III. RESEARCH METHODS

3.1 Research Location

Riau Province becomes the main area in this research on the role of pulp and paper industry. The decision on Riau Province was supported by several facts:

1. The largest pulp and paper companies are located in Riau Province, such as PT. IKPP and PT. RAPP.
2. Riau Province provides abundance natural resources for pulp and paper industry and has potential for the development of the industry.
3. Expectation on Riau Province social economy condition towards large scales companies.

3.2 Type and Source of Data

The type of data used in this study is secondary data, namely Table of Input-Output on domestic transaction based on producer price in Riau Province 2010 from classification from 112 sectors, published by Center of Study on the Dynamics of Development System (PKDSP), Brawijaya University, Malang and Bappeda of Riau Province, which will be aggregated into 22 sectors by the writer using Microsoft Excel 2011. After being aggregated, the linkage, dispersion effect and multiplier are calculated using Input-Output Analysis for Practitioners (IOAP) 1.0.1. Literature studies using journals and articles and other relevant data also used in this research. Input-Output Table of Riau Province 2010 is chosen because it is the most updated data available during this study.
3.3 Method Analysis

Method analyses used in this research are descriptive analysis and Input-Output analysis. The descriptive analysis used to explain the contribution of pulp and paper industry in terms of demand, output, gross value added, investment, and export-import. The Input-Output analysis used to know the linkage, dispersion and multiplier to define whether or not pulp and paper industry is one of the key sectors.

3.3.1 Intermediate Input Coefficient

Intermediate input coefficient is applied to identify the most dominant input components (intermediate input and primary input), the role of raw materials and energy usage, level of banking services, transportation and other inputs. The proportion of intermediate input used in sector i towards total input of sector j is called intermediate input coefficient. Intermediate input coefficient can be arranged into matrix A with structure as follow:

\[
A = \begin{bmatrix}
a_{11} & a_{12} & \ldots & a_n \\
a_{21} & a_{22} & \ldots & a_n \\
a_{31} & a_{32} & \ldots & a_n \\
\end{bmatrix} \ldots \ldots (3.1)
\]

Primary input coefficient shows the role and composition of wages & salary, business surplus, shrinkage, indirect tax and subsidy. Primary coefficient input described as follow:

\[
\alpha V_j = \frac{V_j}{X_j} \ldots \ldots (3.2)
\]

where:

\(X_j\) : total input in sector j (for sector i is \(X_i\))

\(V_j\) : primary input (added value) in sector j

\(\alpha V_j\) : primary coefficient input
3.3.2 Linkage Analysis

Strong, comprehensive and sustainable economic integration between economy sectors is the key success for economic development. Therefore, linkage between sectors is needed to achieve development success. Linkage analysis is a concept used as the basis for formulating economic development strategy by identifying the linkage between sectors within an economy system (Priyarsono, 2007).

Linkage analysis consists of forward linkage, describing the linkage between sectors in sale against total sale of the output produced; and backward linkage, describing the linkage between sectors in purchasing against total purchasing of input used in production process. Forward and backward linkage can be direct linkage, where the effect will impact the sector directly; or direct and indirect linkages. Direct linkage was shown by technical coefficient, while direct and indirect linkages shown by Leontief Inverse Matrix.

1. Direct Forward Linkage

Direct linkage explained the effect of a particular sector to the sectors that use most of the output directly per unit increase in total demand. Direct forward linkage is defined as follows:

\[ F(d)_i = \sum_{j=1}^{n} a_{ij} \quad \ldots \ldots \ldots (3.3) \]

Where:

\[ F(d)_i \quad : \text{direct forward linkage} \]

\[ a_{ij} \quad : \text{technical coefficient matrix} \]
2. Direct-Indirect Forward Linkages

Show the result of a particular sector to the sectors that use most of the sector output both directly and indirectly per unit increase in total demand.

\[ F(d + i) = \sum_{j=1}^{n} \beta_{ij} \quad \text{(3.4)} \]

Where:
- \( F(d+i)_i \): direct and indirect Forward Linkage
- \( \beta_{ij} \): Leontief inverse matrix

3. Direct Backward Linkage

Direct Backward Linkage describing the direct effect from certain sector to other sectors, which provide partial intermediate input for those sectors, against increase in unit of total demand.

\[ B(d)_j = \sum_{i=1}^{n} \alpha_{ij} \quad \text{(3.5)} \]

Where:
- \( B(d)_j \): direct backward linkage
- \( \alpha_{ij} \): technical coefficient matrix

4. Direct-Indirect Backward Linkages

Direct-Indirect Backward Linkages describing the direct-indirect effect from certain sector to other sectors, who provide partial intermediate input for those sectors, against increase in unit of total demand.

\[ B(d + i)_j = \sum_{i=1}^{n} \beta_{ij} \quad \text{(3.6)} \]
Where:

\[ B(d+i)_j \] : direct and indirect backward linkage

\[ \beta_{ij} \] : reverse Leontief matrix model

### 3.3.3 Dispersion Effect Analysis

The dispersion effect analysis is the development from direct backward-forward analysis, by comparing direct and indirect linkage multiplies by number of sector with total direct–indirect linkages values from all sectors. The linkage analysis which has been described above cannot be compared across sectors because of the role of demand of each sector is not the same. So we need to compare the average impact of the sector with an average impact across all sectors.

1. **Coefficient of Dispersion**

   This analysis is describing the effect caused by some units of end demand for all sectors in one economy. Coefficient of Dispersion also called backward dispersion.

   \[
   PD_j = \frac{n \sum_{i=1}^{n} \beta_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij}} \quad \ldots \ldots \quad (3.7)
   \]

   Where:

   \( PD_j \) : coefficient of dispersion sector \( j \)

   \( \alpha_{ij} \) : Leontief inverse matrix model

2. **Sensitivity of Dispersion**

   Sensitivity of Dispersion is a description of the effect caused by a unit of final demand for all sectors in the economy. Sensitivity of dispersion is a direct linkage or indirect forward linkage.
\[ SD_i = \frac{n \sum_{j=1}^{n} \beta_{ij}}{\sum_{i=1}^{n} \sum_{j=1}^{n} \beta_{ij}} \quad \ldots \quad (3.8) \]

Where:

\( SD_j \) : sensitivity of dispersion sector i

\( \alpha_{ij} \) : Leontief inverse matrix model

### 3.3.4 Multiplier Effect Analysis

Multiplier value is used to calculate the effect caused by increase and decrease variable of certain sector to other sectors. Based on Input-Output multiplier analysis, push-factor for economic changes (revenues & workforce) generally assumed as increase in sale in one unit of currency against final demand of certain sector. Therefore, multiplier analysis is divided into three categories: output multiplier, income multiplier and labor multiplier. Each multiplier is divided into two types: type I and type II. Type I analysis is an open model, where household factor become exogenous factor. While type II analysis is closed model, where household factor become endogenous factor. There are two multiplier effects will be calculated in this study, which are:

<table>
<thead>
<tr>
<th>Value</th>
<th>Multiplier</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Output</td>
</tr>
<tr>
<td>Initial Effect</td>
<td>1</td>
</tr>
<tr>
<td>First Round Effect</td>
<td>( \sum_i a_{ij} )</td>
</tr>
<tr>
<td>Industrial Support Effect</td>
<td>( \sum_i \alpha_{ij} - \sum_i a_{ij} )</td>
</tr>
<tr>
<td>Consumption-Induced effect</td>
<td>( \sum_i \alpha^*<em>{ij} - \sum_i a</em>{ij} )</td>
</tr>
<tr>
<td>Total Effect</td>
<td>( \sum_i \alpha^*_{ij} )</td>
</tr>
<tr>
<td>Flow-on Effect</td>
<td>( \sum_i \alpha^*_{ij} - 1 )</td>
</tr>
</tbody>
</table>

Source: Daryanto. 2010
Where:

\( a_{ij} \) : output coefficient

\( h_i \) : household income coefficient

\( \alpha_{ij} \) : open reverse Leontief matrix

\( \alpha^{*}_{ij} \) : closed reverse Leontief matrix

1. Output Multiplier

Output multiplier determines multiplication level of regional output changes caused by changes in end demand of certain sector. Meaning, the total output value created by an economy due to changes in one unit currency of end demand of certain sector.

a) Initial Impact

Initial impact refers to the assumption that when final demand increase, regardless of which component is increased, generally leads to an increase in government spending or export earnings. The initial impact of all industrial output is considered to have the same value, namely one.

b) First Round Effect

Shows the magnitude of direct effects on total output of all sectors due to an increase in final demand of a sector in monetary units.

c) Industrial Support Effect

Shows the magnitude of indirect effects on total output of all sectors due to an increase in final demand of a sector in monetary units.
d) Consumption-Induced Effect

Shows the magnitude of the impact on household income due to changes in demand for final output.

e) Total Effect

Total effect is the total sum of all the effects: the initial impact, the direct effect (the first round effects), the indirect effect (the industrial support effects), and the induction effect of consumption.

f) Elasticity

Percentage of the total impact that can provide a clearer picture of the response given by a sector of the economy as a whole when demand finally turns for a monetary unit.

g) Type I

Output multiplier Type I place the household as exogenous variables in which the household is considered able to determine the consumption outside the existing economic system, but on the other hand can also be assumed that households do not act as exogenous because their income is dependent on the economic development of a region. Type I multiplier value is obtained from an open I-O model.

\[ \text{Type I} = \frac{\text{Initial Effect} + \text{First Round Effect} + \text{Industrial Effect}}{\text{Initial Effect}} \]

h) Type II

Output multiplier Type II is applied to analyze the consumption of households working in a sector to all sectors of economic output. Output multiplier Type II place the household as endogenous variables in which the household is considered able to determine the
consumption inside the existing economic system. Output multiplier

Type II is obtained from closed I-O model.

\[ \text{Type II} = \frac{\text{Initial Effect} + \text{First Round Effect} + \text{Industrial Support Effect} + \text{Consumption Induced Effect}}{\text{Initial Effect}} \]

2. Income Multiplier

Income multiplier measures income total increase of all sectors caused by output changes of a sector in the economy.

a) Initial Impact

Shows the initial impact, in this case simulated that a monetary unit increase in final demand of a sector

b) First Round Effect

Shows the magnitude of direct effects on total income of all sectors due to an increase in final demand of a sector in monetary units.

c) Industrial Support Effect

Shows the magnitude of indirect effects on total income of all sectors due to an increase in final demand of a sector in monetary units.

d) Consumption-Induced Effect

Shows the magnitude of impact is defined as the consumption-induced impacts on household income increased due to increased demand for final output.

e) Total Effect

Total effect is the total sum of all the effects: the initial impact, the direct effect (the first round effects), the indirect effect (the industrial support effects), and consumption-induced effect.
f) Elasticity

Percentage of the total impact that can provide a clearer picture of the response given by a sector of the economy as a whole when demand finally turns for a monetary unit.

g) Type I

Income multiplier Type I is used to analyze total revenue changes caused by final demand, directly or indirectly in the economy of a region. Income multiplier Type I place the household as exogenous variables in which the household is considered able to determine the consumption outside the existing economic system, but on the other hand can also be assumed that households do not act as exogenous because their income is dependent on the economic development of a region. Type I multiplier value is obtained from an open I-O model.

\[
Type I = \frac{\text{Initial Effect} + \text{First Round Effect} + \text{Industrial Support Effect}}{\text{Initial Effect}}
\]

h) Type II

Income multiplier Type II place the household as endogenous variables in which the household is considered able to determine the consumption inside the existing economic system and obtained from closed I-O model. In income multiplier Type II, the impact that occurred on the economic sectors are not only caused by direct and indirect effect, but also due to the changing of consumption and household income. It can be seen if the output of various sectors of the economy increases, it will increase the wages and working hours. with wage increases due to additional hours of work, it will increase
household income and household demand for goods and services will also increase which then causes the output of economic sectors is also increasing.

\[
Type\ II = \frac{Initial\ Effect + First\ Round + Industrial\ Support + Consumption\ Induced}{Initial\ Effect}
\]

3.3.5 Key Sectors Analysis

Multiplier values of Type I and Type II obtained from the analysis of output and income will be used in determining the priority sectors through TOM (Total Output Multiplier) and TIM (Total Income Multiplier). TOM is obtained by totalize the output multiplier value Type I and output multiplier Type II while TIM is obtained by totalize the income multiplier Type I and income multiplier Type II. Results obtained from the TOM and TIM will determine the priority sector. Sector with the highest values of TOM and TIM is the highest priority sector while the sector with the lowest value is the lowest priority sector.

3.4 Concepts and Operational Definitions of Data

3.4.1 Output

Output is all value of production of goods and services (sales receipts) generated by all sectors of the economy in a country or region.

3.4.2 Intermediate Input

Intermediate input includes the use of various goods and services by a sector in production activities. Goods and services can be derived from the production of other sectors, as well as its own production. These items are usually finished in the input of single-use, such as raw materials.
3.4.3 Primary Input

Primary input or value-added goods and services are created or given to the production factors that play a role in the production process. Remuneration includes wages and salaries, business surplus, depreciation and indirect taxes.

Wages and salaries are fringe benefits to employees, either in money or goods, including all allowances while surplus business is the form of a company's gross profit before the distribution to shareholders and the corporation, and also before taxes. Depreciation is the value of corporate profits discrepancy for the accumulation of capital goods that wears out, while indirect taxes are taxes levied against any government sales transactions made by companies.

3.4.4 Intermediate Demand

Intermediate demand is the demand for goods and services used for further production process. This suggests that the demand of a request for input by the sector to other sectors for further processing.

3.4.5 Final Demand

Includes household consumption expenditure, government consumption expenditure, fixed capital formation, stock change, exports and imports. Household expenditure includes the purchase of goods and services by households, both for food and non-food. Purchase of the residence cannot be put in household spending due to be considered as capital formation in building rental sector. Government consumption expenditure includes all purchases of goods and services by government routine, including payment of salaries, and development expenditures for the procurement of facilities and various other capital goods.
1. Household Consumption Expenditure

Household consumption expenditure consist of purchases for the consumption needs have been both in the country and overseas for goods and the language is done by households or entities that are not for profit, which is then reduced by the net value of sales of used goods and goods the rest. Purchases of goods such as real estate investments are not counted as consumption spending, but of a fixed capital formation.

2. Government Consumption Expenditure

Government consumption expenditure, include the expenses of central and local government for consumption, except the capital formation including expenditure for armed forces.

3. Gross Fixed Capital Formation

Gross fixed capital formation include the procurement, manufacture and purchase of new capital goods, both domestic and abroad, and used capital goods from abroad by economic sectors. The method used in the estimation of the number of fixed capital formation is approach flow of goods, namely the approach through the provision of capital goods both from within and outside the country.

4. Stock Change

Stock change is the difference between the values of inventory at the end of the year with the value of inventory at the beginning of the year. In Input-Output Table, stock change data derived from the reconciliation process, which is the difference between the allocations of output by the number of providers.
5. Export and Import

Export and import are transactions of goods and services between residents of an area with a population outside the region, both other provinces and abroad. Export transactions of goods abroad cover all transportation costs in the exporting country, export duties and the cost of loading, which is indicated by the value of free on board \((f.o.b)\). As for the import of foreign transactions is expressed on the basis of landed cost, which consists of the cost, insurance and freight \((c.i.f)\) plus the import duty and sales tax on imports.