entry into the labor market. If this condition still goes on, East Kalimantan has big problem with income distribution and poverty in the future. The mining and oil/gas exploration encouraged workers' skills which are not fulfilled by local workers then there are leakages in income distribution which can trigger social jealousy, particularly by local people.

Table 11. Summary of Simulation with Extraction

Average of Multiplier	Before	After	Gap	%
Output	1,3410	1,2460	0.095	-7,08
Household Income	0,2231	0,2176	0.0055	-2,47
Employment	0,000021	0,000025	(0.000004)	19

Source: Authors' Calculations.

The interesting point was, the loss of mining and oil and gas sectors actually increase the strength of the employment multiplier by 19% (see table 11). This anomaly prove that the existence of mining and oil and gas sector reduces the ability of the employment average multiplier in employment.

CONCLUSION

The mining sector, particularly coal and other non-oil mining, was underdeveloped sector in East Kalimantan and Kutai Kartanegara district. Since it has absolutely no strong relevance to the rear and front, the magnitude of the impact from this sector on government revenue and GRDP did not bring extensive benefits to encourage and attract other economic sectors for the development of East Kalimantan towards better quality in the future.

Injection expenditure in the mining sector will give benefit to owners of capital rather than benefit to the workers employed. If we compare with agriculture and services sector, those sector actually have the highest VAM of 1.020 and 1.066 respectively, with the decomposition of value added in the agricultural sector is also still dominated by the owners of capital rather than labor. In contrast, service sector proves that injection in this sector enjoyed more by labor than by the owners of capital.

Urban households gain the greatest advantage from the activities of this sector compared to agriculture and rural households. Simulations performed using the extraction method showed a total output of East Kalimantan's economy plummeted by 65.12 % if the mining and oil and gas sector completely depleted. That is, more than half of economic power in the region held by the mining and oil and gas sectors. This condition is followed by a decline in total primary input, which is the sum of the ratio of the total factor production revenue, amounting of 69.66%. A drastic drop in income post-mining and oil and gas, will have an impact on the decline in the purchasing power

of East Kalimantan. The interesting point is that the loss of mining and oil and gas sectors actually increases the strength of the employment multiplier of 19%. This anomaly proves that the existence of mining and oil and gas sector, reduces the ability of the average multiplier in employment.

Based on conclusions in this research, we recommend some policy implications as follow: (a) East Kalimantan provincial government should immediately make long-term planning that focuses on shifting dependency from non-renewable resources to renewable resources. Economic transformation should include in long term vision of provincial development agenda to be able to escape from natural resources course. Core economy should empower renewable sectors, such as agricultural industry, trade, services, and other sectors, which has potentially impact in the context of its ability to create employment, income and equity; (b) Industrialization of agricultural sector should be the basis of the dominant economy in the future, with emphasis on the integrated development agroindustries (upstream and downstream activities). The ultimate target is to increase value added of palm oil commodity to give better impact for society, not merely as raw products-export oriented. Even though palm oil has potential impact for East Kalimantan economic development, it must however goes along with environment protection. The policy like ”Roundtable Sustainability Palm Oil (RSPO)” could be one of the promised ways to control the trade-off between economic development expansion and environmental protection. Under this policy scenario, East Kalimantan province is able to maintain the size of its forest and protect local communities in rural area. (c) Strong investment in infrastructure development and human resources policies should be prioritized to support the development of economic transformation targeting immediately; (d) As mentioned, the mining sector, especially coal, should be limited in term of production and export. Policy of the Ministry of Energy and Mineral Resources (ESDM) through the attempts to limit coal exports through Article 5 of Law No. 4 of 2009 should be immediately and consistently implemented. Regulation confirmed should comprise the notions that the government need to control national policy that prioritize mineral and/or coal for domestic through control of production and export. When viewed from the tendency of the rate of production that continues to grow, restrictions on coal exports on one hand reduce exploitations of natural resources, but on the other hand, the result increased production surplus

(excess supply). In proportion to export restrictions, East Kalimantan needs to conform regulations to be set. Excess production that can not be exported must look for new markets and a possible solution to increase local consumption.

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