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A CASE STUDY ON THE VALUE CHAIN, BUSINESS MODEL, AND FINANCIAL MANAGEMENT OF CAPTURE FISHERIES IN KEY INDONESIAN PROVINCES: JAKARTA, YOGYAKARTA, WEST SUMATERA, SOUTH SULAWESI, AND BALI

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ABSTRACT

This study analyzes the value chain in small and medium-sized fishery enterprises across several Indonesian provinces (Jakarta, Yogyakarta, Bali, South Sulawesi, and West Sumatra). To fully comprehend the value chain in the fishing industry, it is essential to answer the research problems of the pattern identification of the capture fish value chainand implementing the business process in the capture fish industry. It identifies challenges and opportunities within the value chain, particularly regarding resource access, regulation, transportation, and financial impacts. The research employs a comprehensive value chain analysis, utilizing the Business Model Canvas approach. Primary and secondary data were gathered through interviews and analyzing external data sources. From May to November 2023, primary and secondary data were collected through interviews and the analysis of external data sources. The study involved 50 seafood restaurant owners and 110 fishermen across five provinces. We conducted the analysis using panel data methods and performed robustness tests to ensure the validity of the results. The study finds significant operational challenges in maintaining the quality and quantity of fresh fish, inefficiencies in various stages of the value chain, and potential areas for improvement in the captured fisheries business models of SMEs and the big firm. It highlights the importance of market stability, sustainable practices, and economic viability for the growth of SMEs in the fishery sector.

Keywords: capture fisheries; finance; management; value chain

INTRODUCTION

Indonesia's fishing industry is crucial for the country's economy in Jakarta, Bali, Yogyakarta, South Sulawesi, and West Sumatera. However, medium-sized businesses face challenges such as rapid urban development, pollution, lack of fishing tools, and financial limitations. Indonesia faces challenges in the value chain, including limited access to resources, transportation constraints, and outdated regulations. Understanding the fissure industry's value chain is crucial, focusing on the pattern of small-medium enterprises' capture fish value chain and implementing business processes. This comprehensive understanding is essential for industry progress and success.

This study examines the capture fisheries value chain in these regions using the Business Model Canvas framework. It highlights the importance of addressing these challenges, such as urbanization and pollution issues in Jakarta, modernizing fishing techniques in Yogyakarta, and investing in technology in South Sulawesi and West Sumatera. The study also identifies opportunities for enhancing value and expanding markets, such as using Bali's tourism industry to access seafood markets. Moreover, The study recommends policy adjustments, investments in technology and infrastructure, and promoting business models involving fishermen and stakeholders to create a more interconnected and resilient fisheries sector.

A value chain is a series of interconnected activities that add value to a product or service before it is sold to consumers (Wubet et al., 2022; Yang et al., 2022). Consequently, Value Chain Analysis is expected to be able to provide a value proposition (Monastyrnaya et al., 2017; Ong et al., 2022). A recent study indicates that value chains in the fishing industry may

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involve various stakeholders, including fisheries management organizations, government regulators, and environmental groups (Jueseah et al., 2020). In addition, the influence of weather that affects the availability of fish stocks is also a problem for fishermen (Akinyi et al., 2022). This study provides detailed information on the value chains in the capture fisheries industry, covering the capture process to delivery and distribution. It aims to identify problems caused by hindrances in the complex and diverse fisheries industry.

Theoretically, value chain challenges include limited access to quality resources, transportation and infrastructure constraints, outdated regulations, and financial issues, leading to reduced income (Ayele et al., 2021; Jueseah et al., 2020). Walters & Lancaster (2000) emphasized that the value proposition is a unique selling point that can be obtained through value chain analysis within the business model to be developed. Business model development is also approached through the Business Model Canvas (Pramudita, 2018). The research evaluates the value chain implementation in capturing and cultivating fresh sea fish, aiming to boost SMEs' development, identify opportunities for value addition, and ensure market stability for consumers. (Napitupulu et al., 2022). On the other hand, the marine fish industry plays a significant role in many economies, providing livelihoods and a source of protein (Grodzicki & Skrzypek, 2020; Porras et al., 2017). The urgency to support SMEs in this sector arises from their frequent challenges in accessing finance and optimizing their business models (Richardson, 2008a). The global seafood market is constantly evolving, necessitating swift adaptation by SMEs to address concerns about overfishing and environmental sustainability (Joséphine et al., 2022; Y. Wang & Wang, 2021) in the marine fish industry, there is an urgent need to develop models that promote sustainable practices while ensuring the economic viability of SMEs (Chea et al., 2023).

Therefore, the main principles of the business model relate to market-oriented activities to provide win-win solutions for multiple actors in the value chain (Knútsson et al., 2016; Nosratabadi et al., 2019). Inclusive business models involve smallholder farmers' market engagement, enhancing value chain relationships and coordination, aiming for a win-win situation for both smallholders and buyers (Purcell et al., 2017). As a follow-up to the analysis between demand and supply, the 360-degree value chain can evaluate the occurrence of declining quality (Aung & Chang, 2014) and stock shortages (Akinyi et al., 2022) and represents a form of innovation (Aini et al., 2020; Nielsen et al., 2017). Teece (2010) states that choosing, changing, and/or developing a business model is very complicated. The value architecture of the business model includes the distribution channels and relationships built (Osterwalder et al., 2005). Finally, the value capture or revenue model describes how profits are generated in terms of revenue and expenses (Grodzicki & Skrzypek, 2020; Kimura et al., 2018).

METHODS

As shown in Figure 1, to understand the value chain pattern of small and large-scale capture fisheries businesses, follow these steps: Firstly, Identify Key Activities by mapping out all primary and support activities involved in the fisheries business. Primary activities include fishing, processing, distribution, and marketing. Support activities include infrastructure, human resource management, technology development, and procurement (Nielsen et al., 2017; Porter's, 1985). Secondly, analyze the value chain by collecting data. Use both quantitative and qualitative methods to gather data on each activity. This includes financial data, production volumes, labor inputs, and market prices. Interviews, surveys, and direct observations are useful tools for data collection (Walters & Lancaster, 2000). Examine the cost structure at each stage of the value chain. Identify where the highest costs are incurred and what factors contribute to these costs. This helps in understanding the economic pressures faced by small and large-scale operators. Thirdly, this research focuses on the value proposition as a unique selling point that can

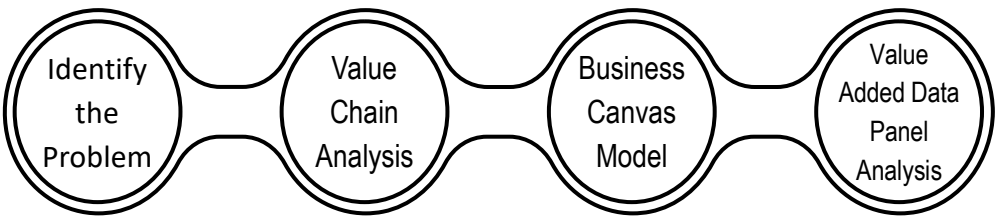

Figure 1. Research Framework Source: Author's Adjusted From Several Studies by: (Nielsen et al., 2017; Porter's, 1985; Walters & Lancaster, 2000)

be obtained through value chain analysis in the business model to be developed. Business model development is also carried out with the Business Canvas Model approach (BCM) (Monastyrnaya et al., 2017). This study conducted preliminary research to look comprehensively at the supply value chain model currently carried out by fishermen in Jakarta, Yogyakarta, Bali, South Sulawesi, and West Sumatra, which focuses on costs and revenue streams from May to November 2023.

There are two types of data, comprises primary data and secondary data. Primary data was obtained through interviews with 50 seafood restaurant owners and 110 fishermen in five provinces consist of West Sumatera, Jakarta, Yogyakarta, Bali and South Sulawesi, while secondary data was obtained through external and company data.

The discussion of each primary activities point is presented in the form of business, operations and financial analyses based on inbound logistics and outbound logistics emphazis goes beyond the selling of goods and products of value chain channel, consisting of: production, post production, processing, distribution and consumption (Delgado et al., 2021). The measurements in this research proposal use innovative measurement methodologies and one traditional methodology.

This study also uses qualitative analysis which is poured through the business canvas model. BCM consists of nine blocks covering key aspects in the business model. These blocks include Customer Segments, Value Proposition, Channels, Customer Relationships, Revenue Streams, Key Resources, Key Activities, Key Partnerships, and Cost Structure) (Charatsari et al., 2023). The study uses customer surveys, market analysis, and stakeholder interviews to gather data on the fisheries business in Indonesia. It identifies customer needs, generates revenue, and formulates a business strategy. The hypothesis is tested and validated by stakeholders, including fishermen, traders, and consumers, to ensure efficient cost management (Tan, 2021). Then, implement the business strategy that has been formulated and continue to monitor business performance (Charatsari et al., 2023; Tan, 2021).

Furthermore, to understand that the value chain aspect provides added value and contributes to increasing people's income (Z. Wang & Zhu, 2018). Thus, the use the panel data test on the following equation is needed (Baltagi, 2021):

$$\text{Ln } Pdit = \beta + ln\ \beta 1 Prit + ln\ \beta 2 Ekit + ln\ \beta 3 Llit + ln \beta 4\ Rtit + ln\ \beta 5 Jnit + \varepsilon it \quad (1)$$

Where : Pd = economic growth (GDP); α0 = constant; β = regression coefficient; Pr = capture fisheries production, Ex= exports, Ll= Land area, Rt= Fishery Households and Jn= Total Fisheries Sector Workers; i=Cross-section, t = time (2015.1-2022.4) and ε = error term

To ensure that the coefficients of two sets of estimated parameters are significantly different from each other, Hausman test and Chow test are conducted to select the appropriate model among the common effect, random effect, and fixed effect models.This difference is then tested for statistical significance using a chi-squared distribution. If the difference is found to be statistically significant, it suggests that the random effects model is inconsistent and the fixed effects model should be preferred (Baltagi, 2021).

$$H=(bFE-bRE)'[Var(bFE)-Var(bRE)]-1(bFE-bRE) \quad (2)$$

Where: bFE is the vector of coefficients from the fixed effects model. bRE is the vector of coefficients from the random effects model. Var(bFE) and Var(bRE) are the variance-covariance matrices of the estimators. This statistic follows a chi-square distribution with degrees of freedom equal to the number of coefficients being tested.

This study informs the type S robustness test evaluating the validity and reliability of regression analysis or statistical models despite data variations or disturbances. It assesses the model's stability against its underlying assumptions, aiding researchers in making informed decisions when analyzing data and interpreting outcomes.

RESULTS

The characteristics of fishermen in various study areas are also determined by the region, technology, and equipment, the type of captured fish targeted. This affects the pattern of the value chain and the fishing business's business process. Fishermen in Bali often use traditional boats and small motorboats. They also brought fishing nets, rods, and fish trap equipment. Reef fish are Tuna, Spanish Mackerel, and Skipjack. In some areas of Bali, the only alternative is to cater for tourism, as fishing boats sell their daily catch directly to restaurants and hotels.

In Yogyakarta, coastal fishermen like Samas

Beach and Depok Beach use motorboats and simple equipment such as gill nets and fishing rods. They often catch snapper, mackerel, pomfret, shrimp, and squid. Local traditions involving the sea, such as sea almsgiving, are performed to honor the sea and pray for safety and abundant catches. Most small-scale fishermen rely on the daily catch to meet their needs, selling seafood in local markets and using it in traditional dishes such as grilled fish.

Fishermen in Jakarta, particularly in the Thousand Islands and Muarakarang, use motorboats, small boats, and modern equipment such as GPS and sonar to fish. They catch various types of fish such as grouper, rabbit fish, mackerel, squid, and shellfish. Many of Jakarta's fishermen work for fishing companies or operate independently, although the area is affected by industry and pollution, which affects catch and ocean health.

In South Sulawesi, fishermen in areas such as Makassar and Selayar use motorboats, jolloro boats, and fishing gear such as fish traps, trawl nets, and fishing rods. The region is rich in fish such as tuna, skipjack, frigate mackerel, coral, and reef fish. They sell their catch to local and international markets, with fisheries being an important economic sector.

In particular, West Sumatra fishermen use traditional boats, motorboats, and fishing gear such as trawl nets, nets, and fishing rods. They catch tuna, skipjack, reef fish, shrimp and squid. Most fishermen are small-scale and rely on fishing as their primary source of income, selling the catch at local markets or processing it into speciality products such as salted fish. The majority of the fishermen are small-scalers whose main work is fishing. The catches are marketed locally or made into artisanal foodstuffs like salt fish. The next stage is the initial phase of the fisheries value chain. In this stage, fishermen catch fish in the sea or ponds. Fishermen can be divided into two groups: capture fishermen and aquaculture fishermen. Capture fishermen catch fish directly from the sea, while aquaculture fishermen cultivate fish in ponds or tanks. The processing stage is the one that transforms raw fish into seafood products ready for consumption. Seafood products can include fresh fish, salted fish, dried fish, smoked fish, canned fish, and various other processed products. However, in this research, the focus is solely on fresh fish caught from the sea, so there is no fish breeding process; instead, there is a checking and storage stageFishermen can be divided into two groups: capture fishermen and aquaculture fishermen. Capture fishermen catch fish directly from the sea, while aquaculture fishermen cultivate fish in ponds or tanks. The processing stage transforms raw fish into seafood products that are ready for consumption. Seafood products can include fresh fish, salted fish, dried fish, smoked fish, canned fish, and various other processed products. However, this research focuses solely on fresh fish caught from the sea, so there is no fish breeding process; instead, there is a checking and storage stage.

The distribution stage involves moving seafood products from producers to consumers. In this stage, seafood products can be sold directly by fishermen to consumers or through collectors, wholesalers, and retailers. The final stage is marketing, which is the phase that promotes and sells seafood products to consumers. In this stage, producers or distributors can carry out marketing through various channels such as traditional markets, small restaurants, fish auctions and or consumers. Figure 2 is the fisheries value chain model.

The fresh fisheries value chain model generally consists of four main stages, constitutes production stage, storage stage, distribution stage, marketing stage and production stage. Figure 3 shows the value chain of the fish industry in Indonesia from catching fish using trawl. The value chain of modern catching fish using trawl involves several stages, from catching the fish at sea to delivering it to the market. The process begins with trawler vessels heading out to sea to catch fish using trawl nets. These nets are designed to be dragged through the water to capture fish in their path. Once the trawl nets are pulled back onto the vessel, the catch is sorted and processed. Undesirable bycatch species, if any, are typically sorted out and discarded. The target species are retained for further processing. The retained fish are processed on board the vessel or at a shore-based processing facility. This involves activities such as gutting, cleaning, and often freezing the fish to maintain its quality. After processing, the fish are packaged for transportation. This may involve placing the fish in containers, boxes, or other suitable packaging materials to keep them fresh during transportation. The packaged fish are transported to various markets and distribution points. This can involve refrigerated trucks, ships, or other means of transportation to ensure the fish remains fresh during transit. At the destination, the fish are distributed to different markets, including local markets, seafood wholesalers, and even export markets. The distribution may involve intermediaries who buy and sell the fish to retailers or end consumers. Then, the fish reach retailers, such as fish markets, supermarkets, or restaurants, where they are made available for purchase by consumers.

Consumers finally purchase the fish and prepare

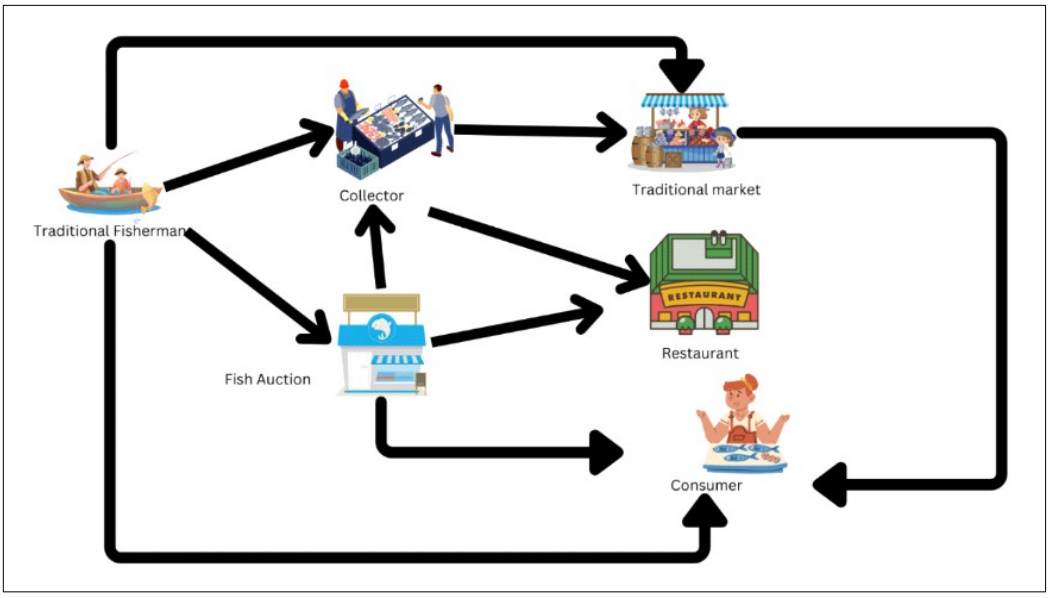

Figure 2. Traditional Fishing Fisheries Value Chain Model

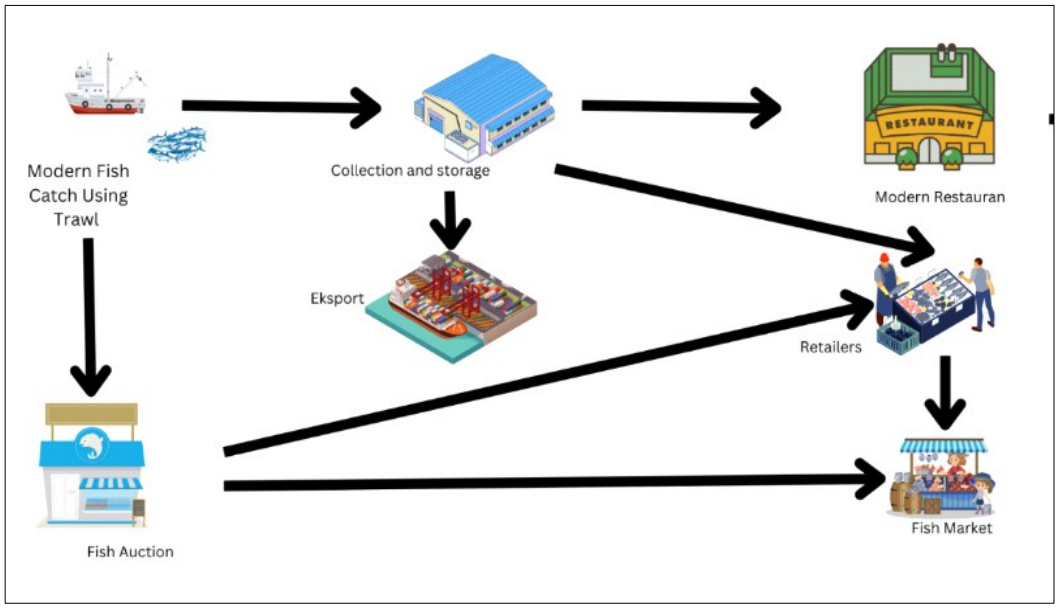

Figure 3. Value Chain Model of Large Scale Fishing

it for consumption, either by cooking it at home or dining out. Throughout this value chain, various stakeholders, including fishermen, processors, distributors, and retailers, play crucial roles in ensuring that the fish reaches consumers in a fresh and marketable condition. The value chain can be divided into two main parts: upstream activities and downstream activities. Upstream activities are those involved in the production of raw materials and the manufacturing of the product, while downstream activities are focused on the marketing and sale of the product to consumers. In the case of the fish industry, upstream activities encompass fishing, collection, and fish storage, while downstream activities involve production, inspection, storage, distribution, marketing, and the sale of fish products. The value chain helps businesses identify the various activities involved in the production and sale of their products. By understanding the value chain, businesses can identify opportunities to improve efficiency and reduce costs, as well as discover new markets and expansion opportunities.

The capture fisheries industry and fish processing industry are the core components of the fisheries industry cluster because both involve the flow of materials (fish) and value-added processes. Additionally, both sectors employ the largest workforce within the fisheries sector (Çap, 2023). The term “value-chain industrial linkage,” as defined by (X. Wang et

al., 2023) refers to an industrial cluster that has an input-output relationship or a buyer-supplier link. For instance, “skipjack fish” fishermen incur operational costs at sea, including expenses for fuel and rations, totaling 76.45%. This cost surpasses the expenses fishermen incur for rations, which amount to only 10.71%, and costs for land-based operations, which are 12.85%. Subsequently, fishermen sell skipjack fish to collecting traders in the form of pans, which encompass the majority of commodity trading actors. This distribution chain typically includes fishermen (86%), collecting traders (90%), wholesalers (100%), and retailers (100%) before reaching consumers.

The following presents the results of a marketing margin analysis, which includes the costs necessary for marketers to perform marketing functions and the benefits received by marketers in each of the most dominant capture fish commodity marketing chains in the city. The primary financing components for collecting traders encompass fish preservation costs, transportation expenses, loading and unloading costs, and levies of Rp911.25 per kilogram of fresh fish. Wholesalers, on the other hand, charge Rp681 per kilogram of fresh fish. The total marketing cost for the subsequent commercial actor is Rp290 for retailers. Collecting merchants incur the highest marketing costs, amounting to Rp921.16 per kilogram of fresh fish. This substantial financing is due to collecting traders incurring higher costs during the capture fish trading process, including expenses for fish preservation such as ice cubes and salt, elevated transportation costs due to buyers being located relatively far from the fish auction place, and retribution costs that must be borne by collecting traders. The highest marketing margins for swordfish are observed in wholesalers (8.14%), retailers (7.75%), and collectors (6.32%) respectively. Based on the net benefit margin, collecting traders who purchase fish directly from fishermen earn a profit of Rp1378.84 per kilogram. Large traders acting as distributors to retailers in markets achieve a profit margin of Rp1317.27 per kilogram, while retailers, who engage in direct transactions with consumers, obtain a profit margin of Rp1281 per kilogram.

The highest marketing margin for mackerel scad species was observed consecutively among collecting traders (10.05%), retailers (9.50%), and wholesalers (7.15%). Based on the net benefit margin, collecting traders who purchase fish directly from fishermen earn a profit of Rp1142.77 per kilogram. Large traders who act as distributors to retailers in markets achieve a profit margin of Rp1137.82 per kilogram, while retailers, who engage in direct transactions with consumers, obtain a profit margin of Rp1021.99 per kilogram.

Similarly, for mackerel species, the highest marketing margin occurred consecutively among retailers (10.45%), collectors (10.23%), and wholesalers (7.50%). Based on the net benefit margin, collecting traders who buy fish directly from fishermen earn a profit of Rp983.71 per kilogram. Large traders who are distributors to retailers in markets earn a profit margin of Rp983.21 per kilogram, while retailers who make direct transactions with consumers get a profit margin of Rp952.91 per kilogram.

Regarding the financial analysis in capture fisheries, the average investment cost for mini purse seine vessels measuring 10 – 30 GT is Rp. 1,284,102,000. The cost depends on the GT size of the ship, with larger ships incurring greater initial capital business costs. According to (Kaczan & Patil, 2020), the investment cost of a fishing business includes expenses for purchasing boats, machinery, fishing gear, and other fishing aids. Investment costs are one-time expenses incurred at the beginning of the business, as capital is a crucial factor in ensuring the smooth production process and future profits of the business.

Furthermore, the average fixed cost for mini purse seine vessels of size 10 – 30 GT per year is Rp198,721,991. Fixed costs are expenses that continue to be incurred whether fishing activities are carried out or not and depend on the GT size of the ship. The GT of the ship also influences the duration of fishing trips, typically ranging from one to three days, according to (Herrick et al., 1997), fixed costs are not affected by production levels and include depreciation costs, maintenance expenses, and licensing fees.

As for operational costs, the amount of operational expenses before capture on ships measuring 10 – 30 GT per year is Rp690,100,102, while post-arrest operational costs per year amount to Rp1,315,915,512. The operational costs of the fishing business depend on factors such as ship size, trip length, and the number of crew members on each ship. Larger ships and longer trips incur higher operational costs, while variable costs, as explained are expenses that change in proportion to the volume of activities. Increased activity levels lead to higher total variable costs, including operational, maintenance, auction, and labor expenses.for Total Cost (Total Cost) consists of Average fixed costs and operational costs on ships 10 – 30 GT per year is Rp1,91 8,743,7 82. The total cost of catching mini purse seine vessels is strongly influenced by fixed and operational costs before and after capture. Total costs are obtained from the sum of fixed costs and

variable costs. Fixed costs are incurred routinely whether operating to make arrests or not, while routine operating costs must be incurred when operating to make arrests, fixed costs include the amount of depreciation costs and investment costs, while non-fixed costs include the amount of operating costs, maintenance costs, auction costs and labor costs (Wijayanto et al., 2020).

The average auction revenue for ships measuring 10 – 30 GT per year is Rp2,812,777,000. The revenue generated by the mini purse seine fishing business cannot be accurately predicted due to the constantly changing environmental conditions. Unlike other business activities, income in the capture fisheries business is highly uncertain due to fluctuating water conditions. Extreme weather conditions such as high waves, wind, and rain can significantly impact the income that can be generated. In the fishing business, income refers to the monetary value obtained from the sale of fish production, and it is influenced by both the quantity of fish caught and the selling price of the fish upon landing.

The average net profit earned on ships measuring 10 – 30 GT per year is Rp1,064,037,179, derived from a total revenue of Rp2,912,772,000 per year, while total costs amount to Rp1,848,734,821 per year. Three commodity distribution channels were identified in the distribution pattern of fish products: the first channel involves fishermen selling to collectors who then sell to wholesalers, who subsequently sell to retailers and finally to consumers; the second channel involves fishermen selling to collectors who then sell directly to retailers and consumers; and the third channel comprises fishermen selling to wholesalers who subsequently sell to retailers and consumers.

Based on interviews conducted by the researcher with fishermen, it was found that there are generally three types of fishing gear used by fishermen: bottom long lines (known as “pancing rawe”), hand lines (“pancing ulur”), and gill nets.

Demersal fish caught by fishermen are directly taken to the fish auction center. At this location, the loading and unloading of fish activities occur almost daily. The unloading of demersal fish caught by fishermen who have landed their boats at the Fish Auction Center (PPI) typically starts in the morning and continues until the afternoon for marketing purposes. Before demersal fish is marketed, several activities take place at the fish auction center. This includes the sorting of fish conducted by experienced personnel in the field who record the type, size, and weight of the fish. All data related to fish unloading is documented by the auction market personnel and the agents of the fishing companies, with the vessel owners as witnesses. Subsequently, some of the demersal fish are sold to local traders, while high-quality demersal fish are sold to large-scale traders for domestic and international marketing purposes.

To facilitate data collection, the researcher engaged with stakeholders in a pentahelix approach and conducted focused discussions, particularly with the leaders of the fishermen’s groups and the relevant departments or agencies involved in fisheries and marine activities. This was also done with research team members, taking into consideration personnel changes, as the availability of time and the discipline of team members were essential aspects of this research.

As additional information, the fisheries sector is currently driving growth, both in terms of domestic demand and exports, and supply through production systems and improved transportation infrastructure. Access to financing for small-scale fishermen and traditional production systems is highly needed. Presently, the fisheries sector is dominated by small-scale producers, with some participation from larger private sector companies.

The Coefficient Plot in Figure 4 showing the estimated coefficients for each variable from the regression analysis. Each dot represents the estimated coefficient of a variable, and the horizontal lines indicate their 95% confidence intervals. The vertical grey dashed line at zero helps to identify which variables have coefficients statistically significantly different from zero. This plot provides a clear visual representation of the impact and significance of each variable in the model, with variables whose confidence intervals do not cross the zero line being considered statistically significant.

Based on the results of the statistical test equations Table 1, it is found that the fisheries production variable (Pr) positively and significantly contributes to the economic growth of the five provinces included in the study during the period from 2015.1 to 2022.4. All the data is transformed into log natural (Ln) to prevent excessive data fluctuations and reduce the variability. Moreover, the data will be less skewed and outliers are usually less extreme (Wei, 2013). Looking at the coefficient values, it can be observed that the production variable has a positive effect, as indicated by a coefficient value of âit=0.838299. This means that a percent increase in fisheries production would lead to 83.82 percent increase in regional income (p-value<0.05).

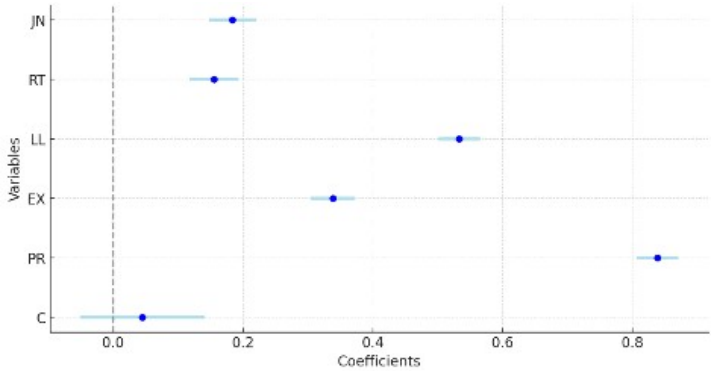

Figure 4. The Coefficient Plot. PR = capture fisheries production, EX= exports, LL= Land area, RT= Fishery Households and JN= Total Fisheries Sector Workers.

Table 1. Data Panel Analysis

Variable	Coefficient	Std. Error	t-Statistic	Prob.
L(C)	0.044836	0.049099	0.913181	0.3629**
L(Pr)	0.838299	0.016645	50.36366	0.0000
L(Ex)	0.338522	0.017028	19.88066	0.0000
L (Ll)	0.533063	0.016318	32.66729	0.0000
L (Rt)	0.155064	0.019318	8.026754	0.0000
L (Jn)	0.183699	0.018568	9.893388	0.0000
R-squared	0.981205	Mean dependent var		2.793606
Adjusted R-squared	0.980435	S.D. dependent var		1.071438
S.E. of regression	0.149868	Akaike info criterion		-0.912385
Sum squared resid	2.740166	Schwarz criterion		-0.778696
Log likelihood	64.39262	Hannan-Quinn criter.		-0.858066
F-statistic	1273.826	Durbin-Watson stat		1.698165
Prob(F-statistic)	0.000000			

Dependent Variable: PD, Method: Least Squares, Sample Included observations: 160, *p-value<0.10, **p-value<0.05, ***p-value<0.01.

Similarly, other variables such as exports (βExit=0.338522, p-value<0.05), land area (βLlit=0.533063, p-value<0.05), Fishery Household (βRtit=0.155064, p-value<0.05), and the Number of Workers in the Fisheries Sector (βJnit=0.183699, p-value<0.05) also positively and significantly contribute to the added value of fresh sea fishery products.

The Chow Test or Likelihood test in Table 2 is employed to compare the common effect model with the fixed effect model in selecting the most appropriate model for this research. The results of the Chow Test indicate a probability of 0.000 with a significance level of 5%. A probability value of 0.000 < 0.05 signifies that the model decision based on the Chow Test results favors the fixed effect model (FE) over the Random Effect (RE) model (Gujarati, 2021).

As shown in Table 3 , the results of the robustness test type S test state that the model has stability to data variations and underlying assumptions. This is indicated by the p-value<10, Fisheries Production (βPrit=0.80, p-value<0.05), Export (βExit=0.40, p-value<0.05), Land area (βLlit=0.50, p-value<0.05), Fishery Households (βRtit=0.20, p-value<0.05) and Number of Fisheries Sector Workers (βJnit=0.10, p-value<0.05).

Table 2. Chow Test

Effect Test	Fixed Effect	
Cross-section F (df=4)	7.52946	0.00000
Cross-section Chi-square	36.0981	0.00000

Sample Included observations: 160, *p-value<0.10, ** p-value<0.05, *** p-value<0.01.

Table 3. Robustness Test

Variable	Coefficient	Std. Error	z-Statistic	Prob.
Pr	0.800000	6.45E-16	1.24E+15	0.0000
Ex	0.400000	6.78E-16	5.90E+14	0.0000
LI	0.500000	6.36E-16	7.86E+14	0.0000
Rt	0.200000	7.85E-16	2.55E+14	0.0000
Jn	0.100000	7.29E-16	1.37E+14	0.0000
	Robust Statistics			
R-squared	0.950000	Adjusted R-squared		0.902500
Scale	5.79E-15	Deviance		3.35E-29
Rn-squared statistic	3.02E+31	Prob(Rn-squared stat.)		0.000000

Dependent Variable: PD; Method: Robust Least Squares; Sample Included in observations: 160; Method: S-estimation S settings: tuning=1.547645, breakdown=0.5, trials=200, subsmpl=5, refine=2, compare=5; Random number generator: rng=kn, seed=1069372010; Huber Type I Standard Errors & Covariance, *p-value<0.10, **p-value<0.05, ***p-value<0.01.

DISCUSSION

These connections represent the business to business (B2B) relationships carried out by the participants involved in trade transactions. These participants exchange value objects, which can be either tangible or intangible, for other value objects. This process involves efforts, which are defined as transaction cost (Charatsari et al., 2023). When viewed from the perspective of connectivity, the participants are engaged in arm's-length relationships. As the market becomes more complex, as previously explained, the costs incurred in transactions rise.

This situation prevents the participants from achieving above-average returns, as their revenue is flattened by the increasing transaction costs. To become more competitive, they need to enhance their efficiency when conducting transactions by establishing collaborative relationships while delivering value propositions through products and/or services to consumers. The connections must also be structured to be as integrated as possible to facilitate the smooth distribution flow of value objects.

The study reveals that fair market transactions allow benefits to be distributed equitably, indicating that the connections are characterized by fairness. The participants earn shares based on their rights and are satisfied with the mutually beneficial trading that occurs. The primary concern is how to fairly share the risk as well. Currently, wholesalers believe that they bear the most significant risk, which often leads them to set higher prices. Consequently, consumers are dissatisfied because fish prices in the city are high.

On the other hand, wholesalers benefit from economies of scale, allowing them to sell fish in large quantities and generate higher profits. Consequently, the accumulated value appears to be primarily in the hands of wholesalers. When considered as a whole, the distribution chain is heavily influenced by wholesalers, as they dominate both financial and material resources. This situation has led to the emergence of opportunistic behavior among participants who compete to find suppliers offering goods at lower prices.

Retailers typically purchase fish from suppliers offering competitive prices, often accompanied by certain incentives. However, this leads to the accrual of switching costs and results in increased inefficiency within the chain. Additional issues arise, such as communication barriers and information flow disruptions at each linkage. Participants often lack awareness of both supply and demand conditions before or after their own linkages, leading to collective blindness. Furthermore, wholesalers frequently encounter retailers who cancel transactions abruptly, rendering the linkages susceptible to market failure. This behavior disrupts the flow of goods and cash, affecting other participants, akin to the bullwhip effect in supply chains.

Ultimately, at the end of the distribution chain, it is the end consumers who bear the losses. Evidence suggests that the distribution chain operates in a common market. In accordance with Neo-Classical theory, the market, as an institutional setting, exhibits classic features such as spot transactions. Linkages between participants only occur during transactions, making the relationships temporary.

However, there are opportunities to enhance these linkages. It has been observed that the chain

possesses valuable social capital through individuals that can be further leveraged. This internal environment strongly fosters robust business relationships among participants, even when they are geographically distant. With this social capital, there is potential to foster a collaborative mindset and make the chain more integrated. For example, buyers often receive products that slightly deviate from prescribed standards but accept them at a reduced price. Conversely, suppliers accommodate these decisions and attempt to align with the prescribed standards. In wholesaling, customer payment delays occur repeatedly, despite the need for capital. The tolerant nature of these relationships allows for the maintenance of long-term business partnerships. It is crucial to effectively manage and capitalize on these network dynamics as a foundation for the supply network's competitive advantage.

In addition to vertical linkages, there are also horizontal linkages within the distribution chain. These horizontal connections serve several purposes, including fostering collective learning, enabling bulk purchasing, reducing transaction costs, and increasing bargaining power. Café and restaurant owners in the regions form associations that facilitate periodic discussions, promoting collective learning and the sharing of crucial business and technical knowledge. Additionally, there is a fishermen's association that provides support in advocating for fishermen when unfavorable policies are proposed. Groups of fishermen can benefit from bulk purchases of inputs from suppliers, leading to lower prices. Wholesalers can maintain regular product shipments due to relatively low logistics costs. Logistic service providers can transport packages from multiple wholesalers in a single trip, reducing operational costs. This integrated service network supports the vertical linkages. The presence of horizontal linkages offers opportunities for the chain's development (X. Wang et al., 2023).

According to (Porter, 2001), a company's business performance can be effectively depicted as a value chain, where total revenue minus the total cost of all activities involved in developing and marketing a product or service results in value creation. Furthermore, (X. Wang et al., 2023; Z. Wang & Zhu, 2018) explains that value chain analysis is a strategic tool used to gain a better understanding of competitive advantage, identify areas where customer value can be enhanced or costs reduced, and improve understanding of a company's relationships with suppliers (Supplier Linkages) and consumers (Consumer Linkages). The activities performed by the actors involved in the value chain of tilapia commodities exhibit coordinated relationships and interdependence. Therefore, the value chain activities for tilapia commodity involve not only core activities but also supporting activities, both directly and indirectly. Key participants in this chain include input providers, fish farmers, fish processors, collecting traders, retail traders, consumers, as well as relevant institutions and organizations associated with the fresh fisheries commodity industry in the five research provinces.

Based on the data collected in the field and quantitative analysis in Table 4, it was generally observed that there are differences in the business models between larger private companies and traditional fisheries. Many traditional fishermen also act as suppliers to collectors and retailers, but not to larger companies. Large-scale fishermen have cold storage facilities and can store their catch for export. Typically, for preserving fish freshness, containers such as tanks on the deck are used, especially for tuna and skipjack catches. This is done to increase the market value of the fish since tuna never stops moving or dies. If they do perish, they must be quickly placed in cold storage at a minimum temperature of 4 degrees Celsius. Once on land, the temperature must be maintained at around -8 degrees Celsius for export quality.

Generally, restaurant owner's source fresh fish from fish auctions, traditional markets, or suppliers who work with traditional fishermen or fishing companies. The financial model for the supply chain is based on the first-in, first-out (FIFO) principle, given that fresh fish must be distributed promptly, and there are handling costs if stored in cold storage. On average, fishing trips for catching fish last for one month, incurring costs for boat rental, fuel, bait, and crew members. The level of freshness, type, and size of fish also determine the price and added value of the harvested fish. The standard freshness level is characterized by: (i) Firm and dense flesh; (ii) Not mushy; (iii) Rigid body; (iv) Neat and tight scales; (v) Fresh scent on the outer part of the gills; (vi) Minimal slime on the skin; (vii) Red gills; (viii) Fish sinks when placed in water; (ix) Clear, clean, shiny, and reddish eyes.

Storage technology, product storage and handling, as well as skilled human resources in production, product handling, and distribution, serve as significant moderating variables. The value chain model in four locations, namely Jakarta Bay (Muara Karang and Muarabaru), Padang (Bungus and surrounding areas), Makassar (Portre and Untia), and Yogyakarta, does not show significant differences. The value chain model

Table 4. Business Model Canvas

<table>
<tr><th>Key Partners</th><th>Key Activities</th><th>Value Propositions</th><th>Customer Relationships</th><th>Customer Segments</th></tr>
<tr><td rowspan="2">Local fishermen.
Wholesale market authorities.
Retailers and restaurants.
Suppliers (e.g., ice providers for fish preservation).
Transportation and logistics service providers.
Government and regulatory bodies.</td><td>Fishing and harvesting of grouper and other fish.
Auctioning and wholesale trading.
Retail sales to restaurants and end consumers.
Transportation and logistics management.
Compliance with legal and regulatory requirements.
Continuous improvement and innovation in business practices</td><td rowspan="2">Fresh, locally harvested grouper fish.
Business enabling environment (BEE) fostering innovation and process upgrading.
Economic and social benefits, such as increased income and resolution of social issues.
Emphasis on quality and standardization.
Focus on market demand for high-quality, safe, and healthy products.</td><td rowspan="2">Direct relationships between fishermen, wholesalers, retailers, and end consumers.
Dependence on trust and informal agreements due to the uncertain nature of the fishery industry.
Reliance on personal, face-to-face interactions and negotiations.</td><td rowspan="2">Local restaurants and seafood eateries.
Domestic market consumers seeking fresh fish.
Potentially, international markets for high-grade fish products.</td></tr>
<tr><td>Key Resources
Fish resources (especially grouper).
Fishing equipment and facilities.
Auction and market facilities.
Supply chain and logistics infrastructure.</td><td>Channels
Wholesale markets and auction centers.
Direct sales to restaurants and retailers.
Distribution networks involving transportation and logistics providers.</td><td>Governance and Structure
Governance mechanisms influenced by market transactions, regulations, and policies.
Arm’s-length relationships primarily dictating interactions in the value chain.
Network governance preferred for cost efficiency and control.
Modular governance suitable for buyer-supplier relationships with a higher degree of control for buyers.
This BMC highlights the critical aspects of the fishery sector's value chain in the pertaining regions, focusing on the integration of various actors, the role of governance and business models, and the challenges and opportunities within the market.</td></tr>
<tr><td colspan="3">Cost Structure
Costs associated with fishing operations.
Auction and wholesaling costs.
Transportation and logistics expenses.
Costs related to compliance with regulations and standards.
Investment in continuous improvement and innovation.</td><td colspan="2">Revenue Streams
Sales of fish products through auctions and directly to retailers and restaurants.
Revenue from market transactions and tax collections.</td></tr>
</table>

for marine capture fisheries generally follows this outline: (i) Input suppliers provide fishing equipment such as nets, boats, and other fishing gear, livestock feed for fish farming, and fuel and maintenance services for fishing vessels. (ii) Fishermen and Fish Farmers include traditional fishermen, commercial fishing vessels, fish farms, and ponds. (iii) Fishing operations at sea. Sorting and initial processing of the catch occur immediately after the fish are caught at sea. To maintain freshness and cleanliness, cleaning, gill removal, and scaling are done when the fish are about to be processed using preservation methods such as freezing, canning, or smoking. (iv) Fishery products are sold to wholesalers and distributors. Transportation and logistics companies play a crucial role in moving products and distributing them to markets and retailers, such as supermarkets, fish markets, and restaurants that purchase seafood products. Moreover, a significant portion of exported products includes tiger shrimp, milkfish, yellowfin tuna, bigeye tuna, seaweed, crabs, lobsters, squid, and octopus.

CONCLUSION

In terms of evaluating the value chain pattern of small and large-scale of capture fisheries business, the study has identified the primary activities involved in the fisheries value chain, which include fish capture, processing, distribution, and marketing. It examines challenges faced by SMEs such as maintaining fish quality and quantity, transportation inefficiencies, regulatory constraints, and access to financial resources. In addition, SMEs face challenges in maintaining fish quality at several stages of the value chain from capture to distribution. Inefficiencies in transportation financing and the capture process lead to increased operational costs and reduced profitability. High operational costs, including maintenance, fuel and equipment, have a significant impact on the financial viability of fishery SMEs. Limited access to modern technology and capital investment hinders the ability to optimize their operations and expand their market reach. The study also found the importance of value addition at every stage of the value chain to increase the marketability and profitability of fish products. This emphasizes the need for stable market conditions and sustainable practices to ensure the long-term economic viability of SMEs in the capture fisheries sector. However, it is also important to consider the potential negative impacts of such practices on the environment and local ecosystems, which could ultimately threaten the long-term sustainability of marine fisheries. Moreover, other factors such as access to financing also play an important role in ensuring the long-term viability of this business.

Referring to business model analysis, this study expounds on the potential of business processes to improve value propositions and business models for SMEs in the capture fisheries sector. This research underscores the complexity of the value chain of marine fisheries and the need for improvement at various stages. It provides insight into business and financial models that are critical to the growth and sustainability of SMEs in the sector. Field data and quantitative analysis reveal differences between the business models of large private companies and traditional fisheries that are mostly small fishermen. Traditional fishermen often supply to collectors and retailers rather than large corporations, whereas large-scale fishermen have cold storage facilities to store their catch for export. Traditional fishermen often prefer to supply their catch to collectors and retailers. Large companies can offer more stable prices and consistent demand, which may be attractive to fishermen. The majority of large capture fishing companies have cold storage facilities and they have an advantage in filling export market share despite facing higher costs and strict regulations that can affect their profitability. Thus, it is essential for fishermen to carefully choose their target market and business model to sustain their operations long-term.

Restaurant owners typically source fresh fish from auctions, traditional markets, or suppliers linked to traditional fishermen or fishing companies. The supply chain financial model operates on the first-in, first-out (FIFO) principle, as fresh fish must be distributed promptly to avoid handling costs in cold storage. Fishing trips generally last for one month and incur costs for boat rental, fuel, bait, and crew members. The freshness, type, and size of the fish determine the price and added value. In addition, storage technology, handling, and skilled human resources in production and distribution are significant moderating variables. The value chain model, mostly quite similar and consistent across Jakarta Bay, Padang, Makassar, and Yogyakarta.

The study suggests the potential for SMEs to enhance their business models, focusing on market stability, sustainable practices, and economic viability. However, this study still has pitfalls in analysing the value chain comprehensively, since the high-quality and relevant data are often challenging to obtain in the fisheries sector, especially in developing countries. Data limitations can hinder accurate analysis. Additionally, the fisheries market tends to be volatile due to factors such as weather changes, and consumer demand. This makes planning and value

chain analysis become more difficult. Moreover, further research is required to investigate the benefits of the value chain for fishermen in the fisheries industry and to provide additional information on how the value chain is applied on a broader scale in fish cultivation and fish product processing business. Despite these challenges in fisheries value chain analysis, understanding and addressing these issues can help improve sustainability, efficiency, and value addition within the sector.

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REFERENCES

Aini, N., Ardiani, F., Akinyi, D. P., Ng'ang'a, S. K., Ngigi, M., Mathenge, M., Girvetz, E., Alshurideh, M. T., Amrhein, S., Antonio, M. S., Rusydiana, A., … N. L.-… and P. (e, 2020, U., Author, C., Covatta Book, A., Editor, B., Cabannes, Y., Marocchino, C., Ayele, A., … Kaufmann, B. (2020). Inclusive Business Models. Guidelines for improving linkages between producer groups and buyers of agricultural produce. *Heliyon*, *II*(1), 32–38. https://doi.org/10.26493/1854-6935.15.255-274

Akinyi, D. P., Ng'ang'a, S. K., Ngigi, M., Mathenge, M., & Girvetz, E. (2022). Cost-benefit analysis of prioritized climate-smart agricultural practices among smallholder farmers: evidence from selected value chains across sub-Saharan Africa. *Heliyon*, *8*(4), e09228–e09228. https://doi.org/10.1016/j.heliyon.2022.e09228

Aung, M. M., & Chang, Y. S. (2014). Traceability in a food supply chain: Safety and quality perspectives. *Food Control*, *39*(1), 172–184. https://doi.org/10.1016/j.foodcont.2013.11.007

Ayele, A., Erchafo, T., Bashe, A., & Tesfayohannes, S. (2021). Value chain analysis of wheat in Duna district, Hadiya zone, Southern Ethiopia. *Heliyon*, *7*(7), e07597–e07597. https://doi.org/10.1016/j.heliyon.2021.e07597

Baltagi, B. H. (2021). *Econometric Analysis of Panel Data*. Springer International Publishing. https://doi.org/10.1007/978-3-030-53953-5

Çap, H. (2023). Job satisfaction and organizational commitment in the maritime industry. *Maritime Wellbeing*, 189–205.

Charatsari, C., Lioutas, E. D., Michailidis, A., Aidonis, D., De Rosa, M., Partalidou, M., Achillas, C., Nastis, S., & Camanzi, L. (2023). Facets of value emerging through the operation of short food supply chains. *NJAS: Impact in Agricultural and Life Sciences*, *95*(1). https://doi.org/10.1080/27685241.2023.2236961

Chea, R., Ahsan, D., García-Lorenzo, I., & Teh, L. (2023). Fish consumption patterns and value chain analysis in north-western Cambodia. *Fisheries Research*, *263*(March), 106677. https://doi.org/10.1016/j.fishres.2023.106677

Delgado, L., Schuster, M., & Torero, M. (2021). Quantity and quality food losses across the value Chain: A Comparative analysis. *Food Policy*, *98*(August 2019), 101958. https://doi.org/10.1016/j.foodpol.2020.101958

Grodzicki, M. J., & Skrzypek, J. (2020). Cost-competitiveness and structural change in value chains – vertically-integrated analysis of the European automotive sector. *Structural Change and Economic Dynamics*, *55*, 276–287. https://doi.org/10.1016/j.strueco.2020.08.009

Gujarati, D. N. (2021). *Essentials of econometrics*. Sage Publications.

Herrick, S. F., Rader, B., & Squires, D. (1997). Access fees and economic benefits in the Western Pacific United States purse seine tuna fishery. *Marine Policy*, *21*(1), 83–96. https://doi.org/https://doi.org/10.1016/S0308-597X(96)00048-6

Joséphine, R., Andrée-Anne, L., & Samir, L. (2022). Lifecycle traceability towards sustainable and circular value chains: analysis framework and state of the art in the fashion industry. *IFAC-PapersOnLine*, *55*(10), 1705–1710. https://doi.org/10.1016/j.ifacol.2022.09.643

Jueseah, A. S., Knutsson, O., Kristofersson, D. M., & Tómasson, T. (2020). Seasonal flows of economic benefits in small-scale fisheries in Liberia: A value chain analysis. *Marine Policy*, *119*. https://doi.org/10.1016/j.marpol.2020.104042

Kaczan, D. J., & Patil, P. G. (2020). Potential Development Contribution of Fisheries Reform: Evidence From Pakistan. *The Journal of Environment & Development*, *29*(3), 275–305. https://doi.org/10.1177/1070496520925878

Kimura, F., Studies, L. C.-B. of I. E., & 2018,

undefined. (2018). Value chain connectivity in Indonesia: the evolution of unbundlings. *Taylor & Francis*, *54*(2), 165–192. https://doi.org/10.1080/00074918.2018.1505412

Knútsson, Ö., Kristófersson, D. M., & Gestsson, H. (2016). The effects of fisheries management on the Icelandic demersal fish value chain. *Marine Policy*, *63*, 172–179. https://doi.org/10.1016/j.marpol.2015.03.015

Monastyrnaya, E., Bris, G. Y. Le, Yannouc, B., & Petitd, G. (2017). A template for sustainable food value chains. *International Food and Agribusiness Management Review*, *20*(4), 461–475. https://doi.org/10.22434/IFAMR2015.0061

Napitupulu, L., Tanaya Sitanggang, S., Ayostina, I., Andesta, I., Fitriana, R., Ayunda, D., Tussadiah, A., Ervita, K., Makhas, K., Firmansyah, R., & Haryanto, R. (2022). Trends in Marine Resources and Fisheries Management in Indonesia: A Review. *World Resources Institute*. https://doi.org/10.46830/wrirpt.20.00064

Nielsen, M., Andersen, P., Ravensbeck, L., Laugesen, F., Kristófersson, D. M., & Ellefsen, H. (2017). Fisheries management and the value chain: The Northeast Atlantic pelagic fisheries case. *Fisheries Research*, *186*, 36–47. https://doi.org/10.1016/j.fishres.2016.08.004

Nosratabadi, S., Mosavi, A., Shamshirband, S., Kazimieras Zavadskas, E., Rakotonirainy, A., & Chau, K. W. (2019). Sustainable Business Models: A Review. In *Sustainability* (Vol. 11, Issue 6). https://doi.org/10.3390/su11061663

Ong, H.-B., Wasiuzzaman, S., Chong, L.-L., Choon, S.-W., MENON, N., Raharja, S. J., Muhyi, H. A., Herawaty, T., Gulati, V. P., Srivastava, S., Chen, L., Ruddy, L., Box, S., Gonzalez, J. L., Widjojo, R., Alzoubi, H. M., Alshurideh, M. T., Kurdi, B. Al, Alhyasat, K. M. K. K., … Ahmad, F. salam. (2022). Formulasi Model Bisnis Hostel di Bandung dengan Pendekatan Value Chain dan Business Model Canvas (Studi Kasus: Pinisi Backpacker). *Heliyon*, *8*(1), 32–38. https://doi.org/10.1016/j.heliyon.2022.e09142

Osterwalder, A., Pigneur, Y., & Tucci, C. L. (2005). Clarifying Business Models: Origins, Present, and Future of the Concept. *Communications of the Association for Information Systems*, *16*. https://doi.org/10.17705/1cais.01601

Porras, I., Mohammed, E. Y., Ali, L., Ali, M. S., & Hossain, M. B. (2017). Power, profits and payments for ecosystem services in Hilsa fisheries in Bangladesh: A value chain analysis. *Marine Policy*, *84*(June), 60–68. https://doi.org/10.1016/j.marpol.2017.06.031

Porter's, V. C. M. (1985). What Is Value Chain. *E-Commer.*, 1–13.

Porter, M. E. (2001). The value chain and competitive advantage. *Understanding Business Processes*, *2*, 50–66.

Purcell, S. W., Crona, B. I., Lalavanua, W., & Eriksson, H. (2017). Distribution of economic returns in small-scale fisheries for international markets: A value-chain analysis. *Marine Policy*, *86*(June), 9–16. https://doi.org/10.1016/j.marpol.2017.09.001

Pramudita, S. A. (2018). Formulasi Model Bisnis Hostel di Bandung dengan Pendekatan Value Chain dan Business Model Canvas (Studi Kasus: Pinisi Backpacker). *ISEI Business and Management Review*, *II*(1), 32–38.

Tan, G. N. D. (2021). A Business-Model Approach on Strategic Flexibility of Firms in a Shifting Value Chain: The Case of Coffee Processors in Amadeo and Silang, Cavite, Philippines. *Global Journal of Flexible Systems Management*, *22*(1), 17–28. https://doi.org/10.1007/s40171-020-00255-5

Teece, D. J. (2010). Business Models, Business Strategy and Innovation. *Long Range Planning*, *43*(2–3), 172–194. https://doi.org/10.1016/J.LRP.2009.07.003

Walters, D., & Lancaster, G. (2000). Implementing value strategy through the value chain. *Management Decision*, *38*(3), 160–178. https://doi.org/10.1108/EUM0000000005344

Wang, X., Sun, Y., & Peng, B. (2023). Industrial linkage and clustered regional business cycles in China)'. *International Review of Economics and Finance*, *85*(August 2021), 59–72. https://doi.org/10.1016/j.iref.2023.01.002

Wang, Y., & Wang, N. (2021). Exploring the role of the fisheries sector in China's national economy: An input–output analysis. *Fisheries Research*, *243*(July), 106055. https://doi.org/10.1016/j.fishres.2021.106055

Wang, Z., & Zhu, S.-J. W. K. (2018). Quantifying International Production Sharing At the Bilateral and Sector Levels. *NBER Workign Paper Series*, *19677*(8).

Wei, W. W. S. (2013). *Time series analysis*.

Wijayanto, D., Setiyanto, I., & Setyawan, H. A. A. (2020). Bio-economic model of Danish seine and purse seine fisheries in Rembang Regency, Indonesia. *Egyptian Journal of Aquatic Research*, *46*(1), 63–70. https://doi.org/10.1016/j.ejar.2019.11.001

Wubet, G. K., Zemedu, L., Tegegne, B., Kindu, G., Zemedu, L., Tegegne, B., Wubet, G. K., Zemedu, L., & Tegegne, B. (2022). Value chain analysis of potato in Farta District of South Gondar Zone, Amhara National Regional State of Ethiopia. *Heliyon*, *8*(3), e09142–e09142. https://doi.org/10.1016/j.heliyon.2022.e09142

Yang, T.-Y., Lin, H.-C., & Liu, W.-H. (2022). The Fishery Value Chain Analysis in Taiwan. *Fishes*, *7*(3), 114. https://doi.org/10.3390/fishes7030114