



Research Article

# Analysis of the Effect of Capital, Labor, Raw Materials, and Production on the Income of Ikat Woven Fabric Artisans in Klungkung Regency

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**Abstract.** This study aims to comprehensively analyze the influence of capital, labor, raw materials, and production processes on the income of woven cloth artisans in Klungkung Regency, Bali. The woven cloth industry in this region holds significant historical and cultural value, yet faces challenges in increasing productivity and income. The study employed a quantitative approach with an associative method, combining data collection techniques through direct observation, structured interviews, and secondary data collection from relevant government agencies. The study population consisted of 120 artisan groups, with a sample of 92 groups determined using simple random sampling. Data analysis was conducted using descriptive statistics to map the general conditions of the respondents, and path analysis using SPSS software to identify direct and indirect relationships between variables. The results indicate that capital, labor, and raw materials positively and significantly influence woven cloth production volume. Furthermore, capital, labor, raw materials, and production simultaneously have a significant direct influence on artisan income, with raw materials emerging as the most dominant factor. These findings confirm that the availability of quality raw materials, the quantity and skills of the workforce, and capital adequacy play a central role in improving production performance and artisan welfare. In addition to direct influences, this study also found an indirect effect of capital, labor, and raw materials on income through the mediation of production variables. This suggests that efforts to improve production factors can automatically strengthen income, both directly and through increased production output. The study's recommendations include the need for policies that facilitate access to capital, workforce training, and a sustainable supply of raw materials to support the sustainability of the woven fabric industry as a vital component of the local creative economy and Bali's cultural heritage.

**Keywords:** capital, income, labor, production, raw materials.

## 1. Introduction

Indonesia is a country rich in cultural, ethnic, and traditional diversity. One of its cultural heritages that continues to grow and develop today is woven fabric ("kain tenun"). Each region in Indonesia has its own distinctive woven fabric, such as those from Java, Bali, East Nusa Tenggara (NTT), Sumatra, Bugis, and many other areas, each with unique characteristics. These fabrics employ a variety of techniques and weaving patterns. As handmade creations, they possess high artistic value and are often used in traditional ceremonies or serve as a symbol of local cultural identity worthy of preservation.

Handicrafts, including woven fabrics, play an important role in Indonesia's economy, especially within the creative industry and craft sectors. The weaving industry not only provides income for communities but also supports tourism and promotes Indonesian culture on a global scale. Woven fabrics are often popular souvenirs, and cultural festivals help promote the beauty and uniqueness of local crafts. This sector significantly contributes to economic growth through both craft product exports and job creation. The weaving textile industry can foster the growth of small and medium enterprises (SMEs), which in turn

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provide sources of livelihood for local communities. Besides preserving and promoting cultural heritage, the development of SMEs in the textile sector contributes to economic growth and improves community productivity.

Development is a continuous process of change that aims to improve and progress toward targeted goals. Indonesia, as a developing country, aims to pursue economic growth (Indunil & Sudarno, 2014). Economic development is crucial for a country, particularly in increasing economic income and improving public welfare (Saputra, 2020). According to Todaro and Smith (2006), economic development is a multidimensional process involving changes in social structure, societal attitudes, and institutions, aiming to accelerate economic growth, reduce inequality, and eradicate poverty.

One of the macro-level indicators used to measure successful development is economic growth, which reflects the real impact of development policies. Promoting economic growth must consider the potential inequality it might create. Ideally, economic growth should reduce poverty and income inequality and support a fair and prosperous society. Regional economic development is often measured by growth and income levels, primarily through the Gross Regional Domestic Product (GRDP). High economic disparity between regions can be identified by GRDP differences across regions (Azim et al., 2022). Natural resource disparities across provinces also influence regional economic inequality. Provinces with limited natural resources may still drive economic development by improving human resource quality. Human resources are vital for development: even in provinces with scarce natural resources, strong human capital can increase productivity and stimulate economic growth (Azim et al., 2022). Economic development seeks not only to increase per capita income but also to ensure equitable income distribution. One strategy the government employs is to develop the industrial sector, particularly SMEs.

Economic development can also be described as a series of efforts and policies aimed at improving the standard of living. This includes expanding job opportunities, achieving more equitable income distribution, and strengthening regional economic ties through shifts from the primary sector to the secondary and tertiary sectors (Awaludin et al., 2023). Local economic development accompanied by increasing growth shows improvements in community prosperity. In general, economic growth refers to the expansion of economic activity that increases goods and services produced within a society, thus improving welfare (Yasin, 2020). Sukirno (2012) describes economic growth as a process where economic activities result in increased production of goods and services, leading to higher societal prosperity. The rate of regional economic growth is measured through GRDP growth based on constant prices. Industrialization plays a key role in this progress. The industrial sector is a major contributor to Indonesia's economic growth (Rany et al., 2020). GRDP data, as regional income statistics, are useful for evaluating development outcomes and planning future regional development. GRDP is calculated using three approaches: production, expenditure, and income, each presented in current and constant prices (Ummah, 2019).

Economic growth reflects increased national output, which improves the population's access to goods and services. It represents an expansion in a country or region's production capacity over a certain period, measurable through real Gross Domestic Product (GDP) or per capita product. Economic growth is inherently tied to rising production of goods and services. It is a unidimensional process measured through increased output and income (Sri Hartati, 2021). Regional GRDP illustrates an area's ability to generate output at a given time. GRDP calculation is based on two approaches: production and use. These reflect value-added composition by sector and by expenditure component. From the production side, GRDP is

the total gross value-added from economic sectors based on their production activities (Ummah, 2019).

The GRDP condition of Bali Province is closely linked to the tourism sector, as Bali is one of Indonesia's and the world's top tourist destinations. Tourism significantly contributes to Bali's GRDP through accommodation, food and beverage services, transportation, and supporting sectors like handicrafts, including woven textiles. In general, Bali's GRDP is dominated by tourism, which significantly boosts regional income. Bali's tourism encompasses nature, culture, and art, which have developed extensively over the years. Domestic and international tourists positively impact the local economy by creating employment and increasing demand for local products.

Small and Medium Enterprises (SMEs) in Bali play a crucial role in the region's economy. They contribute significantly to Bali's GRDP and span across various sectors including handicrafts, food and beverages, textiles, and tourism-related products sold locally and internationally. These sectors not only generate employment but also enhance the value of local products. For instance, Balinese handicrafts like sculptures, wooden carvings, and woven fabrics such as ikat are a major draw for tourists.

SMEs are industries categorized by their scale. Small industries refer to economic activities that convert basic goods into finished or semi-finished products or enhance the value of low-value goods. Medium industries follow a similar definition (BPS, 2021). Overall, SMEs offer strong economic potential. In Bali, the growth of the manufacturing sector is supported by SMEs, which serve as a cornerstone of development and economic drivers by adding value to various local commodities (Ayuningsasi, 2024).

Bali is globally renowned, partly due to the unique cultural characteristics of its people, admired by tourists. Balinese communities are known for their creativity in producing various crafts, both in rural and urban areas, including woven textiles, bamboo, rattan, wood crafts, and more, each with distinctive characteristics (Studi et al., 2024). This rich craft heritage underscores Bali's significant potential in tourism and creative industries.

The provincial government of Bali is committed to supporting the creative industry, especially MSMEs, through policies such as Governor Regulation No. 79 of 2018 and No. 99 of 2018, which promote the use and consumption of Bali's local products (Adnyani & Agustini, 2020). Alongside technological advances, modern textile factories now produce higher-quality and more affordable fabrics using advanced equipment (Soekanto, 2006: 261). These include fabrics for clothing, sashes, trousers, bags, batik, and others. Factory-based production is faster and more efficient than traditional weaving.

Weaving is a fabric-making technique based on a simple principle: interlacing threads lengthwise and crosswise. In other words, warp and weft threads intersect alternately. Woven fabrics are typically made from wood fiber, cotton, silk, and other materials (Studi et al., 2024). In Indonesia, especially in Bali, woven fabrics are typically produced at the household level. The art of weaving is closely tied to knowledge systems, cultural beliefs, the natural environment, and social organization. Given the diversity of social culture, weaving styles vary across regions. Thus, weaving is inherently particular, reflecting local cultural identities. The quality of woven products is usually assessed by material quality, color composition, motifs, patterns, and decorative variety (Saputra, 2020).

Woven fabrics, particularly Endek, flourished during the reign of King Dalem Waturenggong in Gelgel, Klungkung. Endek spread across the archipelago and is well-known among Balinese people. Traditionally produced, Endek experienced rapid development between 1985 and 1995. As technology advanced, non-mechanical looms (ATBM) were adopted. Major Endek production centers include Karangasem, Klungkung, Gianyar,

Buleleng, Negara, and Denpasar. The word "Endek" is derived from "Gendekan" or "Ngendek," meaning to remain unchanged, referencing the dyeing process where tied sections retain their color. Endek holds philosophical and cultural significance for Balinese communities. It is a generational heritage worthy of preservation. The government has supported Endek through art exhibitions, encouraging designers to use it in fashion, providing artisan training to develop new products such as shoes, bags, souvenirs, and crafts, and issuing Bali Governor Circular Letter No. 04 of 2021 on the Use of Endek Woven Fabric (Sudiartini et al., 2022).

Klungkung Regency is one of Bali's most well-known centers of woven fabric production. BPS Regulation No. 19 of 2017 (amending Regulation No. 95 of 2015) classifies ikat woven fabric as a business group involving fabric production and pre-dye thread tying. This industry falls under category C, with Indonesian Standard Business Classification (KBLI) code 13122.

Woven fabric production is present across all districts of Klungkung Regency, particularly in Dawan and Klungkung Districts. Key production and marketing centers include Gunaksa Village, Paksewali Village, and Nusa Penida. Most production still relies on handlooms or ATBM, using manual, non-mechanical processes. The introduction of ATBM opened new opportunities for the Endek weaving industry, transforming it from a purely traditional practice into an income-generating industry. The use of ATBM helps preserve traditional characteristics while creating employment and reducing local unemployment. It sustains human involvement in the production process, thus playing a key socio-economic role.

The ikat weaving industry in Klungkung is concentrated in Klungkung District with 62 artisan groups, and in Dawan District with 50 groups. Nusa Penida has only eight artisan groups, focusing more on tourism and fisheries, while Banjarangkan District has no weaving artisans, as it specializes in gambelan (Balinese percussion instrument) production. The concentration in Klungkung and Dawan is likely due to better market access, skilled labor, and strong weaving traditions.

## **2. Literature Review**

### **Capital and Artisan Income**

Capital is a fundamental production factor that enables artisans to acquire equipment, raw materials, and technology to increase efficiency and scale. Adequate capital investment enhances production capacity and allows artisans to meet larger market demand, thereby increasing income (Todaro & Smith, 2006; Saputra, 2020). In SMEs, capital adequacy is often linked to innovation and competitiveness, which directly influence artisan welfare (Indunil & Sudarno, 2014).

### **Labor and Artisan Income**

Labor plays a crucial role in industries dependent on manual skills, such as ikat weaving. Skilled workers improve production quality and efficiency, which increases competitiveness and income (Azim et al., 2022). Human resources are considered vital for development, even in regions with limited natural resources, as strong human capital can stimulate productivity and economic growth (Awaludin et al., 2023). In weaving, labor quality directly determines product value and market acceptance (Saputra, 2020).

### **Raw Materials and Artisan Income**

Raw materials are the backbone of woven fabric production. The availability and quality

of threads and dyes directly affect product quality and market value. Premium raw materials allow artisans to produce fabrics with higher selling prices, while shortages or poor-quality inputs reduce competitiveness (Sri Hartati, 2021). Sustainability of raw material supply is therefore essential for artisan income growth (Ummah, 2019).

### **Production as a Mediating Variable**

Production efficiency and volume are central to income generation. Increased production capacity allows artisans to sell more products, while efficiency reduces costs and raises profitability (Sukirno, 2012; Rany et al., 2020). In the ikat weaving industry, production mediates the relationship between capital, labor, and raw materials with income, amplifying their effects through output expansion (Yasin, 2020).

### **SMEs, Creative Economy, and Cultural Heritage**

SMEs in Bali, particularly in handicrafts, contribute significantly to GRDP and cultural preservation (Ayuningsasi, 2024; Studi et al., 2024). The ikat weaving industry in Klungkung is not only an economic driver but also a cultural heritage that sustains local identity and tourism (Sudiartini et al., 2022). Government policies supporting local products and artisan training further strengthen the sustainability of this sector (Adnyani & Agustini, 2020).

### **Conceptual Framework and Hypotheses**

#### **Capital and Production**

Capital is a critical determinant of production capacity in small and medium enterprises, including the ikat weaving industry. Adequate capital allows artisans to purchase better equipment, adopt new technologies, and secure raw materials at competitive prices, thereby increasing efficiency and output (Todaro & Smith, 2006; Saputra, 2020). In the context of Klungkung Regency, artisans with sufficient capital are more capable of scaling up production and meeting market demand. Thus, it is hypothesized that capital has a positive and significant effect on production (H1).

#### **Labor and Production**

Labor is equally vital in industries that rely heavily on manual skills, such as ikat weaving. Skilled workers enhance production efficiency and product quality, which directly contributes to higher production volumes (Azim et al., 2022; Awaludin et al., 2023). In Klungkung, the availability of trained artisans ensures that weaving traditions are preserved while also enabling greater productivity. Therefore, labor is expected to have a positive and significant effect on production (H2).

#### **Raw Materials and Production**

Raw materials form the backbone of woven fabric production. The quality and availability of threads and dyes directly influence the quantity and market value of the final product (Sri Hartati, 2021; Ummah, 2019). Inadequate or poor-quality materials hinder production, while sufficient high-quality inputs allow artisans to expand output and improve competitiveness. Hence, raw materials are hypothesized to have a positive and significant effect on production (H3).

#### **Capital and Artisan Income**

Beyond its role in production, capital also directly impacts artisan income. Financial resources and equipment investments enable artisans to increase production capacity and improve product quality, which translates into higher earnings (Indunil & Sudarno, 2014). In Klungkung Regency, artisans with greater capital access can innovate and expand their

businesses, thereby enhancing their income. Thus, capital is hypothesized to have a positive and significant effect on artisan income (H4).

### Labor and Artisan Income

Labor not only influences production but also directly affects income. Skilled workers produce higher-quality fabrics that command better prices in the market (Saputra, 2020). Increasing the number of workers also raises production volume, which directly contributes to income growth. Therefore, labor is hypothesized to have a positive and significant effect on artisan income (H5).

### Raw Materials and Artisan Income

Raw materials are the most dominant factor influencing artisan income. High-quality threads and dyes result in premium products that can be sold at higher prices, while sufficient supply ensures artisans can meet market demand (Sukirno, 2012; Rany et al., 2020). In Klungkung, the sustainability of raw material supply is crucial for artisans' welfare. Thus, raw materials are hypothesized to have a positive and significant effect on artisan income (H6).

### Production and Artisan Income

Production efficiency and volume directly determine artisan income. The more products artisans can produce, the greater their potential earnings (Yasin, 2020). Efficient production processes reduce costs and increase profitability, while higher output allows artisans to compete in broader markets. Therefore, production is hypothesized to have a positive and significant effect on artisan income (H7).

### Indirect Effects through Production

Production also serves as a mediating variable, amplifying the effects of capital, labor, and raw materials on income. Greater capital investment increases production, which in turn raises income. Similarly, more skilled labor and sufficient raw materials enhance production capacity, indirectly boosting earnings (Ummah, 2019; Ayuningsasi, 2024). Thus, it is hypothesized that capital (H8), labor (H9), and raw materials (H10) indirectly influence artisan income through production.

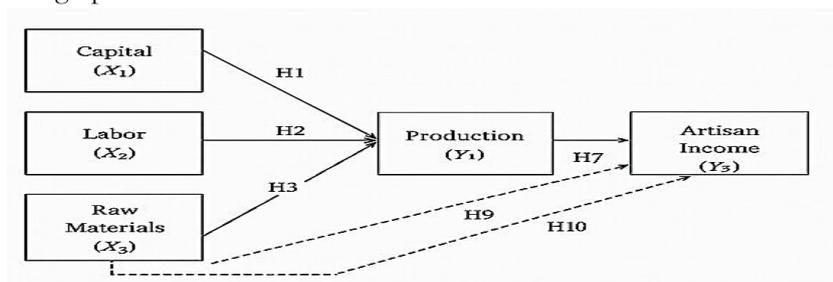


Figure 1. Conceptual Framework of the Effects of Capital, Labor, and Raw Materials on Artisan Income through Production

The conceptual framework diagram illustrates the hypothesized relationships between capital ( $X_1$ ), labor ( $X_2$ ), and raw materials ( $X_3$ ) as independent variables, production ( $Y_1$ ) as a mediating variable, and artisan income ( $Y_2$ ) as the dependent variable. Solid arrows represent direct effects: capital, labor, and raw materials each directly influence both production and income, while production itself directly affects income. Dashed arrows indicate indirect effects, showing that capital, labor, and raw materials also influence income through their impact on production. This structure reflects the study's path analysis approach, emphasizing that improvements in production capacity not only enhance output but also mediate the

economic benefits artisans receive. The framework supports the idea that strategic investment in production factors can simultaneously strengthen productivity and income, aligning with the study's goal of improving artisan welfare in Klungkung Regency.

### 3. Research Methods

This study employed a quantitative approach with an associative research type, aiming to analyze the relationship between capital, labor, raw materials, and production variables on the income of ikat woven fabric artisans in Klungkung Regency. The research was conducted in Klungkung Regency, known as one of the main centers of traditional ikat weaving in Bali, particularly in Gelgel Village, which holds significant historical value in the development of Balinese weaving. The data used consisted of primary data collected through direct observation and interviews, as well as secondary data obtained from relevant government institutions such as the Department of Cooperatives, SMEs, Industry and Trade of Klungkung Regency, and the Central Bureau of Statistics (BPS) of Bali Province (Sugiyono, 2019).

The research subjects were 120 artisan groups producing ikat woven fabrics, spread across the districts of Nusa Penida, Dawan, and Klungkung. The Banjarangkan District had no artisan population. The sampling technique used was simple random sampling, and the sample size was determined using the Slovin formula, resulting in 92 artisan groups as respondents. The variables in this study consisted of independent variables: capital (X1), labor (X2), and raw materials (X3); a mediating variable: production (Y1); and a dependent variable: the income of ikat woven fabric artisans (Y2). The operational definitions of each variable were described based on monthly measurement units, either in rupiah or in terms of production and labor quantity (Arieska & Herdiani, 2018).

The data analysis techniques employed included descriptive statistics and path analysis using SPSS software. Path analysis was used to identify both direct and indirect effects among the variables, as well as to examine the role of production as a mediating variable. Hypothesis testing was carried out using the t-test for direct effects and the Sobel test for mediating effects, with a 5% significance level. The structural model in this study demonstrates that capital, labor, and raw materials influence not only production directly, but also income both directly and indirectly through production as a mediator (Ghozali, 2017).

## 4. Results and Discussion

### Results

#### Direct Effect

##### 1) Direct Effect of Capital on the Production of Ikat Woven Fabric in Klungkung

The regression coefficient for the relationship between the capital variable (X1) is 0.271, with a t-value of 2.607 and a significance value of 0.011. Since the t-value is greater than the t-table value (1.987) and the significance level is less than 0.05, it can be concluded that capital has a positive and significant effect on production. This means that the more capital is used, the greater the production generated by the ikat woven fabric artisans.

Capital, in the form of money, equipment, or investment in technology, plays a crucial role in influencing production capacity. Adequate capital enables artisans to improve tools, adopt new technologies, and purchase raw materials at better prices. In the ikat weaving industry, available capital allows artisans to enhance production efficiency, expand production scale, and ultimately increase the volume of products that can be sold. This increase in production capacity directly impacts artisans' income. With sufficient capital, artisans can meet larger market demand and earn higher profits. Therefore, capital serves as a key driver in improving the economic welfare of ikat woven fabric artisans.

## 2) Direct Effect of Labor on the Production of Ikat Woven Fabric in Klungkung Regency

Labor (X2) has a positive effect on production, with a regression coefficient of 0.710. The obtained t-value is  $2.214 > t$ -table value of 1.987, and the significance is 0.029, which is less than 0.05. This indicates that labor has a positive and significant effect on production. An increase in the number of workers directly contributes to greater production capacity, reflecting the importance of labor in supporting the output of ikat woven fabric artisans in Klungkung Regency.

Labor is a vital factor in any production process, particularly in industries that rely on manual skills, such as ikat weaving. Artisans with a sufficient number of skilled workers are capable of producing high-quality products more efficiently. Increasing the number of skilled workers supports increased production capacity, which in turn leads to higher income. More labor allows artisans to produce more items and accelerate production processes. Furthermore, better-skilled workers can produce higher-quality products, increasing the competitiveness of ikat fabrics in the market and potentially yielding higher selling prices. Therefore, enhancing labor quality and skills is crucial to the success of this industry.

## 3) Direct Effect of Raw Materials on the Production of Ikat Woven Fabric in Klungkung Regency

Raw materials (X3) have a regression coefficient of 0.272 with a t-value of  $5.477 > t$ -table 1.987 and a significance value of 0.000, less than 0.05. These results show that raw materials also have a positive effect on production. The more raw materials available, the higher the level of production that can be achieved.

Raw materials, as the main component of the production process, greatly influence the quality and quantity of the final product. In the ikat weaving industry, materials such as threads and dyes directly affect the quality of the fabric produced. When high-quality materials are used, the resulting products will have higher market value, which in turn increases artisans' income. Additionally, adequate supply of raw materials allows artisans to expand production capacity and better meet market demand. Inadequate or low-quality materials can hinder production, result in poor-quality products, and reduce competitiveness. Hence, the sustainability of affordable and high-quality raw material supply is essential for smooth production and the income growth of ikat woven fabric artisans.

## 4) Direct Effect of Capital on the Income of Ikat Woven Fabric Artisans in Klungkung Regency

The relationship between capital (X1) and income (Y2) has a regression coefficient of 0.151, with a t-value of  $2.571 > t$ -table 1.988 and a significance value of 0.012, less than 0.05. This result indicates that capital has a positive and significant effect on the income of ikat woven fabric artisans. In other words, the more capital the artisans use, the higher the income they earn.

Capital refers to financial resources and equipment used to support production activities. Adequate capital enables artisans to purchase modern equipment, increase production capacity, and procure larger quantities of higher-quality raw materials. Without sufficient capital, artisans may struggle to improve production quality or meet market challenges. Larger capital investments also enable innovation in more efficient production techniques. For instance, artisans with capital access can upgrade their weaving tools, enhance product quality, and expand production scale. All of these contribute to increased production volumes, which in turn raise income. Thus, the greater the available capital, the higher the potential income, as artisans can satisfy larger market demands and generate more valuable products.

### 5) Direct Effect of Labor on the Income of Ikat Woven Fabric Artisans in Klungkung Regency

Labor (X2) also shows a positive effect on income, with a regression coefficient of 0.188. The t-value is  $2.441 > t\text{-table } 1.988$ , and the significance value is 0.015, which is below 0.05, indicating that labor has a significant effect on the income of artisans. An increase in the number of workers contributes to higher income, highlighting the importance of labor in the ikat weaving production process.

Labor is equally important in every production sector, especially in manual skill-based industries such as ikat weaving. More skilled labor leads to a more efficient and higher-quality production process. Skilled laborers can produce better-quality products in less time, increasing production capacity and reducing order fulfillment time. Increasing the workforce also boosts overall production output, directly impacting income. Furthermore, if workers are skilled in advanced weaving techniques, the resulting products will have better quality, allowing artisans to charge higher prices. Therefore, developing workers' skills is essential to increasing production outcomes and artisans' earnings.

### 6) Direct Effect of Raw Materials on the Income of Ikat Woven Fabric Artisans in Klungkung Regency

Raw materials (X3) have the most dominant effect on income, with a regression coefficient of 0.376. The t-value is  $4.267 > t\text{-table } 1.988$  and the significance level is 0.000, below 0.05, indicating that raw materials significantly affect artisans' income. This suggests that having sufficient and high-quality raw materials is vital for increasing income. Without adequate raw materials, artisans' income will be limited.

Raw materials are a fundamental component in the production process of ikat woven fabric. The availability of sufficient and high-quality materials significantly affects both the quality and quantity of the final product. Premium raw materials, such as quality threads or dyes, lead to higher-quality products that can command better prices. Conversely, limited or poor-quality materials can result in substandard products and difficulty meeting market demand. Adequate raw materials allow artisans to scale up production. The more materials available, the more products can be made, directly contributing to higher income. Hence, a stable and high-quality supply of raw materials is crucial for successful production and income enhancement for ikat woven fabric artisans.

### 7) Direct Effect of Production on the Income of Ikat Woven Fabric Artisans in Klungkung Regency

The relationship between production (Y1) and income (Y2) shows a positive and significant effect, with a regression coefficient of 0.408, a t-value of  $5.248 > t\text{-table } 1.988$ , and a significance level of 0.000, less than 0.05. This result indicates that increased production directly impacts increased income. The more products produced, the higher the income artisans can earn. This highlights the importance of production efficiency in improving the well-being of ikat woven fabric artisans in Klungkung Regency.

Higher production levels are directly associated with increased income. For ikat woven fabric artisans, producing more items means more products can be sold, thereby raising income. Additionally, production efficiency plays a crucial role in reducing costs and increasing profits. The more efficient the production process, the more products can be made in less time, enhancing profit potential. In the ikat weaving industry, factors such as the quality of raw materials, the number of workers, and available capital influence production capacity. Increasing production, in both volume and quality, enables artisans to improve their profitability. If artisans can produce more high-quality fabrics, they will have better market

competitiveness and can sell their products at higher prices, ultimately contributing to increased income.

### Sobel test

#### 1) Testing the Indirect Effect of Capital on Income through Production of Ikat Woven Fabric in Klungkung Regency

$$S\beta_{1\beta 7} = \sqrt{\beta_7^2 s_{\beta_{12}} + \beta_1^2 s_{\beta_{72}}}$$

$$S\beta_{1\beta 7} = \sqrt{(0,408)^2(0,000)^2 + (0,203)^2(0,034)^2}$$

$$S\beta_{1\beta 7} = \sqrt{(0,166 \times 0) + (0,0412 \times 0,001136)}$$

$$S\beta_{1\beta 7} = \sqrt{0 + 0,0000476}$$

$$S\beta_{1\beta 7} = \sqrt{0,0000476}$$

$$S\beta_{1\beta 7} = 0.00684$$

Based on the calculation above, to test the significance of the intervening variable, the Z value from  $S\beta_{1\beta 7}$  is calculated using the following formula:

$$Z = \frac{\beta_{1\beta 7}}{S\beta_{1\beta 7}}$$

$$Z = \frac{0,0828}{0,00684}$$

$$Z = 12.12$$

The result shows that the indirect effect of Capital (X1) on Income (Y2) through Production (Y1) has a Z-value of 12.12, which is significantly higher than the critical Z-value of 1.96 at a 5% significance level. This means the indirect effect is statistically significant, indicating that capital has a significant indirect influence on income through increased production of ikat woven fabric in Klungkung Regency. In other words, the greater the capital available, the higher the production will be, which ultimately increases the income of the business actors.

$$X1 \rightarrow Y1 \rightarrow Y2 = (0.203 \times 0.408) = 0.083$$

A value of 0.083 indicates that the indirect effect of capital on income through production is 8.3 percent.

#### 2) Indirect Effect of Labor on Income through Production of Ikat Woven Fabric in Klungkung Regency

$$S\beta_{2\beta 7} = \sqrt{\beta_7^2 s_{\beta_{22}} + \beta_2^2 s_{\beta_{72}}}$$

$$S\beta_{2\beta 7} = \sqrt{(0,408)^2(0,080)^2 + (0,181)^2(0,034)^2}$$

$$S\beta_{2\beta 7} = \sqrt{(0,166464 \times 0,0064) + (0,032761 \times 0,001136)}$$

$$S\beta_{2\beta 7} = \sqrt{0,000006816 + 0,00003722}$$

$$S\beta_{2\beta 7} = \sqrt{0,000044036}$$

$$S\beta_{2\beta 7} = 0.0066$$

To test the significance of the intervening variable, the Z value is calculated using the following formula:

$$Z = \frac{\beta_{2\beta 7}}{S\beta_{2\beta 7}}$$

$$Z = \frac{0,07385}{0,0066}$$

$$Z = 11.19$$

The result shows that the indirect effect of Labor (X2) on Income (Y2) through Production (Y1) has a Z-value of 11.19, which is greater than the critical Z-value of 1.96 at the 5% significance level. This indicates a statistically significant indirect effect, meaning labor significantly affects income through increased production of ikat woven fabric in Klungkung Regency. In other words, the more labor is involved, the greater the production, which in

turn positively and significantly increases income.

$$X2 \rightarrow Y1 \rightarrow Y2 = (0.181 \times 0.408) = 0.083$$

A value of 0.083 indicates that the indirect effect of labor on income through production is 8.3 percent.

**3) Indirect Effect of Raw Materials on Income through Production of Ikat Woven Fabric in Klungkung Regency**

$$S\beta_3\beta_7 = \sqrt{\beta_7^2 s_{\beta_{32}} + \beta_3^2 s_{\beta_{72}}}$$

$$S\beta_3\beta_7 = \sqrt{(0,408)^2(0,000)^2 + (0,571)^2(0,034)^2}$$

$$S\beta_3\beta_7 = \sqrt{(0,166464 \times 0,000) + (0,326041 \times 0,001136)}$$

$$S\beta_3\beta_7 = \sqrt{0 + 0,0003704}$$

$$S\beta_3\beta_7 = \sqrt{0,0003704}$$

$$S\beta_3\beta_7 = 0.0192$$

To test the significance of the intervening variable, the Z value is calculated using the following formula:

$$Z = \frac{\beta_2\beta_7}{S\beta_2\beta_7}$$

$$Z = \frac{0,23296}{0,0192}$$

$$Z = 12.13$$

The result shows that the indirect effect of Raw Materials (X3) on Income (Y2) through Production (Y1) has a Z-value of 12.13, which is greater than the critical Z-value of 1.96 at the 5% significance level. This indicates a statistically significant indirect effect, meaning that raw materials significantly affect income through increased production of ikat woven fabric in Klungkung Regency. In other words, the more raw materials are procured, the higher the production, which will positively and significantly impact the income of the business actors.

$$X3 \rightarrow Y1 \rightarrow Y2 = (0.571 \times 0.408) = 0.234$$

A value of 0.234 indicates that the indirect effect of raw materials on income through production is 23.4 percent.

**Table 1. Direct, Indirect, and Total Effects of Capital, Labor, Raw Materials, and Production on the Income of Ikat Woven Fabric Artisans in Klungkung Regency**

Variable Relationship	Direct Influence	Indirect Influence Through Y1	Total
X1 → Y1	<b>0.203</b>	-	<b>0.203</b>
X2 → Y1	<b>0.181</b>	-	<b>0.181</b>
X3 → Y1	<b>0.571</b>	-	<b>0.272</b>
X1 → Y2	<b>0.151</b>	(0.203 x 0.408) = 0.083	0.203 + (0.203 x 0.408) = 0.286
X2 → Y2	<b>0.188</b>	(0.181 x 0.408) = 0.074	0.181 + (0.181 x 0.408) = 0.255
X3 → Y2	<b>0.376</b>	(0.571 x 0.408) = 0.233	0.408 + (0.571 x 0.408) = 0.804
Y1 → Y2	<b>0.408</b>	-	<b>0.408</b>

Source: Processed Data, 2025

Table 1 presents a summary of the direct, indirect, and total effects of the variables Capital (X1), Labor (X2), and Raw Materials (X3) on Production (Y1) and Income (Y2) of ikat woven fabric artisans in Klungkung Regency. The table shows that all independent variables have direct effects on both Y1 and Y2, and also contribute indirect effects through the mediating variable Production (Y1). Capital (X1) has a direct effect on income of 0.151 and an indirect effect through production of 0.083, resulting in a total effect of 0.234. Labor (X2) shows a direct effect of 0.188 and an indirect effect of 0.074, yielding a total effect of 0.262. Meanwhile, Raw Materials (X3) contribute the most to income, with a direct effect of 0.376 and an indirect effect of 0.233 through production, giving a total effect of 0.609. Production (Y1) itself also has a significant direct effect on income, with a coefficient of 0.408. This table highlights the important role of production as a mediating variable that strengthens

the relationship between input variables (capital, labor, and raw materials) and the income increase of the artisans.

**Effect of Capital, Labor, and Raw Materials on the Production of Ikat Woven Fabric in Klungkung Regency**

1) Substructural Equation 1

The first substructural test in this study was conducted to determine the direct effect of capital, labor, and raw materials on the production of ikat woven fabric in Klungkung Regency. The regression equation results are shown as follows:

$$Y1 = - 14.089 + 0.203 X1 + 0.181 X2 + 0.571 X3$$

$$Sb = (0.000) \quad (0.080) \quad (0.000)$$

$$T = (2.607) \quad (2,214) \quad (5,477)$$

$$Sig = 0.011 \quad 0.029 \quad 0,000$$

$$R2 = 0.738$$

$$F = 82,706$$

$$Sig. = 0.000$$

$$Ftable = 2.71$$

2) Structural Equation Summary

**Table 2. S Summary of Path Coefficients – Substructure I**

Connection	Standardized Regression Coefficient	thitung	Sig.	Information
X1→Y1	0.203	2,607	0.011	Positive and significant
X2→Y1	0.181	2,214	0.029	Positive and significant
X3→Y1	0.571	5,477	0,000	Positive and significant

Source: Processed Data, 2025

Note:

X1 = Capital

X2 = Labor

X3 = Raw Materials

Y1 = Production

Based on the substructural equation, the calculated F-value (Fhitung) = 82.706 > F-table = 2.71. This indicates that the estimated regression model of capital, labor, and raw materials is fit or appropriate to explain its influence on the production variable.

**Effect of Capital, Labor, Raw Materials, and Production on Income**

1) Substructural Equation 2

The second substructural test was conducted to examine the direct effect of capital, labor, raw materials, and production of ikat woven fabric in Klungkung Regency on income.

The regression equation results are as follows:

$$Y2 = -499542.913 + 0.151X1 + 0.188X2 + 0.376 X3 + 0.408 X4$$

$$Sb = (0.039) \quad (0.012) \quad (0.020) \quad (0.034)$$

$$t = (2,571) \quad (2,441) \quad (4,267) \quad (5,248)$$

$$Sig = 0.012 \quad 0.015 \quad 0,000 \quad 0,000$$

$$R2 = 0.863$$

$$F = 136,595$$

$$Sig. = 0.000$$

$$Ftable = 2.48$$

2) Structural Equation

**Table 3. Summary of Path Coefficients Substructure II**

Relationship	Standardized Regression Coefficient	thitung	Sig.	Description
X1→Y2	0.151	2,571	0.012	Positive and significant
X2→Y2	0.188	2,441	0.015	Positive and significant
X3→Y2	0.376	4,267	0,000	Positive and significant

Y1→Y2	0.408	5,248	0,000	Positive and significant
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Source: Processed Data, 2025

Note:

X1 = Capital  
 X2 = Labor  
 X3 = Raw Materials  
 Y1 = Production  
 Y2 = Income

Based on the substructural equation, the calculated F-value ( $F_{hitung}$ ) = 136.595 >  $F_{table}$  = 2.48. This suggests that the estimated regression model of capital, labor, raw materials, and production is fit or appropriate to explain its influence on the income variable.

#### Standard Error of Estimate

To determine the value of  $e_1$ , which shows the amount of variance in the production variable (Y1) not explained by the capital, labor, and raw materials variables, the following formula is used:

$$e_1 = \sqrt{1 - R_1^2}$$

$$e_1 = 0.512\sqrt{1 - 0,738}$$

The value of  $e_2$ , which indicates the amount of variance in the income variable (Y2) not explained by the capital, labor, raw materials, and production variables, is calculated as:

$$e_2 = \sqrt{1 - R_2^2}$$

$$e_2 = 0.370\sqrt{1 - 0,863}$$

#### Total Determination Coefficient

To assess model validity, the total determination coefficient ( $R^2_m$ ) is used, calculated as follows:

$$R^2_m = 1 - (e_1)^2 - (e_2)^2$$

$$R^2_m = 1 - (0.512)^2 - (0.370)^2$$

$$R^2_m = 1 - (0.262) - (0.137)$$

$$R^2_m = 1 - 0.036$$

$$= 0.964$$

Note:

$R^2_m$  = total determination coefficient

$e_1, e_2$  = standard error of estimate

The coefficient of determination value of 0.964 means that 96.4% of the variability or changes in the observed data can be explained or predicted by the model used. In other words, this model is highly effective in explaining the relationship between the tested variables. The remaining 3.6% cannot be explained by the model and may be due to unobserved factors or data error.

## Discussion

### Capital and Production

The findings confirm that capital has a positive and significant effect on production, as indicated by the regression coefficient of 0.271 and a significance value of 0.011. This supports the hypothesis (H1) that greater capital availability enhances production capacity. Capital enables artisans to purchase better equipment, adopt new technologies, and secure raw materials at competitive prices, thereby increasing efficiency and output. This aligns with Todaro and Smith's (2006) view that economic development requires investment in productive resources, and Saputra (2020) emphasizes capital adequacy as a driver of growth. In the context of Klungkung Regency, sufficient capital allows artisans to scale up production and meet market demand more effectively.

### **Labor and Production**

Labor was also found to have a significant positive effect on production, with a regression coefficient of 0.710 and a significance value of 0.029. This supports hypothesis H2, which posits that labor directly influences production outcomes. The weaving industry is highly dependent on manual skills, and the presence of skilled workers ensures higher-quality and more efficient production. These findings resonate with Azim et al. (2022), who highlight human resources as a vital component of regional development, and Awaludin et al. (2023), who argue that labor quality enhances productivity even in resource-constrained regions. In Klungkung, the availability of trained artisans sustains weaving traditions while simultaneously boosting production capacity.

### **Raw Materials and Production**

Raw materials emerged as a crucial factor influencing production, with a regression coefficient of 0.272 and a significance value of 0.000. This validates hypothesis H3, which states that raw materials positively affect production. The availability and quality of threads and dyes directly determine the quantity and market value of woven fabrics. Sri Hartati (2021) emphasizes that production growth is inherently tied to material inputs, while Ummah (2019) notes that resource adequacy is essential for sustaining output. In Klungkung, artisans rely on a stable supply of high-quality raw materials to maintain competitiveness and expand production.

### **Capital and Artisan Income**

The results show that capital has a significant positive effect on artisan income, with a regression coefficient of 0.151 and a significance value of 0.012. This supports hypothesis H4, which suggests that capital directly influences income. Adequate capital allows artisans to increase production capacity, improve product quality, and expand market reach. Indunil and Sudarno (2014) argue that capital investment is central to SME growth, while Saputra (2020) highlights its role in improving welfare. In Klungkung, artisans with greater capital access are better positioned to innovate and generate higher earnings.

### **Labor and Artisan Income**

Labor also demonstrated a significant positive effect on income, with a regression coefficient of 0.188 and a significance value of 0.015. This supports hypothesis H5, which posits that labor directly affects artisan income. Skilled workers produce higher-quality fabrics that command better prices, while increasing the number of workers raises production volume and income. Saputra (2020) underscores the importance of labor quality in enhancing product competitiveness. In Klungkung, the development of artisan skills is essential for sustaining income growth.

### **Raw Materials and Artisan Income**

Raw materials were found to be the most dominant factor influencing income, with a regression coefficient of 0.376 and a significance value of 0.000. This validates hypothesis H6, which suggests that raw materials directly affect artisan income. High-quality threads and dyes result in premium products that can be sold at higher prices, while sufficient supply ensures artisans can meet market demand. Sukirno (2012) and Rany et al. (2020) emphasize that resource adequacy drives production and income growth. In Klungkung, the sustainability of raw material supply is crucial for artisan welfare and industry resilience.

### **Production and Artisan Income**

Production itself showed a significant positive effect on income, with a regression coefficient of 0.408 and a significance value of 0.000. This supports hypothesis H7, which posits that production directly influences artisan income. Higher production volumes allow artisans to sell more products, while efficiency reduces costs and increases profitability. Yasin (2020) highlights that economic growth is inherently tied to rising production, and Ummah (2019) notes that output expansion strengthens regional income. In Klungkung, production efficiency is therefore central to improving artisan welfare.

### **Indirect Effects through Production**

The Sobel test results confirmed significant indirect effects of capital, labor, and raw materials on income through production, supporting hypotheses H8, H9, and H10. Capital indirectly influenced income by 8.3%, labor by 8.3%, and raw materials by 23.4%. These findings highlight the mediating role of production in amplifying the effects of input factors on income. Ummah (2019) emphasizes that production serves as a bridge between resources and income, while Ayuningsasi (2024) notes that SMEs thrive when production factors are optimized. In Klungkung, strengthening production capacity not only enhances direct income but also magnifies the benefits of capital, labor, and raw materials.

The results of this study collectively demonstrate that capital, labor, and raw materials are indispensable drivers of production and income among ikat woven fabric artisans in Klungkung Regency. Each factor exerts both direct and indirect effects, with raw materials emerging as the most dominant determinant of artisan welfare. Production plays a central mediating role, amplifying the influence of these inputs on income and underscoring the importance of efficiency and output expansion. These findings align with broader economic development theories that emphasize the interplay between resources, human capital, and production capacity in fostering growth (Todaro & Smith, 2006; Saputra, 2020; Azim et al., 2022). For Klungkung's weaving industry, strengthening access to capital, enhancing labor skills, and ensuring sustainable raw material supply are not only economic imperatives but also cultural priorities, as they safeguard the continuity of Bali's creative heritage. Ultimately, the study highlights that policies and interventions aimed at improving production factors will simultaneously elevate artisan income, contributing to both local economic resilience and the preservation of traditional weaving practices.

## **5. Conclusion**

This study demonstrates that capital, labor, and raw materials significantly influence the production capacity of ikat woven fabric artisans in Klungkung Regency, with raw materials emerging as the most dominant factor. Production itself plays a central role, directly affecting artisan income while mediating the effects of capital, labor, and raw materials.

Furthermore, the results confirm that capital, labor, raw materials, and production all have direct positive effects on artisan income, underscoring the importance of resource adequacy and production efficiency in sustaining artisan welfare. Among these, raw materials exert the strongest impact, highlighting the need for stable and high-quality supply chains.

Finally, the indirect effects through production reveal that improvements in capital, labor, and raw materials not only enhance output but also magnify income growth. This dual pathway confirms that strengthening production factors is essential for both immediate and long-term income sustainability, aligning with broader theories of economic development and SME growth.

### Managerial Implications

The findings provide several practical implications for policymakers, cooperatives, and artisan groups. First, facilitating access to affordable capital through microfinance or government-backed credit schemes can empower artisans to invest in better equipment and expand production. Second, targeted workforce training programs are essential to improve artisan skills, efficiency, and product quality, thereby increasing competitiveness in both local and international markets.

Third, ensuring a stable and high-quality supply of raw materials through partnerships with suppliers or community-based initiatives is critical to sustaining output and income. Finally, production efficiency should be enhanced through technology adoption, such as semi-mechanical looms, while preserving traditional weaving techniques to balance cultural heritage with economic viability.

### Future Research Agenda

Future studies could expand this research in several directions. First, incorporating variables such as market access, innovation, and government policy support would provide a more comprehensive understanding of artisan income determinants. Second, comparative studies across different weaving centers in Indonesia (e.g., NTT, Java, Sumatra) could highlight regional differences and best practices.

Third, longitudinal research examining changes over time would capture the dynamic effects of capital, labor, and raw materials on production and income, especially in response to tourism fluctuations and global market trends. Finally, integrating qualitative approaches—such as ethnographic studies—could enrich the analysis by exploring cultural values, artisan experiences, and community resilience in sustaining traditional weaving industries.

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