Indonesian coffee exports and its relation to global market integration

Fitriani[1]*, Bustanul Arifin[2], and Hanung Ismono[2]

[1]State Polytechnic of Lampung, Indonesia
[2]University of Lampung, Indonesia

*Correspondence email: fitriani@polinela.ac.id

ABSTRACT

Coffee price is an important indicator that stimulates farmers to advance their welfare. Unfortunately, coffee crisis makes the farm gate price uncertain and volatile. This study aims to explore the Indonesian coffee export situation related to price risks and coffee market integration between Indonesian coffee price and international price. The time series data were the coffee price from 1987 to 2014 in Indonesian domestic market and in global trade in London. Vector Error Correction Model (VECM) approach was applied to test market integration based on Ravallion's equation. Based on the analysis, the results of the study revealed that Indonesian coffee export performed progressively in the last decade. Export destination countries for Indonesian coffee also developed broadly. There was market integration on the Indonesian coffee market and global price in the London terminal. Although not fully, the shock in the international price was somehow felt in the Indonesian coffee market. There were sufficient shreds of evidence to conclude that the Indonesian coffee market is well integrated with the international market in the long run. The changing coffee price in Indonesia and the International market adjusted in the next three years. In short term, Indonesian coffee price was 76% influenced by international price changes, but not vice versa.

INTRODUCTION

The global economic condition has been broadly driven by international trade which is considered an important source of income in developing countries. Coffee is one of the valuable international trade commodities across countries. The cash crop coffee trade involves many countries as producers, industries, global chains, and consumers. Dominantly, in consumer countries, global coffee chains have extended rapidly. Consumers do not only justify on quality of material but typically emblematic on quality and in-person services as a lifestyle manifestation.

Global coffee industry wave achieves a highly successful, high-quality, customer-centric, and sustained coffee business that meets the desires and needs of today's demanding and knowledgeable coffee drinkers. In the European Union in 2018, the share of coffee consumption had the highest growth include France (32% of all coffee consumption), the Netherlands (31%), and Belgium (27%). The leading countries in Europe are Germany, France and Italy (CBI, 2020). The increasingly sustainable coffee certification consumption also becomes a global trend. Consumers' willingness to pay premium prices to

obtain organic products, which can be viewed as the cost of investment in human health, is encouraging (Mengistie, 2020).

The essential characteristics of the global coffee chain in the last 40 years can be described with two broad historical periods: the International Coffee Agreement (ICA) regime (1962-89) and the post-ICA regime (1989–present). The post-ICA regime exhibits calls a "buyer-driven" chain, specifically labeled as a "roaster-driven" chain. The processes of a commodity supply chain need to understand its internal and external relations with each of its members and accept the positive effects of the supply chain integration in the operational performance of a company (Ramos et al., 2019). The liberalization of the coffee industry has started competition among members. The appearance of a global coffee chain with voluntary regulatory systems excess coincided with the coffee crisis (Muradian & Pelupessy, 2005). Important changes in the governance and institutional arrangement of the coffee commodity chain have been the reasons for explaining the coffee paradox. The coffee paradox is the coexistence of a 'coffee boom' in consuming countries and a 'coffee crisis' in producing countries. When the international coffee prices falls dramatically, the producers receive the lowest prices in decades. Thus, the exporter countries are still poor and of low income. Social accountability has been applied in various forms of effective interactions between the community and village government. Many efforts are required to improve the quality of human resources through more stakeholder engagement, training activity, and community empowerment (Zeho et al., 2020).

The global coffee chain has changed dramatically as a result of deregulation, new consumption patterns, and evolving corporate strategies. Disaggregation embedded in a network of activities controlled by global firms changes the structure of production, trade, and consumption of commodities (Lee et al., 2012). Global Value Chains (GVC) analysis emerges. 'Value chains' requires coherent link on input supply, production, trade, and consumption explicitly. GVCs lead to the relationship between the level of coordination and strength asymmetry indirectly. The formulation of the success of production standards is steered by the market. Given the vertical nature of these markets, they are most appropriately characterized by successive oligopoly and or oligopsony.

Indonesian coffee has been getting famous and commercially classified as an agricultural commodity since its first export in 1711. It is the most outstanding commodity in international transactions, as well as the domestic supply, in terms of quantity and value. The major suppliers are located in developing countries and the major customers are the developed countries, where coffee demand is concentrated (de Almeida & Vegro, 2020). Global coffee establishment was well before the first outbreak of rust in Ceylon (Sri Lanka) in 1869 (Igo, 2020). Nowadays, Indonesia is the fourth biggest coffee producer in the world with Brazil, Vietnam, and Colombia. Coffee production within 2014—2018 in average amount was 662.75 thousand ton per year and 70% of it was exported. Coffee production was mostly cultivated by smallholder farmers (95.45%). Robusta coffee was more dominantly produced than arabica coffee, reaching 72.66%. The estimation of Indonesian coffee production in 2020-2024 is 777.73 thousand tons of coffee beans with the increasing growth of 1.36% per year (BPS, 2019). Almost half of the coffee trade in the EU is dominantly controlled by some Indonesian importers: Nestlé (Switzerland), DE Masterblenders (the Netherlands), Tchibo (Germany), Lavazza (Italy), Aldi (Germany), and Segafredo (Italy) (Simamora, 2014). This relationship forms a vertical integration between roasters and international traders.

Globally, ICO noted that coffee export supply is higher than that of the world coffee consumption in 2017-2018. This is contrary to the situation in 2018-2019, where the world coffee consumption was higher than its production (Figure 1).

The changing global coffee supply is linked with the cyclical coffee production pattern in the coffee producer. Mostly it is the global climate change that disturbs the production situation. The data remains a prior work on exchange rate pass-through and export supply curves (Amiti et al., 2019). On the other hand, coffee consumption raised in 2020 after the decline in 2019. When the consumption was higher than production, the farm gate price has an opportunity to have a better price. Global coffee price also depends on consumers' country lifestyle. It links with the trend of sustainable coffee with certification commodities platform (buyer's driven). The coffee market will most likely keep adapting itself to satisfy such changes. Consumer behavior will certainly continue to change. The whole chain currently generates thousands of jobs across the globe, and the potential for new consumers

to begin purchasing and drinking coffee is enormous (de Lima et al., 2019). Furthermore, the coffee price in domestic producer region and global tends to be dynamic and volatile (Figure 2).
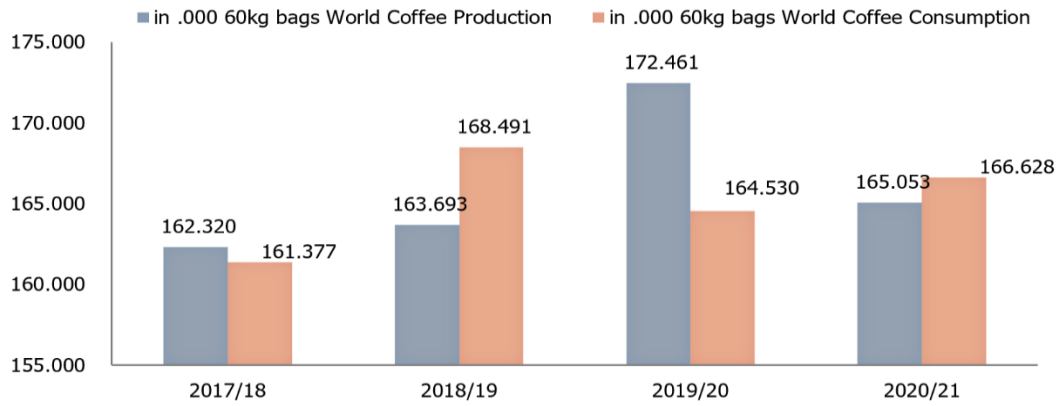

Figure 1. World coffee production and consumption (ICO, 2021)
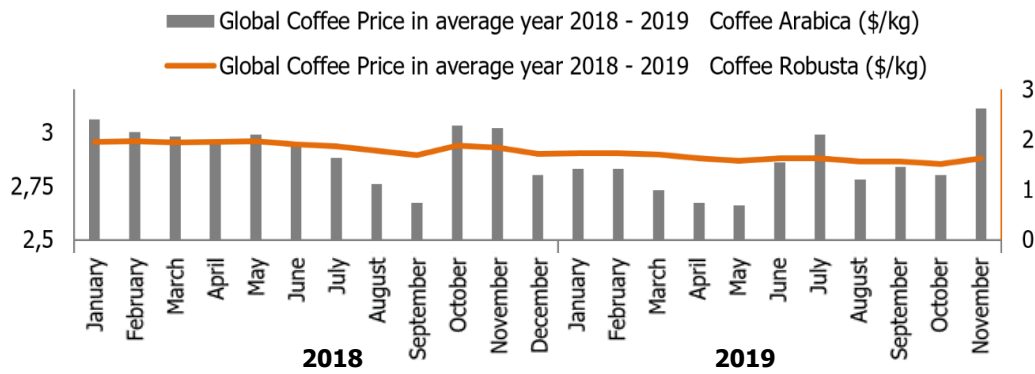

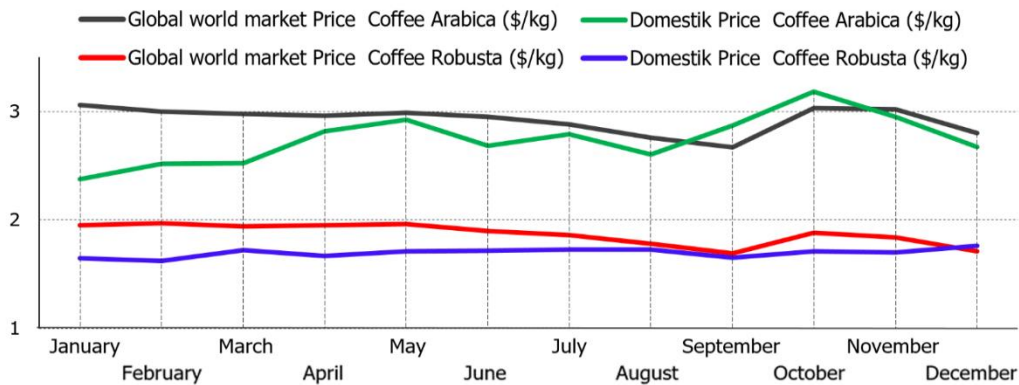Figure 2. World coffee price 2018-2019 (ICO, 2021)

Figure 3. Global and Indonesia's coffee price, 2018 (BPS, 2019; ICO, 2021)

Coffee as a tradable commodity has high volatility in price (Suyamto and Noordwijk, 2004). Uncertainty and the volatility of Indonesian coffee prices reflected by the variations for prices have been experienced by coffee producers in Indonesia, different from the prices paid by consumers in the developed countries. Coffee price in East Java is only valued between 4.8 to 24.2% of the retail price in the importing countries. Coffee price in Lampung is much lower, only about 1.2 to 7.5% of the retail price in the importing countries (Hutabarat, 2006).

The price of both robusta and arabica coffees at the farm gate in Indonesia tends to fluctuate compared to the global price (Figure 3). Arabica's price tends to fluctuate more than robusta's. There is a wide disparity of price between arabica and robusta.

Price is an important indicator for farmers as an incentive for their production (Stigler, 1987). Price is a key to better income and improving coffee grower's welfare. Even though coffee bean prices in Indonesia is quite low, there is a strong relationship between the coffee industry in Western Europe and the one in Lampung, and a less stronger one between that and the one in Jawa Timur (Hutabarat, 2006).

The dynamic movement of global coffee price is linked with the coffee farm gate at the farmers' level. Previous studies about coffee farmer's income in the production center in West Lampung revealed that the income from coffee farming (Incamilla et al., 2015) was lower than Lampung's regional minimum wage standard. This fact shows that smallholder's coffee farming is not economically sustainable yet. Coffee farmers face poverty and are still underdeveloped.

Vulnerability on coffee prices can reduce farmer's motivation to improve their coffee farming. In many producer countries, farmers are concerned with price stability and access to market information, because constraints in the coffee market evoke high exposure to risks. During the past two decades, the "coffee crisis" has threatened the social structure of communities that rely heavily on coffee cultivation for their livelihood. The crisis was more severe in Vietnam than in Columbia. The change in commodity prices affected land-use decisions on farms, and the environmental services they provide (Li, 2013; Haggar et al., 2013).

Based on the importance of prices for the welfare of coffee farmers, this research seeks to find out such issues as (1) How does the Indonesian coffee export situation deal with price risks? (2) How does Indonesian coffee export progress in the last two decades and contribute to farmer's welfare? and (3) How does the relationship between coffee prices in Indonesia and global prices?

The study of market integration will inform the phenomenon of the price disparity between producers and consumers. It has been exposed through several studies, among which is Pioneer publication's in spatial market integration that belongs to Ravallion (1986). Therefore, this study focuses on the Indonesian coffee situation due to market connection or integration with global trade. This deals with the Indonesian coffee export situation related to global market participation. Beside that, the study investigates the Indonesia coffee market condition to pursue market integration with global trade (London terminal). This information will be meaningful to improve the coffee market structure at the local and regional levels.

RESEARCH METHOD

The spatial market integration in agriculture commodities is commonly measured by static price correlations. Yet, a dynamic model can also be advantageous through which one can distinguish between the concepts of instantaneous market integration and the less restrictive idea of integration as a long-run target of the short-run dynamic adjustment process. An influential change in spatial market integration literature by using an error correction model which allowed autocorrelation problems distinguishes long and short-run dynamics and seasonal components for spatial price differentials (Ravallion, 1986). The prices of a commodity in two markets are equal and their co-movement is perfect, and when markets are integrated, price changes in a market will be transmitted to the other market on a one-for-one basis. The basic simple bivariate form is tested by estimating (Eryigit & Karaman, 2011):

$$P_{it} = \beta_1 + \beta_2 P_{jt} + \varepsilon_t) \qquad \ldots\ldots\ldots \quad (1)$$

where P_{it} and P_{jt} are the logarithms of the prices in the region i and j respectively. The satisfaction of restrictions $\beta_1 = 0$ and $\beta_2 = 1$. Estimating an equation of the above form, however, can lead to spurious regression problems, since regressions of price levels necessitate that the price series be stationary. The most common approach is to take first the differences of all non-stationary variables before specifying the model. Time-series data may trend over time, i.e.,

stochastic trends, a spurious regression might exist in the presence of non-stationary variables. In this situation, the method of co-integration can provide a better way to test a more general notion of market integration.

Suppose that trade is infinitely costly between two market locations but that the time series of prices at the two locations are synchronously, identically, and linearly affected by another variable, in term of good trade in a common market or a shared dynamic seasonal structure in production, then one can readily express price in one market as a linear function of price in the other market, with slope unity, even though the markets are segmented. Measurement of market integration can be viewed as basic data for an understanding of how specific markets work (Ravallion, 1986).

Unit root test analysis is the first step to estimate the model. Augmented Dickey-Fuller tests were conducted to verify stationary or presence of unit root in the individual series of the model. The next step was cointegration tested by Johansen criteria. An obvious procedure estimated a Vector Error Correction Model (VECM) on the difference series to define the lag order for the data analysis. The coffee market integration model adopted the spatial market structure by Ravallion (1986). The model is summarized as follows.

$$P_1 = f_1 (P_2, P_3, ...P_N, X_1) \qquad .... \ (2)$$
$$P_i = f_i (P_1, X_1) \quad (i= 2, ... N) \qquad .... \ (3)$$

with X_i (i=1, ..., N) a vector of other influences on the local market. The function f_1 (i=1, ...N) can be thought of as a solution of appropriate conditions for market equilibrium. Considering the dynamic effect can arise from several conditions underlying behavioral relations, the econometric model of the T-period series of the price of N region was assumed:

$$P_{1t} = \sum_{j=1}^{n} a1j \ P1t - j + $$
$$\sum_{k=2}^{N} \sum_{j=0}^{n} bk1j \ Pkt - j \qquad .... \ (4)$$

$$P_{it} = \sum_{j=1}^{n} aij \ Pit - j + \sum_{j=0}^{n} bij \ P \ 1t - j + $$
$$Xit \ ci + e \ it \qquad .... \ (5)$$

The e's were appropriate error processes and the a's, b's, and c's were fixed.

The following hypotheses usually are testable:
1. Market segmentation (bij = 0; (j= 0, ..., n))
2. Short-run market integration (bio = 1)

3. Long-run market integration (bio = 1);
    Consider that the equation (5) taken when $P_{it} = P^*_i$, $P_{it} = P^*_t$, and eit = 0 for all t, then

$$P^*_t = \frac{\sum_{j=0}^{n} bij \ + Xit \ ci}{1- \ \sum_{j=1}^{n} aij} \qquad .... \ (6)$$

Under long-run integration, equation (6) can be written:

$$\Delta Pit = (ai1 - 1)(P1t - 1 - P1t - 1) + $$
$$\sum_{j=2}^{n} aij \ (Pit - j - p1t - j) \ + \ bi0 \ \Delta Pit + $$
$$\sum_{j=1}^{n=1}(bi0 - 1 + \sum_{k=1}^{j} aik \ + \ bik) \Delta P1t - $$
$$j + Xit \ ci + eit \qquad ..... \ (7)$$

P_{1t} and P_{1t-1} were coffee prices in Indonesia as a producer at t and t-1 time; P_{2t} and P_{2t-} were coffee prices at the London terminal market at t and t-1 time; Xt was dummy coffee crisis in Indonesia; bi was regression coefficient, and it was an error term.

The research scope study was time series of annual data on a coffee price for the period from 1987 to 2014. The range of studies considered the completeness data of Indonesian coffee prices in farm gate and London terminal (ICO, 2018). The data source was ICO and Indonesia Statistical Bureau. Time series coffee price was in Indonesia as domestic market and global trade in London.

RESULT AND DISCUSSION

Coffee Market Situation

Totally 95% of world coffee production is produced by countries member of the International Coffee Organization (ICO). Brazil and Vietnam contributed more than 44.1% of ICO total production (Table 1). Vietnam has the highest growth as an exporter and also has coffee export competitiveness in the ASEAN market (Sinta, Alamsyah, & Elwamendri, 2017). Indonesia contributed 6.4% of the coffee production share in the global market. It was decreased compared with 2013 which was 8.6%.

Global coffee production in 2019/2020 decreased compared to 2016-2018 (Table 2). Arabica coffee production decreased by 5% to 95.99 million bags, while that of Robusta rose by 1.9% to 73.36 million bags. World coffee consumption decreased by 2.35% in 2018 and rose to 1.28% in 2019, and then there was a coffee deficit in 2019. World coffee exports in the world in January 2021 reached 10.21 million bags. Exports in the first 4 months of the coffee year of

2020/21 (Oct 20 to Jan 21) increased by 3.7% to 41.88 million bags compared to 40.38 million bags in the same period in 2019/20. The Covid-19 pandemic continues to put pressure on the global economy and greatly limits out-of-home coffee consumption in 2020.

Indonesian coffee export attained 49% from national coffee production in 2019 which was equal to 359.053 thousand tons with an export value (US$.000) 883.183 (Figure 4). Net export value of coffee in 2019 attained (US$.000) 816.938. The decrease in coffee export was mainly caused by the inefficient coffee production line facade on the coffee farming level and the exogenous factor of climate change. Indonesian coffee farming was characterized by smallholder farming (94%). Mostly, they still showed low productivity, low income, and poverty because of limited access to technology, credit, and the market. Hence, the coffee quality and value addition in coffee processing from small farmers is in Indonesia need to develop further.

Based on the kinds of product, export was dominated by coffee beans (80%), instant coffee (19%), roasted coffee (1%), and coffee extract. Indonesia coffee export destinations are mainly to Europe and Asia. The European market was mainly traded by international roaster corporations (Table 4). The US and Africa have become important to market recently. The demand for Indonesian coffee beans in the US is influenced by row coffee prices. Indonesian coffee is elastic in the main importing countries of the US, Japan, and Germany. Based on the cross elasticity value of Indonesian coffee is inelastic, , Indonesian coffee is complementary to Vietnamese coffee in the US market, while in Japan and Germany the market it is substitutable (Manalu, Harianto, Suharno, & Hartoyo, 2020). Market destination diversification is prior. Diversification of the market destination and commodity composition is necessary to increase the export of processed coffee (Kustiari, 2007).

Table 1. Global Coffee Producer, 2013-2017

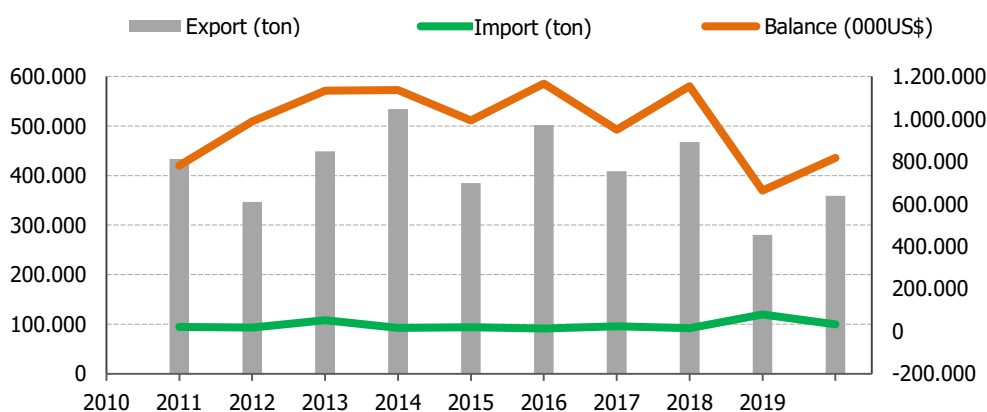| No	Country	2013	2014	2015	2016	2017	Average	Share	Cumulative Share
		.... ton						%	%
1	Brazil	1,699,147	1,986,506	2,005,034	1,823,886	1,647,811	1,832,477	25.36	25.36
2	Vietnam	1,306,503	1,400,000	1,229,596	1,400,000	1,434,452	1,354,110	18.74	44.11
3	Colombia	543,685	619,108	713,060	734,689	712,542	664,617	9.20	53.31
4	Indonesia	532,157	382,774	499,651	412,529	485,931	462,608	6.40	59.71

Source: ICO (2021)

Figure 4. Indonesian coffee export-import 2010-2019 (Dirjenbun, 2019)

Tabel 2. The Global Coffee Production and Consumption, 2016-2020

Year	Production	Growth	Consumption	Growth
	000 60 kg	%	000 60 kg	%
2016/17	162,320		161,377	
2017/18	163,693	0.85	168,491	4.41
2018/19	172,461	5.36	164,530	-2.35
2019/20	165,053	-4.30	166,628	1.28

Source: ICO (2021)

Table 3. Export-Import Value of Indonesian coffee 1980-2019

Year	Export	Import	Balance
	ton	ton	000 US$
2010	433,595	19,755	779,459
2011	346,493	18,108	987,552
2012	448,591	52,645	1,132,345
2013	534,023	15,800	1,135,191
2014	384,816	19,111	992,573
2015	502,021	12,462	1,166,243
2016	408,838	23,634	949,588
2017	467,790	14,221	1,153,304
2018	279,961	78,847	662,011
2019	359,053	32,102	816,938

Source: Dirjenbun (2019)

Indonesian Coffee Market Integration

Time series variables are faction from random and stochastic processes. Stationery data need to run the regression for time series analysis. Time series data are often confined in non-stationary conditions. The consequence makes the regression spurious. The unit root test developed by Dickey-Fuller was one of the robust tools to detect the stationery data. Integration market analysis involved time series data prices at the domestic and global levels. The results of the unit root

test to data coffee price are shown in Table 5. Price coffee data were placed at first differentiation.

Table 4. Export Destination Country of Indonesian Coffee, 2019

No,	Country	Export Volume	Export value	Share of Export Volume
		ton	000 US$	%
1	USA	58,672	253,872	16.34
2	Malaysia	36,895	62,937	10.28
3	Italy	35,452	60,355	9.87
4	Egipt	34,287	59,057	9.55
5	Japan	25,594	68,572	7.13
6	Great Britain	18,924	38,234	5.27
7	Germany	18,452	44,911	5.14
8	Belgium	16,260	44,759	4.53
9	India	12,579	15,518	3.50
10	Georgia	12,230	20,064	3.41
11	Russia Fed	11,106	17,334	3.09
12	Marocco	9,664	16,275	2.69
13	Singapura	8,723	27,881	2.43
14	Vietnam	7,222	11,273	2.01
15	Spain	5,546	9,256	1.54
	Others	47,448	132,826	13.21

Source: Dirjenbun (2019)

The next step after data placement was to detect cointegration between both coffee prices. The cointegration test is important to determine a kind of (Vector Auto Regression) system. VECM (Vector Error Correction Model) was used in non-structural VAR when data stationed at first differentiation and there was cointegration linkage. Johansen cointegration was applied to test the price variable cointegration. Based on the Johansen cointegration test performed (Table 6), there was a trace 1 cointegrating equation at the 0.05 level.

Table 5. Unit Root Test of Coffee Price

Level	Equation Test (trend and intercept)	ADF Stat	Critical Value		p-value
PF	Level	-0.050067	0.01	-3.699871	0.9454
			0.05	-2.976263	
			0.10	-2.627420	
	First differentiation	-4.606870	0.01	-3.711457	0.0012*
			0.05	-2.981038	
			0.10	-2.629906	
PR	Level	-1.444955	0.01	-3.699871	0.5454
			0.05	-2.976263	
			0.10	-2.627420	
	First differentiation	-5.085010	0.01	-3.711457	0.0004*
			0.05	-2.981038	
			0.10	-2.629906	

*) stationer at a significant 0.05 level
PF = Indonesian coffee price
PR = International trade price represent in London terminal market

Table 6. Johansen Co-integration Test

Coffee price cointegration			
Rank	Eigenvalue	Trace statistic	0.05 critical value
r=0	0.461598	23.06663	18.39771
		Max Eigen statistic	0.05 critical value
		16.0971	17.14769

Trace test indicates 1 cointegrating equation(s) at the 0.05 level

Based on the test results, the trace test indicated the cointegration equation at a 0.05 level. At the same time, the maximum Eigenvalue test also indicated that there is one cointegration. This fact reveals the notices that both trace test and Max–eigenvalue test agree that there was cointegration on the coffee prices in Indonesian and the international market. It means that there is a long-term relationship between the coffee prices in producer countries (Indonesia) and International prices at the London terminal. For centuries, Indonesian coffee has been exported, so the price policies decided by those markets will affect the coffee prices in the domestic market. The cointegration implies an existence of a linear long-term relationship between the non-stationary variables. Hence, co-integration tests for market integration only assess whether there is a statistically significant linear long-run relationship between different price series. The existence of this relationship provides a shred of evidence for market integration (Eryigit & Karaman, 2011).

After the positive cointegration was detected, VECM was applied to determine the short-run and long-run integration market. VECM can expose the dynamic equilibrium relationship of short-run and long-run in a system of equations. VECM regress changes in the price variable fell behind the deviation of long-run equilibrium relationship and also lag deviation of prices in the short-run period. Deviation from equilibrium, as the reflection coefficient by VECM, will bring changes to the balance between these co-integrated variables (Enders, 2008). The top display informed the long-run integration market (Table 7).

Based on the VECM result, it is shown that the first row in the second part presented the estimation of the speed of adjustment coefficient for each variable, the second was standard errors and the third was t-statistics. The equation of coffee market integration in the long-run term performed is as follows.

$$D(LOG(PF)) = 0.238296055721*(\ LOG(PF(-1)) + \\ 2.536055449*LOG(PR(-1)) + \\ 3.33150746545*CR(-1) - 22.5192739029$$

The estimated VECM suggested that the adjustment process was relatively fast about 24% of the divergence from the notion of long-run equilibrium being corrected each year. The changing prices transmitted contemporaneously to the producer price, although just partly. Granger causality test for long-run indicated that the changing price, not vice versa to Indonesia coffee price.   Then, asymmetric adjustment to the long-run equilibrium appeared doubtful. It suggested that the increases and decreases in the international coffee price are passed through similarly and symmetrically to the Indonesian coffee market.

Positive trade flows are sufficient to demonstrate spatial market integration under the traceability standard. But prices do not need to be equilibrated across markets (Barrett, 2005). Economic analysis of internationally traded commodities would gain much from explicitly incorporating market structure (Igami, 2012). The equation of short-run integration of coffee market could be formulated as below:

$$D(LOG(PF)) = - 0.765610412455*D(LOG(PF(-1))) - \\ 0.610587811297*D(LOG(PF(-2))) - \\ 0.621824452781*D(LOG(PF(-3))) + \\ 0.362988669231*D(LOG(PR(-1))) - \\ 0.176060193261*D(LOG(PR(-2))) - \\ 0.804352441602*D(LOG(PR(-3))) - \\ 0.794881960484*D(CR(-1)) - \\ 0.868618531214*D(CR(-2)) - \\ 0.633327166545*D(CR(-3)) + \\ 0.202062846843$$

Based on the ECT (0.2020), it can be implied that 20.20% inappropriate price of coffee in Indonesian and international coffee would be adjusted in three years. The parameter ΔPft was estimated to be equal to 0.76, suggesting that shocks in the international price directly, although not fully, passed through the domestic market. Finally, there is sufficient evidence to conclude that the Indonesian coffee market is well integrated with an international market in the long run. Price signals are also transmitted in the short run.

On the other hand, lag differenced terms are also estimated to be negative, reflecting a somewhat complex short-run dynamic.

Table 7. Vector Error Correction Estimates

Cointegrating Eq:	CointEq1		
LOG(PF(-1))	1.000000		
LOG(PR(-1))	2.536055		
	(0.46213)		
	[5.48777]		
CR(-1)	3.331507		
	(0.34047)		
	[9.78503]		
C	-22.51927		
Error Correction:	D(LOG(PF))	D(LOG(PR))	D(CR)
CointEq1	0.238296	-0.282338	-0.300985
	(0.19832)	(0.10488)	(0.11911)
	[1.20158]	[-2.69208]	[-2.52684]
D(LOG(PF(-1)))	-0.765610	0.338370	0.344950
	(0.28006)	(0.14810)	(0.16821)
	[-2.73377]	[2.28469]	[2.05072]
D(LOG(PF(-2)))	-0.610588	-0.013293	0.314934
	(0.24072)	(0.12730)	(0.14458)
	[-2.53646]	[-0.10442]	[2.17820]
D(LOG(PF(-3)))	-0.621824	0.161744	0.472912
	(0.25124)	(0.13287)	(0.15090)
	[-2.47500]	[1.21735]	[3.13389]
D(LOG(PR(-1)))	0.362989	0.787496	0.109432
	(0.56881)	(0.30080)	(0.34164)
	[0.63816]	[2.61797]	[0.32031]
D(LOG(PR(-2)))	-0.176060	0.363508	0.207971
	(0.54976)	(0.29073)	(0.33020)
	[-0.32025]	[1.25034]	[0.62984]
D(LOG(PR(-3)))	-0.804352	1.062022	0.053035
	(0.51274)	(0.27115)	(0.30796)
	[-1.56875]	[3.91671]	[0.17221]
D(CR(-1))	-0.794882	0.741491	0.443484
	(0.48350)	(0.25569)	(0.29040)
	[-1.64400]	[2.89993]	[1.52712]
D(CR(-2))	-0.868619	0.579119	0.382197
	(0.40244)	(0.21282)	(0.24171)
	[-2.15840]	[2.72115]	[1.58120]
D(CR(-3))	-0.633327	0.638573	0.258646
	(0.36664)	(0.19389)	(0.22021)
	[-1.72740]	[3.29350]	[1.17454]
C	0.202063	0.029273	-0.099367
	(0.09121)	(0.04823)	(0.05478)
	[2.21536]	[0.60688]	[-1.81384]
R-squared	0.638191	0.630398	0.730960
Adj. R-squared	0.359876	0.346089	0.524006
Sum sq. resids	2.206273	0.617014	0.795911
S.E. equation	0.411963	0.217859	0.247435
F-statistic	2.293056	2.217299	3.531989
Log likelihood	-5.413536	9.876476	6.821335
Akaike AIC	1.367795	0.093627	0.348222
Schwarz SC	1.907736	0.633568	0.888163
Mean dependent	0.120697	0.030679	-0.041667
S.D. dependent	0.514904	0.269412	0.358641
Determinant resid cov. (dof adj.)	0.000288		
Determinant resid covariance	4.58E-05		
Log-likelihood	17.71885		
Akaike information criterion	1.523429		
Schwarz criterion	3.290510		

Cr: Indonesian coffee crisis period

International price and coffee crisis variable had significant to Indonesian coffee price. The coffee crisis that happened in the past also influenced the Indonesian coffee price. The coffee crisis in Indonesia hit coffee farming starkly. Many farms changed from coffee into other commodities. This is the reason why lag 3 is used for the analysis because the coffee plant needs at least 3 years for its first harvest. The coffee crisis included the drastic decrease of coffee price globally which then affected the domestic price. The domestic farmers responded by changing the coffee plant to other commodities broadly or having failure in production because of pest and disease, drought, flood, and other environmental risks. If there was a crisis shock on Indonesian coffee, there would be changes in domestic coffee price. Coffee price in the Indonesian market was significantly influenced by three-year lag time price. The same situation also happened to international coffee price and coffee crisis variables.

The phenomenon also happened at the global grain market. The changes in the world prices transmitted to the domestic prices are relatively low both in the short run and in the long run, and that adjustment to the new equilibrium following a shock is slow (Ozturk, 2020). Changes in coffee productivity and prices appear to be linked with multiple factors including local market reform, a greater presence of public extension agents, high international prices, and a push for certification by international buyers (Minten et al., 2019). Social innovation based on the collaboration of different actors and the integration of the coffee production chain will promote the social and economic development of the community (Agostini et al, 2020)

The main problem with threshold models of spatial market integration is that in the absence of information on transfer cost, the estimation procedure is rather complicated, particularly with two thresholds. To overcome this problem, outside information on transfer costs is used to formulate a threshold variation of Ravallion's well-known dynamic model of spatial market integration (Ravallion, 1986). Response impulse analysis is used to profound the VECM interpretation. This analysis traces the response of endogenous variables in the VAR system toward shocks or changes in disturbance variables (e). Response impulses for coffee market integration are relayed in the picture below.
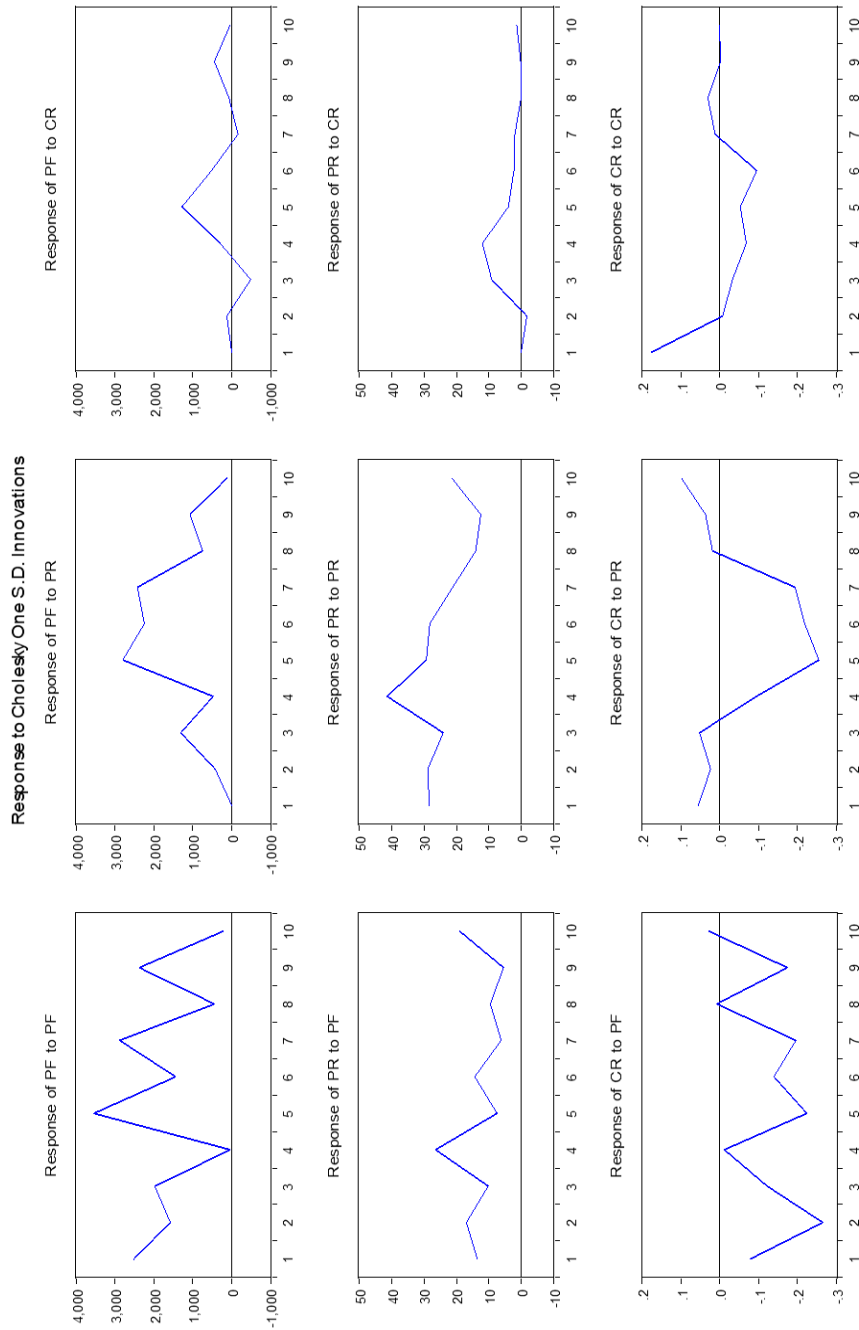
Figure 5. Response impulses for coffee market integration

The top layer performed response of Log PF toward shock in LOG PR and Log Cr. Shock caused by the increasing international coffee price tended to be followed by increasing Indonesian coffee price sharply for 10 years forward. On the other hand, the coffee crisis shocks affected Indonesian coffee price relatively smoothly for 10 years forward. International coffee price impulse response toward Indonesian coffee price performed sharper than a coffee crisis for 10 years forward. Some previous researches informed that a few producers have the means required to successfully achieve profitable and long-term market integration. The opportunity for the biggest and best-connected producers is necessary to exacerbate asymmetries inside peasant smallholders farming communities and weaken producers' cooperatives (de la Vega-Leinert, Brenner, & Stoll-Kleemann, 2016). There is strong evidence of the link between the coffee price in the European coffee industry and that in Lampung farm gate as reported by Hutabarat (2006).

Research Implication

Based on the analysis, the implication of this research focuses on the following issues. The integration of commodity markets is very important in determining an equitable value chain for all business actors involved in it. An integrated market shows that the information transmission that occurs at the consumer market level is dispersed as information on commodity prices at the producer level. The difference in the results of the market integration index in the short and long term is important to consider in the policy of strengthening coffee farmers as the upstream commodity supply chain. Global corporations that drive vertical business value chains are important in ensuring that their business practices do not come at the expense of smallholders. Interconnections between actors in the business chain need to be built and intensively communicate various programs to ensure the sustainability of quality coffee supplies from farmers.

Price is the main incentive for farmers. The threat of price fluctuations that tend to harm farmers can be the reason for switching to other commodities that can threaten the sustainability of coffee supplies.

Market price volatility can threaten sustainable coffee, especially at the farm gate. The producer will severely restrict the ability to pursue social, environmental, and economic development.

Improving predictability and stability for producers, exporters, and consumers alike through contractual arrangements for promoting sustainability among producers is necessary. The contractual arrangements with an integrated approach addressing basic economic issues within the context of other production and trading practices are essential to provide a reference point for all players along the supply chain, especially enhance producer autonomy. Asymmetric information on the actions of other players within the coffee market usually lying between producers, policymakers, roasters, and even consumers. Minimum protectionist policies and lower levels of government intervention increase the domestic market integration with the international market (Ozturk, 2020). For producers to successfully reap the benefits of the international market, they must have dependable, understandable, and up-to-date market information as well as information on efficient strategies for adjusting to market-changing market conditions (Schuller et al., 2008).

Therefore, coffee business value chain actors (form trade collector, roasting industry, intermediary trader, manufactured industries, and exporter) starting from a local and regional scale need to build and develop the institutional capacity of partnerships, especially in mutual- hubs corporation with coffee farmers. The presence of corporate institutions at the coffee farmer level is needed to capitalize on farming capital, increase market access and price guarantees, to sustain the supply chain capacity in the national to the global coffee business value chain.

Changes appear to be linked with multiple factors including local market reform, a greater presence of public extension agents, high international prices, and a push for certification by international buyers. On the other hand, a combination of production (lack of improved seedlings, weather, and disease shocks), as well as institutional issues (saving constraints and lack of vertical integration and traceability), have seemingly impeded more widespread uptake of improved practices and therefore better farm performance. The eventually promote higher-value coffee exports, with a better image of the country as a high-quality coffee producer and a national trust-worthy coffee bean classification system will improve Indonesian coffee performance in global buyer sight. The evolution of the coffee consumer profile with

market trends on coffee consumption is important ([de Lima et al., 2019](#)).

The presence of the role of the government as a regulator is needed to provide a business and investment climate in favor of smallholder coffee farmers, especially in access to capital, markets, technology, and institutions. Fulfillment of the farmers' needs-based approach is a priority. Enhance farmer's access to credit and start-up funds for small producers will provide the ability of such producers to enter into such markets. Limitation on access to capital press the ability of producers to adopt strategies towards diversification both along the coffee supply chain as well as into other product areas. The adoption of clear and transparent management practices, combined with the enhanced information on market conditions typically associated with recognized sustainability systems, improves the risk profile of producers, thereby making them more worthy clients for credit.

It is also important to be present in facilitating the improvement of the quality of human resources for farmers through various field school programs and training. The government also should prescribe export and import policies. International trade policy is necessary to enhance the productivity of coffee agribusiness development.

CONCLUSION AND SUGGESTION

Indonesian coffee export performs progressively in the last decade. The export destinations countries for Indonesian coffee also develop broadly. There was market integration on the Indonesian coffee market and global price in the London terminal in the period of 1987-2014. Although not fully, the shock in the international price was somehow felt in the Indonesian coffee market. There was a shred of sufficient evidence to conclude that the Indonesian coffee market is well integrated with the international market in the long run. There was a 20.20% inappropriate coffee price in Indonesia coffee and International coffee will be adjusted in three years. In the short term, 76% of Indonesian coffee price was influenced by international price changes, but not vice versa.

The facts indicate that global coffee price mainly steers the Indonesian coffee market, but this Indonesian market information is not complete yet. The market concentration on vertical integration needs to be explored deeply. Market concentration is

another evidence related to the possibility of asymmetric global coffee price workability.

The integrated transmission of coffee price information at local, regional and global market levels is important information in building a fair coffee business value chain. The "coffee paradox" phenomenon that has emerged due to the contradiction between the condition of coffee farmers with their poverty problem and the condition of consumers who enjoy luxurious coffee needs to be addressed carefully. Farmers as the starting point for coffee production are the weakest actors. Only with systematic and directed efforts with clear indicators of achievement of improvement in farmer welfare can coffee farmers be empowered. Strengthening and increasing the capacity of farmers can be done through the implementation of the principles of corporate share value by corporate stakeholders in the coffee business chain. Increasing the business competitiveness of coffee entrepreneurs must be integrated with efforts to strengthen equitable supply chain lines. Empowered coffee farmers will be able to ensure coffee production according to GAP, handle harvest according to GMP, and have a good bargaining position in price and market negotiations. Thus, coffee farming income increases and farmers are empowered and resilient.

REFERENCES

Agostini, M. R., Bitencourt, C. C., & Vieira, L. M. (2020). Social innovation in Mexican coffee production: filling 'institutional voids.' International Review of Applied Economics, 34(5), 607–625. https://doi.org/10.1080/02692171.2019.1638351

Amiti, M., Redding, S., & Weinstein, D. E. (2019). The Impact of the 2018 tariffs on prices and welfare. The Journal of Economic Perspective, 33(4), 187–210. https://doi.org/10.1257/jep.33.4.187

Barrett, C. B. (2005). Spatial Market Integration. (August), 1–7. The New Palgrave Dictionary of Economics, 2nd Edition, Lawrence E. Blume, Steven N. Durlauf, eds., London: Palgrave Macmillan, Retrieved from https://ssrn.com/abstract=1142520

BPS. (2019). Indonesian Coffee Statistics. Jakarta: BPS Indonesia. Retrieved from https://www.bps.go.id/publication/2020/12/02/de27ead7c1c7e29fd0aa950d/statistik-kopi-indonesia-2019.html

CBI. (2020). What trends offer opportunities or risks in the European coffee market? CBI - Centre for the Promotion of Imports from developing countries. In CBI market information tools. Retrieved from https://www.cbi.eu/node/796/pdf

de Almeida, L. F., & Vegro, C. L. R. (2020). Coffee consumption and industry strategies in Braziel global coffee market: Socio-economic and cultural dynamics. In de Almeida, L. F. & Spers, E. E. (Eds.), Coffee Consumption and Industry Strategies in Brazil (p. 398). Elsevier Inc. All rights reserved. https://books.google.co.id/books?id=7XSvDwAAQBAJ

de la Vega-Leinert, A. C., Brenner, L., & Stoll-Kleemann, S. (2016). Peasant coffee in the Los Tuxtlas Biosphere Reserve, Mexico: A critical evaluation of sustainable intensification and market integration potential. Elementa: Science of the Anthropocene, 4, 000139. https://doi.org/10.12952/journal.elementa.000139

de Lima, L. M., de Pellegrini Elias, L., e Silva, M. M. C. D., da Silva, K. V., & Pacheco, A. S. V. (2019). Behavioral aspects of the coffee consumer in different countries: The case of Brazil. In Coffee Consumption and Industry Strategies in Brazil: A Volume in the Consumer Science and Strategic Marketing Series. https://doi.org/10.1016/B978-0-12-814721-4.00016-0

Dirjenbun. (2019). Statistik Perkebunan Indonesia 2018-2020. Buku Statistik Perkebunan Indonesia, 1–82. Retrieved from https://drive.google.com/file/d/1Ku4Nq8BzEcV4svDw1nV28eeaXqFjltfE/view

Enders, W. (2008). Applied Econometric Time Series. In John Wiley & Sons. https://books.google.co.id/books?id=zvjcxeynHtoC

Eryigit, K. Y., & Karaman, S. (2011). Testing for spatial market integration and law of one price in Turkish wheat markets. Qual Quant, 45(April), 1519–1530. https://doi.org/10.1007/s11135-010-9320-1

Haggar, J., Medina, B., Maria, R., & Sun, I. Á. (2013). Land use change on coffee farms in Southern Guatemala and its environmental consequences. 811–823. https://doi.org/10.1007/s00267-013-0019-7

Hutabarat, B. (2006). Analisis saling-pengaruh harga kopi Indonesia dan Dunia. Jurnal Agro Ekonomi, 24(1), 21–40. http://doi.org/10.21082/jae.v24n1.2006.21-40

ICO. (2018). Monthly data of coffee production. International Coffee Organization. London. Retrieved from http://www.ico.org/

ICO. (2021). Global Coffee Production. International Coffee Organization. London. Retrieved from http://www.ico.org/

Igami, M. (2012). Oligopoly in International Commodity Markets : The Case of Coffee Beans. 1–37. Retrieved from https://economics.yale.edu/sites/default/files/igami-120926.pdf

Igo, S. E. (2020). Figuring the population bomb: gender and demography in the mid-twentieth century: By Carole R. McCann. Environmental History, 25(4), 811–813. https://doi.org/10.1093/envhis/emaa036

Incamilla, A., Arifin, B., & Nugraha, A. (2015). Keberlanjutan usahatani kopi agroforestri di Kecamatan Pulau Panggung Kabupaten Tanggamus. Jurnal Ilmu-Ilmu Agribisnis, 3(3), 260–267. Retrieved from http://jurnal.fp.unila.ac.id/index.php/JIA/article/view/1050

Kustiari, R. (2007). Perkembangan pasar kopi dunia dan implikasinya bagi Indonesia. Forum Penelitian Agro Ekonomi, 25(1), 43-55. https://doi.org/10.21082/fae.v25n1.2007.43-55

Lee, J., Geref, G., & Beauvais, J. (2012). Global value chains and agrifood standards : Challenges and possibilities for smallholders in developing countries. PNAS (Proceedings of the National Academy of Sciences), 109(July), 12326–12331. https://doi.org/10.1073/pnas.0913714108

Li, X. & Saghaian, S. (2013). An empirical comparison of coffee price transmission in Vietnam and Colombia. Agricultural and Applied Economics Association (AAEA) Conferences, 2013 Annual Meeting, August 4-6, 2013, Washington, D.C. 1–18. Retrieved from https://ageconsearch.umn.edu/record/150625/

Manalu, D. S. T., Harianto, H., Suharno, S., & Hartoyo, S. (2020). Permintaan kopi biji indonesia di pasar internasional. Agriekonomika, 9(1), 114–126. https://doi.org/10.21107/agriekonomika.v9i1.7346

Mengistie, B. T. (2020). Consumers' awareness on their basic rights and willingness to pay for organic vegetables in Ethiopia. Journal of Socioeconomics and Development, 3(1), 1-15. https://doi.org/10.31328/jsed.v3i1.1278

Minten, B., Dereje, M., Engida, E., & Kuma, T. (2019). Coffee value chains on the move: Evidence in Ethiopia. Food Policy, 83, 370–383. https://doi.org/10.1016/j.foodpol.2017.07.012

Muradian, R., & Pelupessy, W. (2005). Governing the coffee chain : The role of voluntary regulatory

systems. World Development, 33(12), 2029–2044. https://doi.org/10.1016/j.worlddev.2005.06.007

Ozturk, O. (2020). Market integration and spatial price transmission in grain markets of Turkey. Applied Economics, 52(18), 1936–1948. https://doi.org/10.1080/00036846.2020.1726862

Ramos, E., Mesia, R., Matos, D., & Ruiz, S. (2019). Organic coffee supply chain source process integration: A Peruvian case. International Journal of Supply Chain Management, 8(6), 133–145. Retrieved from https://ojs.excelingtech.co.uk/index.php/IJSCM/article/view/2623

Ravallion, M. (1986). Testing market integration. American Journal of Agricultural Economics, 68(1), 102-107. https://doi.org/10.2307/1241654

Schuller, S., Vagneron, I., Killian, B., Pinard, F., Schroeder, K., Potts, J., … Giovannucci, D. (2008). Seeking Sustainability: COSA preliminary analysis of sustainability initiatives in the coffee sector. International Institute of Sustainable Development (IISD). Retrieved from https://www.iisd.org/system/files/publications/seeking_sustainability.pdf

Simamora, S. D. (2014). Market Brief: Langkah dan Strategi Ekspor ke Uni Eropa: Produk Kopi. Retrieved from https://apindo.or.id/id/publikasi/makalah-penelitian/market-brief-langkah-dan-strategi-ekspor-ke-uni-eropa-produk-kopi.

Sinta, N. M., Alamsyah, Z., & Elwamendri. (2017). Analisis daya saing ekspor kopi Indonesia dan Vietnam di pasar Asean. Jurnal Ilmiah Sosio Ekonomika Bisnis, 20(1). 3-11. https://doi.org/10.22437/jiseb.v20i1.5028

Stigler, G. J. (1987). The Theory of Price. MacMillan Publishing Company. https://books.google.co.id/books?id=3hO8AAAAIAAJ

Suyamto, D. A., & Noordwijk, M. Van. (2004). Respon petani kopi terhadap gejolak pasar dan konsekuensinya terhadap fungsi tata air: Suatu pendekatan pemodelan. AGRIVITA, 26(1), 14–17.

Zeho, F. H., Prabowo, A., Estiningtyas, R. A., Mahadiansar, M., & Sentanu, I. G. E. P. S. (2020). Stakeholder collaboration to support accountability in village fund management and rural development. Journal of Socioeconomics and Development, 3(2), 89-100. https://doi.org/10.31328/jsed.v3i2.1395