OECD publishing

Please cite this paper as:

Greenville, J. (2018-12-17), "ASEAN rice market integration: findings from a feasibility study", *OECD Food, Agriculture and Fisheries Papers*, No. 117, OECD Publishing, Paris. http://dx.doi.org/10.1787/8ca16e31-en

OECD Food, Agriculture and Fisheries Papers No. 117

ASEAN rice market integration: findings from a feasibility study

Jared Greenville

OECD

OECD FOOD, AGRICULTURE AND FISHERIES PAPERS

This paper is published under the responsibility of the Secretary-General of the OECD. The opinions expressed and the arguments employed herein do not necessarily reflect the official views of OECD countries.

The publication of this document has been authorised by Ken Ash, Director of the Trade and Agriculture Directorate.

The statistical data for Israel are supplied by and under the responsibility of the relevant Israeli authorities. The use of such data by the OECD is without prejudice to the status of the Golan Heights, East Jerusalem and Israeli settlements in the West Bank under the terms of international law.

Comments are welcome and can be sent to tad.contact@oecd.org.

© OECD (2018)

You can copy, download or print OECD content for your own use, and you can include excerpts from OECD publications, databases and multimedia products in your own documents, presentations, blogs, websites and teaching materials, provided that suitable acknowledgment of OECD as source and copyright owner is given. All requests for commercial use and translation rights should be submitted to *rights@oecd.org*.

ASEAN RICE MARKET INTEGRATION: FINDINGS FROM A FEASIBILITY STUDY

Jared Greenville, OECD

This study explores feasibility of regional rice market integration by examining the impacts on production and trade, with a specific focus on the adjustment impacts for rice producers. It seeks to set out policy measures required to better integrate the rice markets of Association of Southeast Nations (ASEAN) countries and the role that trade policy can play to help the agricultural sector adjust to pressures created from freer trade in rice within this region. While regional rice market integration can deliver more rice at lower prices to the regions consumers, this study finds significant adjustments to the rice sectors will be required in Indonesia, Malaysia, and the Philippines. However, opportunities through lowering tariff barriers with existing key trading partners of free trade agreements has the scope to create more employment and value adding opportunities in all agricultural sectors to offset the losses from regional rice market integration. The study suggests a number of measures are necessary to build trust in regional markets to allow rice market integration to take place. This includes an agreement to ban export restrictions. Furthermore, while broader trade reforms will help create new opportunities for agricultural sectors across the ASEAN region, flanking policies and investments in the enabling environment are still required for the sectors to take full advantage of these opportunities.

Key words: Agriculture, agricultural trade, regional integration

JEL codes: F14, F15, F60, Q17, Q18

Acknowledgements

The author would like to thank Carmel Cahill, Clara Thompson-Lipponen, Claire Delpeuch, Jonathan Brooks, Emily Gray, Dorothee Flaig, Frank van Tongeren, Jane Korinek, Hubertus Gay, Annelies Deuss, Jesús Antón and Julia Nielson for their comments and help in developing this study. The author also wishes to thank the members of the OECD Joint Working Party on Agriculture and Trade for their valuable feedback and direction received in developing and finalising this study. Finally, the author thanks Anita Lari and Michèle Patterson for preparing this document for publication.

Table of contents

Overview 5

1. Introduction 12
2. Agriculture and rice in the context of regional integration efforts 14
3. Rice production, trade and consumption in the region 15
4. Rice policies in ASEAN 21
5. Price differences and levels across ASEAN 28
6. Current state of rice market integration 31
7. Impacts of rice market integration 35
8. Capturing the benefits of rice market integration through broader reforms to agro-food trade 47
9. Policy implications and conclusions 58

References 60

Annex A. Region and sector aggregation in the METRO model 64

Annex B. Data source for domestic rice prices 66

Annex C. Formal tests for co-integration of regional rice prices 67

Tables

Table 1. Self-sufficiency targets in ASEAN 22
Table 2. Contemporaneous correlation in rice prices, ASEAN and selected key partners 33
Table A.1. Sectors in the model 64
Table A.2 Countries and regions in the model 65
Table B.1. Sources of rice price details 66
Table C.1. Unit root tests 68
Table C.2. Johansen tests for co-integration 69
Table C.3. Engle Granger co-integration tests 69

Figures

Figure 1. Regional exports and trade in rice 5
Figure 2. Tariff and non-tariff measures significantly influence regional rice trade 6
Figure 3. Policies in some member states place upward pressure on rice prices 7
Figure 4. ASEAN agro-food trade integration, and improved trade with key partners can offset adjustment costs and increase opportunities for agro-food production 10
Figure 5. Trade in rice across ASEAN countries 16
Figure 6. Revealed comparative advantage in rice production and processing 17
Figure 7. Changes in revealed comparative advantage, rice and other sectors 18
Figure 8. Rice yields across ASEAN 19
Figure 9. Relative rice yield growth across ASEAN 20

Figure 10. Rice consumption per capita across ASEAN ... 20
Figure 11. Share of rice in total caloric intake ... 21
Figure 12. Intra- and external rice tariffs, 2015-16 ... 23
Figure 13. Non-tariff measures applied to rice by ASEAN member states ... 24
Figure 14. Change in number of non-tariff measures applied to rice, 2000 to 2018 ... 25
Figure 15. ASEAN exporter domestic rice prices ... 29
Figure 16. Indonesia, Philippine and adjusted Thai price ... 30
Figure 17. Lao PDR, Chinese and Thai rice prices ... 31
Figure 18. Movements in rice prices across the region ... 32
Figure 19. Correlation with main producers, 12 month lag ... 34
Figure 20. Impact of rice market integration on undernourishment in ASEAN ... 36
Figure 21. Changes in undernourishment with and without production shocks ... 37
Figure 22. Changes in rice exports and imports for ASEAN members from market integration ... 39
Figure 23. Integration and agro-food value added ... 40
Figure 24. Changes in final demand from rice market integration ... 41
Figure 25. Self-sufficiency rates across ASEAN with rice market integration ... 42
Figure 26. Labour movement and wage effects from rice market integration ... 45
Figure 27. Intra-ASEAN and external agro-food tariffs, 2015-16 ... 48
Figure 28. Number of non-tariff measures applied to agro-food trade in ASEAN ... 49
Figure 29. Heterogeneity scores for agro-food NTMs across ASEAN ... 50
Figure 30. NTM similarity scores for ASEAN member states ... 50
Figure 31. *Ad valorem* equivalent of NTMs in ASEAN ... 51
Figure 32. Adjustment impacts of broader ASEAN agro-food trade integration ... 53
Figure 33. Adjustment impacts from broader ASEAN agro-food trade integration and trade liberalisation with key partners ... 54
Figure 34. Movements from rice to other agriculture and food sectors ... 55
Figure 35. Gross and value added export destinations for Indonesia, 2014 ... 57
Figure 36. Adjustment impacts from multilateral reform and ASEAN rice market integration ... 57

Boxes

Box 1. ASEAN-OECD co-operation ... 13
Box 2. The ASEAN Plus Three Emergency Rice Reserve ... 27
Box 3. ASEAN rice market integration can enhance regional food security ... 36
Box 4. Modelling rice market integration in METRO ... 40
Box 5. Supporting adjustment through flanking policies ... 47
Box 6. Reducing barriers in the United States, China and developing countries important for Indonesia to complement own reforms ... 56

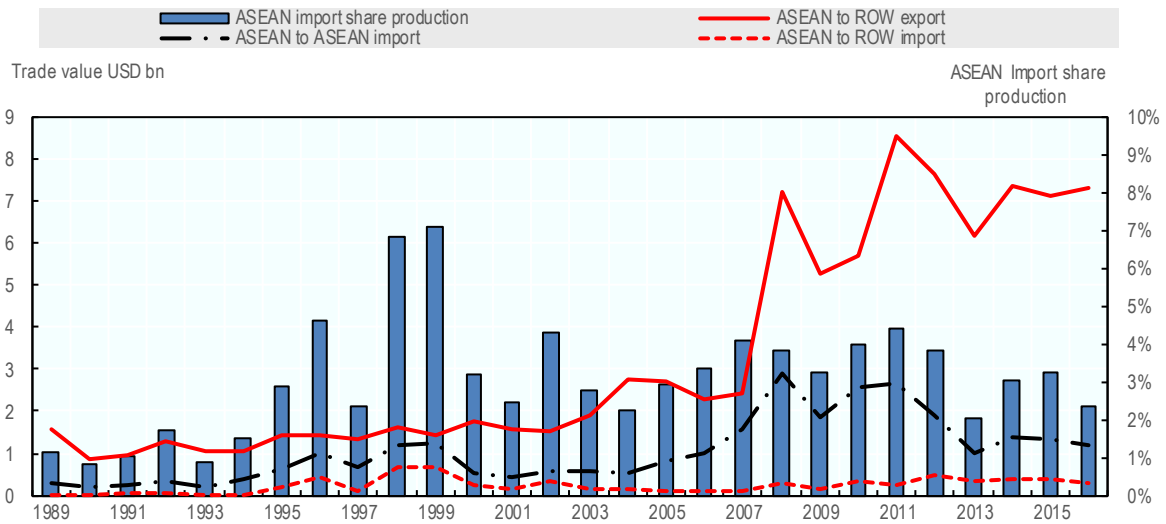
Overview

Past work completed under co-operation between the OECD and the Association of Southeast Asian Nations (ASEAN) on agricultural policy issues identified the potential for regional rice market integration to contribute to further reducing food insecurity in the region. It was found that integration of regional rice markets could reduce the rate of undernourishment in the region by one percentage point and when production risk are considered, by around six percentage points. In response, the OECD was requested to develop a study to explore the feasibility of ASEAN rice market integration. In particular, the study was to focus on the possible adjustment impacts of rice market integration on rice farmers across the region and to identify steps that would make market integration a more feasible option for ASEAN. This study aims to explore the range of policy reforms that can deliver benefits for food security while providing a feasible adjustment pathway for rice producers adversely affected by increased competition from other ASEAN members.

Rice is the key staple crop across the ten countries that comprise ASEAN. It delivers much of the basic caloric need for many people in the region, where it is grown and consumed by millions. Overall, the region is a significant net exporter of rice, producing significantly more that it consumes. Much of the export position is driven by Thailand and Viet Nam, however other members export rice and some have the potential to increase exports significantly.

Figure 1. Regional exports and trade in rice

Exports and imports of rice, and imports share of production for ASEAN 1989-2016



Source: WITS (2018), *World Integrated Trade Solution*, https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx and USDA (2018b), *Production, Supply and Distribution Online*, http://apps.fas.usda.gov/psdonline/psdquery.aspx.

Despite differences in exports and imports across the region, almost all ASEAN members have a significant rice sector servicing domestic populations. Revealed comparative advantage indicators suggest that across the region strong levels of international competitiveness follow geographic and climate conditions and are strongest in countries

with environments most suited to rice production. The balance of trade in rice between ASEAN members is thus as much determined by total production capacity (land) and demand (incomes and population) as policy interventions that restrict trade.

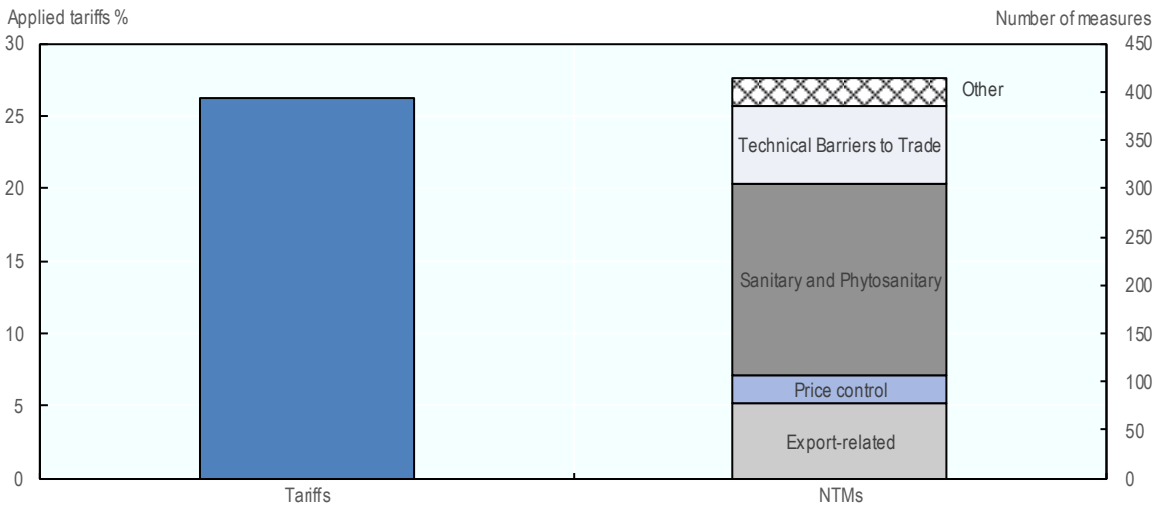
For the region, intra-ASEAN trade in rice remains relatively thin – around USD 1.3 billion on average between 2014 and 2016, accounting for around 2% of regional production. Part of the reason rice remains thinly traded is that it has remained outside regional integration efforts that have seen increased trade in a wide range of goods. ASEAN has long had a vision of creating one production base in the region, however, rice has always remained on the general exemptions list. As a result, significant barriers to rice trade persist in the region.

Many ASEAN member states continue to levy significant tariffs on rice – with the regional average applied rate at close to 25%. Furthermore, very little differences exist between tariffs applied on intra-regional trade and those applied to extra-regional trade for most countries.

Further complicating the trade landscape are the presence of non-tariff measures (NTMs), in particular import licensing and monopoly import arrangements. In 2018 there were over 400 non-tariff measures applied by ASEAN members to rice trade alone – an increase from 94 in 2000. Most of these were related to sanitary and phytosanitary and were implemented to protect plant, animal and human health.

Figure 2. Tariff and non-tariff measures significantly influence regional rice trade

Applied *ad valorem* tariffs in 2015-16 and number of non-tariffs measures in 2018



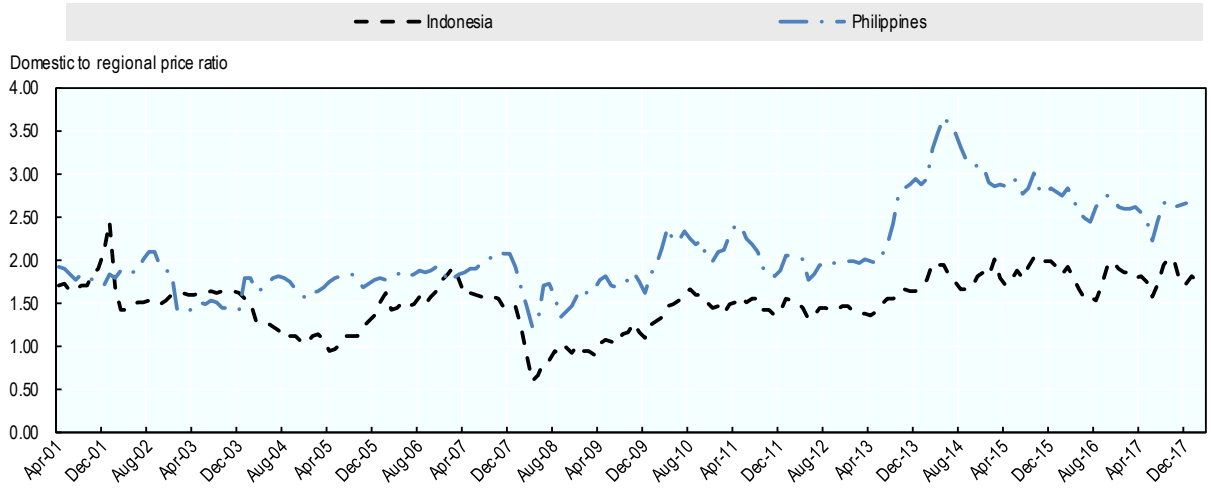
Source: WITS (2018), *World Integrated Trade Solution*, https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx and UNCTAD-ERIA-WTO (2018).

Some of the most significant barriers to trade, however, relate to the import licensing and monopoly import arranges that exist in Indonesia, the Philippines and Malaysia. These arrangements grant import rights to a few, or only one, under specific conditions and are used to restrict imports of rice even where no quota or tariff arrangements are in place. Such arrangements are coupled with self-sufficiency objectives and stockholding programmes that seek to promote producer incomes and to provide access to rice for poorer households. However, the balance has swayed towards producer interests with wholesale

rice prices in Indonesia and the Philippines significantly higher than comparable border prices of imported Thai rice.

Figure 3. Policies in some member states place upward pressure on rice prices

Domestic to regional price ratio



Note: Thai price represents 15% broken rice with adjustment for transport costs based on Thailand-Singapore per tonne estimated cost of insurance and freight (difference between fob and cif price).
Source: Author estimates.

The policy motives that underpin the programmes in Indonesia, the Philippines and Malaysia, and that of many other ASEAN members, are intertwined with food security concerns. Past disruptions in international markets, combined with the thinly traded nature of rice globally, have created incentives to find domestic solutions to international trade policy issues.

The reliance on domestic production, however, increases the exposure of consumers to more frequent domestic production risks. It also reduces access to rice despite its availability by creating higher prices. For these reasons, closing price gaps and sharing production risks with a move towards integrated regional rice markets can reduce both undernourishment and the risk of undernourishment.

For ASEAN as a whole, it is estimated that in the absence of shocks to production through either regional droughts or individual country shocks to production, rice market integration could lead to a 5% reduction in the number of households experiencing undernourishment – or around a 1 percentage point reduction in ASEAN's total undernourishment rate. This comprised gains in food security in Indonesia and the Philippines but, given the possible price effects, some rises in undernourishment in Myanmar and Viet Nam. While safety nets can help mitigate the potential negative effects of these increases on poor households, it is likely that the gradual integration of the regional rice market would actually prevent a sharp – or indeed any – increase in rice prices in exporting countries.

When production risks that caused shocks to production were taken into consideration, the gains were larger. The region has, and is expected to continue to have, production shocks associated with droughts or other environmental events that reduce production in any given year. Under current policies, ASEAN undernourishment rates when faced with these events

are expected to increase by around 6% across ASEAN for a regional *El Niño* and 7% in any ASEAN member state for a domestic crop failure event (based on a weighted average across ASEAN member states). In both cases, rice market integration reduces these risks, reducing undernourishment by 5 and 6 percentage points respectively relative to the outcomes with current policies. For exporting countries like Viet Nam and Myanmar, however, a regional shock may place greater pressure on domestic prices.

Rice market integration has the potential to increase agro-food sector value added and welfare across the region – an increase in agro-food value added of around USD 60 million per year and welfare by about USD 5.2 billion (measured by changes in final domestic demand). The impacts are not uniform across countries, however. The greatest gains are experienced by Thailand and Viet Nam who meet the increased demand for imported rice created by integration. And while the region remains highly self-sufficient – indeed more rice is produced at lower cost – there are shifts in production. Self-sufficiency rates fall in Indonesia, the Philippines, and Malaysia as a result of increased import competition. However, particularly for Indonesia and the Philippines, self-sufficiency rates remain high at 90% and 80% respectively – representing falls of 10 and 14 percentage points in self-sufficiency rates. These high rates highlight two aspects of regional rice production and the costs associated with market interventions:

- In all countries, the majority of rice consumption continues to be met by domestic production – all ASEAN member states have large and internationally competitive rice sectors.
- For countries where policies have increased self-sufficiency rates by increasing domestic prices, the marginal cost of these policies is significant. For example, Indonesia's push to increase self-sufficiency rates from 90% to close to 100% is akin to purchasing that 10% of domestic consumption at a cost of close to USD 1 700 per tonne – over close to 7 times the current world price. For the Philippines, the cost of the additional 14% of domestic demand is equivalent to a purchase price of USD 2 950 per tonne – over 11 times the world price.

The non-uniform effects on ASEAN member states are indicative of the possible adjustment pressures that might be created if rice market integration was to occur in isolation from broader agricultural policy reform. In particular, rice farmers in Indonesia, the Philippines and Malaysia could be adversely affected by such a move. The reason adjustment pressures would be strong is that other opportunities within agro-food sectors are not likely to be forthcoming with an isolated reform push. This means that the least efficient rice farmers would need to leave the agro-food sector altogether due to falling demand for the rice they produce. This is not to say that reforms in isolation would not be net beneficial, but rather it highlights that social costs exist and that these costs can create political and practical barriers to rice market integration and lessen the economic and food security gains on offer.

Flanking policies, such as targeted financial assistance for adversely impacted households and retraining programmes, have the potential to ease the adjustment costs. Indeed, such policies are important to complement all trade reform options as regardless of the net impacts, there is always are distribution of winners and losers from reforms. However, it is possible that other reforms may help lower the adjustment costs and provide a positive incentive for change by creating new opportunities. The combination of these reforms can lessen the work that might be required from flanking policies – particularly redistributive policies – which due to fiscal costs may be difficult to implement. This more feasible (and implementable) pathway for ASEAN members would allow them to capture the food

security benefits from rice market integration, to leverage their comparative advantages in agro-food production, and to increase the economic opportunities for rice farmers so that they can remain in agro-food sectors. Further, while an analysis of these is outside the scope of this study, to fully take advantage of these new opportunities, ASEAN governments would need to continue and enhance investment in agricultural and trade infrastructure and regulatory reforms to encourage business innovation and activity.

Two additional policy reforms have the potential to help ASEAN members capture the benefits from regional rice market integration and provide additional economic opportunities for rice farmers to remain in agro-food sectors. In both these scenarios, as per the rice market integration scenario, the impact of targeted household assistance or other redistributive policies have not been taken into account. The additional scenarios include:

- Integrating not only rice but broader agro-food sectors across the region.
- Combining regional integration efforts with a reduction in tariffs on agro-food trade with key trading partner countries (Australia, New Zealand, Japan, Korea, China, and India) to zero within existing free trade agreements. That is, ASEAN deepens trade ties individually with key partners by reducing tariffs on bilateral agro-food trade flows to zero (with the exception of rice – key partners do not liberalise between each other).

These reforms will not only ease the adjustment pressures in Indonesia, the Philippines and Malaysia, but have the potential to grow agro-food production in all ASEAN member states and improve wages for unskilled workers in the region. The key mechanism is that other trade reforms that allow freer trade internally and between ASEAN member states and key partners can create additional economic opportunities within agriculture and, to a lesser extent, food sectors than could the economic opportunities displaced by rice market integration. Thus while some rice farmers can no longer continue their work as farmers, other production or employment opportunities within agriculture would be created which would likely reduce the adjustment pressures from rice market integration. While these would be further reduced with targeted assistance and other redistributive policies (not assessed), it should be *a priori* easier for a rice farmer to move out of rice production to another agricultural activity or to become an agricultural worker. The net impact on wages suggests the scope for income will be enhanced through this process.

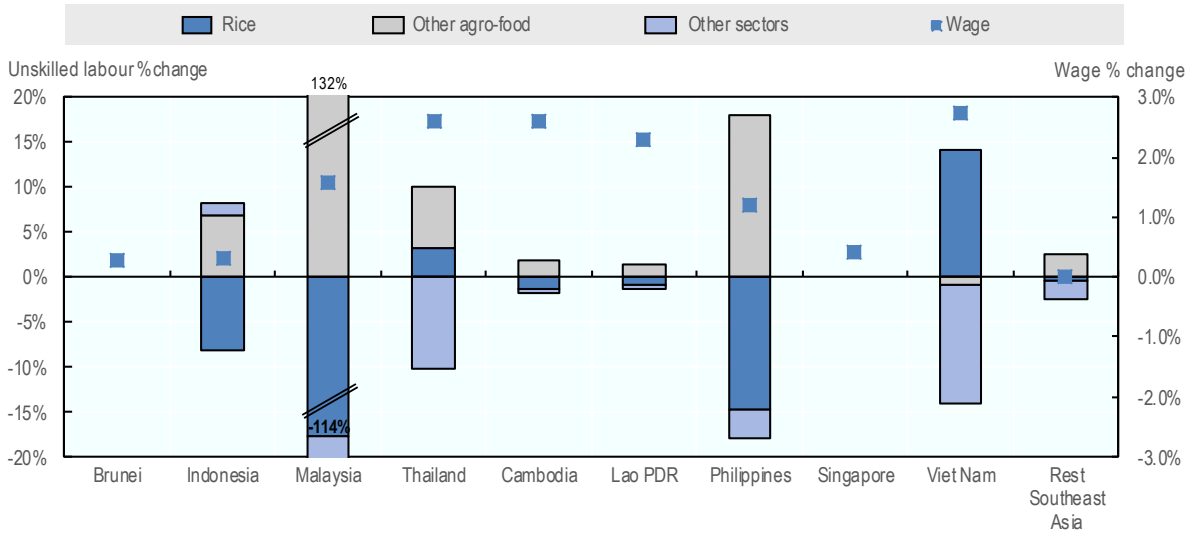
To capture these benefits, ASEAN efforts to integrate agro-food markets will require steps to be taken to reduce trade costs associated with non-tariff measures. These include bolstering regional harmonisation efforts through better implementation (such as improved implementation of regionally set maximum residue limits) and a more co-ordinated development of domestic food safety systems. On the trade side, opportunities for small producers could be enhanced by exploring the need to impose rules of origin on small producers where preference margins are low.

For all ASEAN members, complementing rice and internal agro-food market integration, along with zero tariffs on agro-food trade with key partners (excluding rice trade with key partners) provides more opportunities for displaced rice farmers to find employment within other agro-food sectors. The reforms provide scope for agro-food sectors in each ASEAN member state to expand, drawing in farmers from rice and even other sectors of the economy for some. Part of the reason why enhanced trade with key partners creates growth in ASEAN agro-food sectors is because of differences in the underlying agricultural sectors. Trade is increased, but existing trade patterns deepen the existing production specialisation differences. As a result, ASEAN countries increases current imports (such as

dairy, meat products, temperate crops and wool) and exports more of what it currently exports (seafood, palm oil, rice and other tropical products). The creation of new economic opportunities for agro-food sectors has a flow on impact on unskilled wages even outside the agro-food sector as it increases the demand for workers overall, creating a positive influence in most ASEAN member states.

Figure 4. ASEAN agro-food trade integration, and improved trade with key partners can offset adjustment costs and increase opportunities for agro-food production

% changes in unskilled labour demand relative to base rice sector demand and % change in unskilled wages



Note: Rest of Southeast Asia used to represent Myanmar (composite region of Myanmar and Timor-Leste). Shifts of unskilled labour relative to base unskilled labour demand in rice sector in each country. Reforms exclude tariff reductions between ASEAN and key partners on rice.
Source: Author estimates.

The steps taken to reduce trade costs and integrate agro-food markets in ASEAN also need to be complemented with steps to improve trust in regional markets and in domestic agricultural sector capacities. The thinly traded nature of rice and past price spikes in 2007-08 caused by government policy interventions have reduced trust in regional markets. This is costly for both exporters and importers of rice. A number of steps can be taken to reduce incentives for policy makers to interfere in export or import markets, including through improving regional safety nets – such as the ASEAN Plus Three Regional Rice Reserve – however most important would be an agreement amongst ASEAN member states to ban export restrictions on rice. Such a step would provide a tangible commitment to regional integration and significantly limit any policy induced price spikes. On the domestic policy side, movements towards greater investments in agricultural infrastructure – physical and human – along with steps to improve agricultural innovation systems will help the agricultural sector overall take advantage of new opportunities and indeed create them. These will avoid the current mix of policy incentives that often encourage rice production and set agricultural sectors across the region on a path that can increase productivity and create higher incomes for those who remain in the sector. Indeed, the provision of support that is targeted to measures that can enhance producer productivity and deliver new opportunities for farmers will be important, regardless of integration.

Beyond regional solutions, ASEAN has a vested interest in seeing reductions in distortions in world agro-food markets. The possible benefits from regional rice market integration would be enhanced in the presence of non-discriminatory global action on reducing distortions to agro-food markets. ASEAN's existing trade links have become increasingly outward focused and while intra-ASEAN trade and that with key partners is important, broader reforms for some members (particularly with other developing countries) could unlock greater gains for the region's agro-food producers and help ensure a more food secure region. These opportunities are created through greater export opportunities, facilitated by greater participation in global agro-food value chains, which in turn is supported through access to cheaper foreign inputs by removing import restrictions.

Key recommendations

Capturing the possible benefits from rice market integration for food security and avoiding the potential adjustment costs on rice producers in Indonesia, the Philippines and Malaysia will require reforms. ASEAN member states would need to:

- Remove rice from the general exception list within ASEAN Free Trade Area's (AFTA) Common Effective Preferential Tariff agreement with a view to transitioning to zero tariffs over the medium term.
- Remove all quantitative restrictions and import licensing provisions applied to rice.
- Take concrete steps to build trust in the regional rice market, namely:
  - ban export restrictions on rice as part of the AFTA.
  - strengthen the ASEAN Plus Three Emergency Rice Reserve and its programme of holding donor stocks in vulnerable areas, exploring the possibility to include other key partner countries.
- Undertake broader regional agro-food trade reforms to integrate rice markets to lessen the adjustment pressure resulting from market integration through:
  - Harmonising sanitary and phytosanitary and technical barriers to trade arrangements across the region to reduce trade costs while meeting the objectives. For example:
    - further develop and implement regional import standards related to food safety (such as the work on maximum residue limits)
    - develop consistent domestic food safety systems across the region and between domestic and import standards to reduce the transaction costs associated with regional trade.
  - Reduce the impact of rules of origin (RoO) and provide greater access to regional markets for small producers by eliminating RoO on products with a low preference margin or providing exemptions to small exporters.
- Further reduce agro-food tariff barriers with key partners within existing free trade agreement frameworks.
  - Deepen the existing free trade area agreements by moving to reciprocal zero tariffs on all agro-food trade. This would increase economic opportunities within agro-food sectors in all member countries, thereby easing adjustment pressures created from rice market integration.
- Contribute to ongoing multilateral efforts to eliminate distortions in agricultural markets. Such a move could improve the region's agricultural sector performance and the food security of its populations.

1. Introduction

Rice is the key staple crop across the countries that comprise the Association of Southeast Asia Nations (ASEAN). It delivers much of the basic caloric need for many people in the region, and is grown by over an estimated 36 million farmers in Indonesia, Malaysia, the Philippines, Thailand and Viet Nam alone (Alavi et al., 2012),[1] and over 200 million farmers across Asia more broadly (Ricepedia, 2018). For this reason, rice and its production have been seen as a key aspect of regional food security.

The focus on rice for food security, however, has led to a mix of government programmes and intervention aimed at supporting the sector and encouraging domestic supplies of rice. These interventions have not always had their intended impact on food security (OECD, 2017a) and have led to a range of perverse outcomes as policies influence both the market price of rice and its supplies. In some countries, raising domestic prices has given rise to a significant increase in the number of farmers producing rice than what otherwise might be the case. In these instances, policy makers are often torn between seeking to provide accessible food to poor consumers (affordable rice) whilst supporting the incomes of (often poor) farmers.

Similarly conflicting policy objectives are seen across Asia more broadly. On the one hand, policies in India have in the past depressed domestic rice prices below comparable international price benchmarks. On the other hand, some countries – such as Indonesia and the Philippines – have placed primacy on domestic production and domestic producers, thereby creating a situation where domestic prices are close to double or more of comparable regional prices (discussed in detail in Section 5). Both situations can have adverse impacts for the food security of populations – producers in India and consumers in Indonesia and the Philippines, for example. These policies also require the presence of restrictions to trade to be effective.

For ASEAN, however, opportunities have been identified. Moving away from individual country interventions that create price gaps between members has the potential to offer significant gains in food security across the region – particularly in countries with high rice prices (OECD, 2017a). In taking steps towards the integration of rice markets, ASEAN would make significant inroads to reducing food insecurity and to meeting the UN Sustainable Development Goals (SDGs) of zero hunger by 2030. But in doing so, rice producers in some member states would have to leave the sector and find employment or production opportunities elsewhere.

The question remains as to what type of reforms and types of adjustment are required for ASEAN to capture the benefits of rice market integration for food security, while easing the adjustment faced by rice producers. This study focuses on:

- The background to rice market integration efforts to date in ASEAN.
- Current production, consumption, trade and rice policy approaches across ASEAN.
- The current mix of trade barriers, including tariff and non-tariff measures, used to control rice trade between ASEAN member states.

[1] Numbers based on data from the mid to late 2000s. See Alavi et al. (2012), Table 1.1 p. 36 for more details.

- The current status of rice price integration across ASEAN member states to provide insight into the types of steps required to close regional price gaps.
- The impact of removing tariff and non-tariff barriers on rice trade and regional production, with a focus on the movement of labour from the rice sector to other sectors of the economy.
- The impacts of accompanying trade reforms that may help ease adjustment costs of rice market integration so as to provide a feasible reform path for ASEAN countries to capture the benefits of rice market integration for food security. These include complementing rice market integration with:
  - broader agro-food trade reforms within the region
  - deepening agro-food trade within the region and with ASEAN's six key partners, and
  - global agro-food trade reform (tariff and quota removal).

Background

This study forms part of a broader theme of work that underpins OECD-ASEAN co-operation on agricultural policy issues (Box 1). The OECD has a long history of providing information, analysis and advice to help governments improve the domestic and international performance of their farm, food and fisheries policies, including such areas as sustainable agriculture, agricultural trade, food security, agricultural innovation systems and risk management. The work of the OECD increasingly covers a wide range of countries stretching well beyond the membership of the organisation.

Box 1. ASEAN-OECD co-operation

The ASEAN-OECD co-operation arrangements focus on developing regionally-integrated policies to support policy development in enhancing food security, food safety and trade of agricultural and forest products. The ASEAN-OECD co-operation agenda was given effect by 36th SOM AMAF in August 2016 and has been supported by a range of regional events and the Global Forum on Agriculture hosted by the OECD in May 2017. The co-operation arrangements have also supported the development and completion of the OECD study (OECD, 2017a), titled *Building Food Security and Managing Risk: A Focus on Southeast Asia*.

At the 2017 Global Forum on Agriculture, discussions explored the possibility to further investigate the feasibility of regional rice market integration. Following the Global Forum, ASEAN senior officials agreed to support the study which resulted and which is presented here.

OECD has a history of bilateral co-operation with several individual ASEAN member states which pre-dates the launch of co-operation arrangements with ASEAN in 2016. Agricultural policy reviews have been undertaken for Indonesia (2012), Viet Nam (2015), and the Philippines (2017. Specific work has also been undertaken with Indonesia on food security.

In November 2014, the OECD and ASEAN Secretariats co-organised the first Regional Conference on Policies for Food Security, in Bogor, Indonesia. This conference provided an opportunity for exchanges between the OECD, ASEAN members and other international organisations with policy experience in the region. The potential value of regular and

systematic co-operation between OECD and ASEAN members was recognised. Four ASEAN-OECD regional conferences have since taken place.

This study is organised as follows. In Section 2, the inclusion of agriculture and rice in the broader push towards regional integration in ASEAN is briefly presented. Section 3 details rice production, consumption and trade in the region, while Section 4 provides a brief overview of the main agricultural policies directed towards rice in the region. Section 5 examines the rice prices across the region with Section 6 setting out evidence on the current levels of integration the main impediments to regional rice market integration. Section 7 presents the impacts of regional integration through the removal of both tariff and non-tariff barriers. Section 8 presents the results of complementary trade reforms that can help ease the required adjustment and place ASEAN on a solid footing to capture the gains of an integrated rice market. Policy implications and conclusions are discussed in Section 9.

2. Agriculture and rice in the context of regional integration efforts

ASEAN was formed in 1967 with the aim of establishing an association for regional co-operation (ASEAN, 2018a). Initially comprising five countries – Indonesia, Malaysia, the Philippines, Singapore and Thailand – membership has since grown to include five additional Southeast Asian countries: Brunei Darussalam in 1984, Viet Nam in 1995, Lao PDR and Myanmar in 1997 and Cambodia in 1999.

ASEAN member states have committed to a push towards regional integration across a broad range of areas, including agriculture. The ASEAN Economic Community (AEC) initiative has set a target for regional integration which is supported by the ASEAN Economic Community Blueprint 2025. It seeks to create:

- a single market and production base
- a highly competitive economic region
- a region of equitable economic development
- a region that is fully integrated within the global economy (ASEAN, 2015).

This initiative extends well beyond agriculture, and aims to allow for the free flow of goods, services, investment and skilled labour across the region, along with the freer flow of capital. As such, it has the potential to significantly influence growth opportunities in the region and therefore food security. Integration in agricultural markets is also a component of the ASEAN Integrated Food Security (AIFS) Framework and the Strategic Plan for ASEAN Co-operation in Food, Agriculture and Forestry.

Work completed by the OECD and others has pointed to the potential role of regional integration in enhancing the region's agricultural sector and improving food security (OECD, 2017; Bello, 2005; Hoang and Meyers, 2015).

Concrete steps towards the goal of regional integration have taken various forms, and include the creation of an ASEAN free trade area (AFTA) in 1992. The objectives of the AFTA include the elimination of all tariff and non-tariff barriers (ASEAN, 2018b). The Common Preferential Tariff (CEPT) Agreement with AFTA requires tariffs to be reduced to between 0 and 5% for a wide range of manufacturing and agricultural goods on the "inclusion list". This list provided for the reduction of tariffs to between 0-5% by 2002 for the founding five members, and by 2006 for Viet Nam, 2008 for Lao PDR and Myanmar, and 2010 for Cambodia.

Three other lists exist in the CEPT that provide for slower or less robust liberalisation efforts by ASEAN member states (ASEAN, 2018b). These include the:

- *Temporary exclusion list*: Products which still face a reduction of tariffs to between 0-5% but have a longer period over which this will occur.
- *Sensitive list*: Contains a number of unprocessed agricultural products, with the aim that these would also be subject to reductions to 0-5% by 2010 for members and 2013 for Viet Nam, 2015 for Lao and Myanmar, and 2017 for Cambodia.
- *General exception list*: Products excluded from the agreement on the grounds of national security, public morals, human, animal or plant life and health and articles of artistic, historic and archaeological value. This list includes 1 036 tariff lines.

On the general exception list for many ASEAN countries is rice. Rice trade largely remains outside the scope of the AFTA and is thus an area of possible future liberalisation. Other agricultural products also remain on the general exception list, including sugar in some member states, with others maintaining tariffs of 5% in their schedule of commitments for other agricultural products such as fruits and vegetables.

3. Rice production, trade and consumption in the region

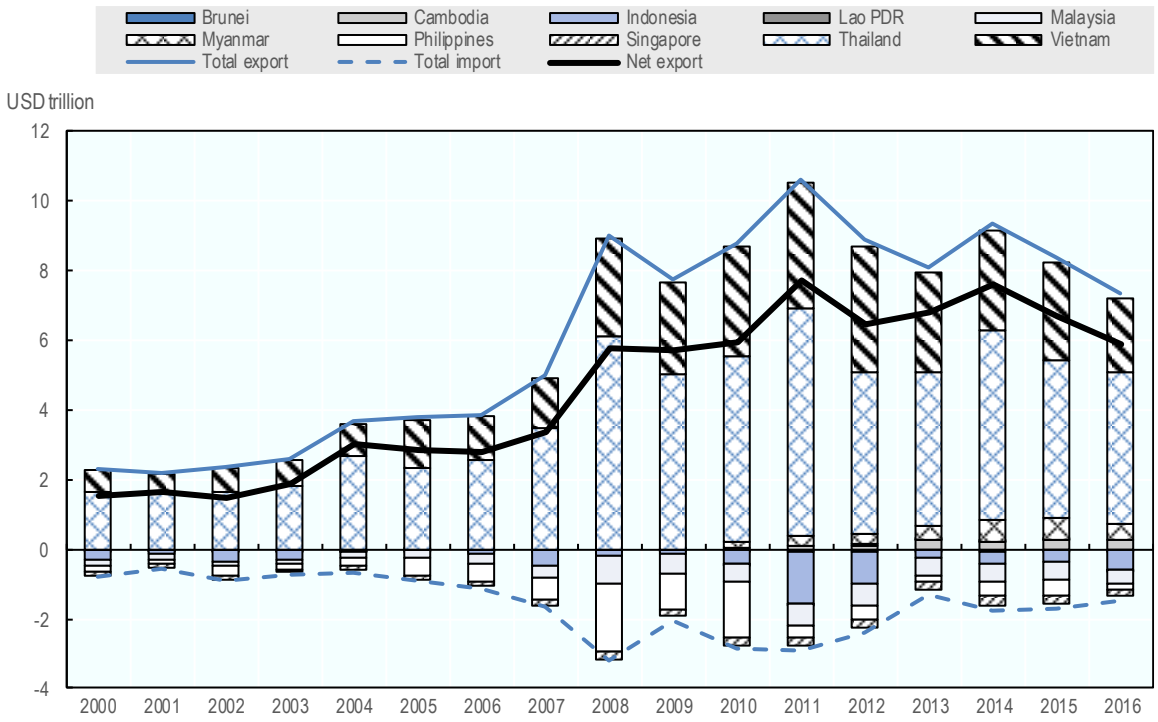
ASEAN is comprised of a mix of mainland countries and island or narrow peninsula states. With this comes a mix of geographic and climatic conditions that fundamentally influence agricultural production systems and inherent comparative advantages. With respect to food production, the geography of the region determines natural rice production capabilities.

Over the long run, the production and trade positions of ASEAN member countries show a consistent pattern of high production and net exports from mainland countries, and net imports by island and peninsula states (Dawe, 2013). This pattern is primarily driven by the fact that mainland states are dominated by large river systems that provide ample water and flat land that is well suited to rice production. In general, these conditions mean that Viet Nam, Cambodia, Lao PDR, Thailand and Myanmar have historically been net exporters of rice, producing more than domestic consumption levels. In contrast, Indonesia, Malaysia, the Philippines, Singapore and Brunei Darussalam have traditionally been net importers.

Historical trends in net export/import status appear to persist today. The region as a whole is a significant net exporter of rice – however, this position is driven primarily by exports from Thailand and Viet Nam (Figure 5). Recently, Cambodia also became a net exporter, while the remaining countries for which data exists are net importers.

Figure 5. Trade in rice across ASEAN countries

Rice exports, imports and net regional trade 2000-2016, USD trillions

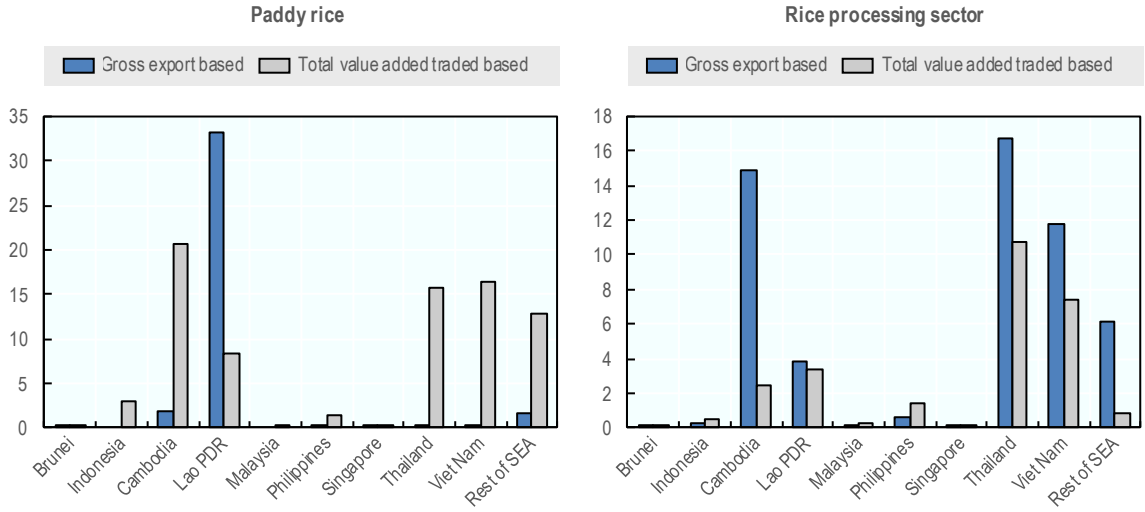


Source: WITS (2018), *World Integrated Trade Solution*, https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx.

Estimates of revealed comparative advantage also highlight the role of geography in the comparative advantage of rice production. Revealed comparative advantage (RCA) indicators are calculated by comparing a country's shares in world exports – gross and in value added terms – with its shares of total output or total sector value added. These are computed at the sector or industry level. If a country's share in exports exceeds its share of total world production value (in value added or gross terms), then it is said to have a relative comparative advantage in that product. Thus, indicator values greater than 1 suggest relative comparative advantages, with those less than 1 suggesting relative comparative disadvantages. On a value added basis, countries such as Lao PDR, Thailand and Viet Nam have a comparative advantage in both the production of rice (paddy rice) and its transformation into a final product (processed rice) (Figure 6). In contrast, Cambodia and the Rest of South East Asia (SEA) – dominated by Myanmar – have a stronger comparative advantage in production rather than in processing.

Figure 6. Revealed comparative advantage in rice production and processing

Gross export and trade in value added basis, 2014



Note: Rest of Southeast Asia (SEA) includes Myanmar along with Timor-Leste. Gross exports represent the calculation of the revealed comparative advantage based on gross exports of paddy rice and processed rice; total value added basis is calculated based on trade value added that originated in the paddy rice or processed rice sector. The latter includes the paddy rice sector value added that forms part of gross processed rice export value, and that which may be part of other products (such as other food products or livestock when rice is used as feed) that are traded on international markets.
Source: Greenville and Kawasaki (2018).

The revealed comparative advantage indicators also provide insight into rice production in both Indonesia and the Philippines. On a trade in value added basis, both countries have an indicator score in excess of 1 for paddy rice production (and for the processing sector in the Philippines). This result is driven by the indirect use of paddy rice value added in other exports, and suggests that underpinning the production in both countries is the potential for an internationally competitive sector. While important barriers restrict the use of rice to predominately domestically produced quantities, the processing sectors are still able to source some rice in these conditions that allows them to remain internationally competitive. In this context, imports of rice to these countries cannot be viewed as an indicator of a non-competitive sector (or parts thereof), but rather of a large domestic demand compared to domestic supply capacity. What would limit competitiveness of this part of the sector are steps to subsidise the sector or to isolate it from regional and international markets.

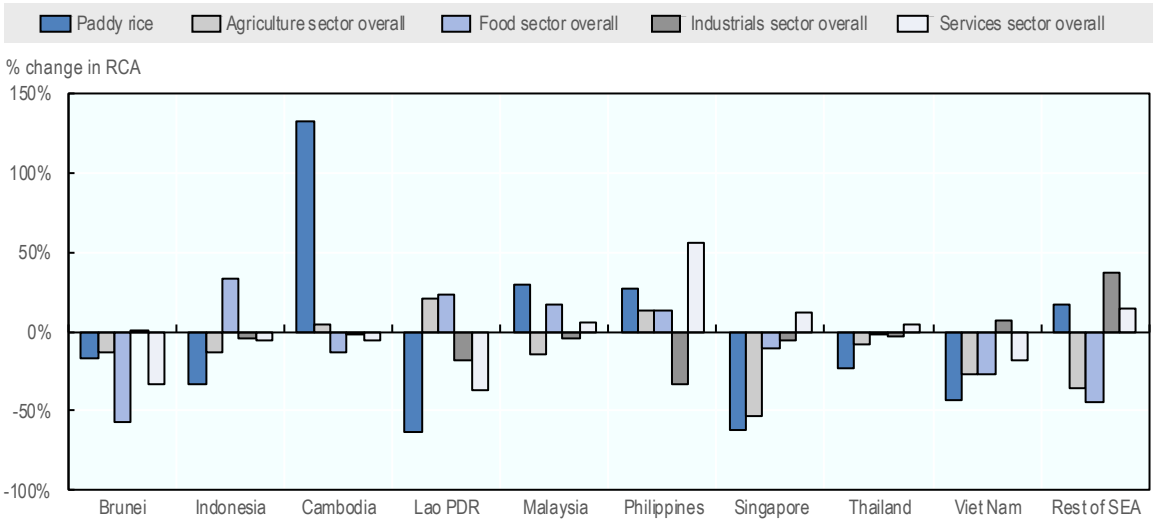
Changes in comparative advantage also reveal some trends across ASEAN countries in rice and broader trade. Changes are determined by both changes in the sector itself and, importantly, changes in other sectors of the economy. For example, if another sector begins to grow and leads to the shifting of resources away from rice, it may cause a fall in the measured comparative advantage even though there may have been no change in the fundamental competitiveness of the rice sector. Thus, placing changes in rice in the context of agriculture and other sectors is important. Across ASEAN countries, changes depict different development aspects. For Thailand and Viet Nam, growing service and industrial sectors are creating shifts in resources and economic activity away from agriculture to elsewhere in the economy – the large share of rice production in total agricultural production means that much of the shifts in resources are coming from the rice sector meaning falls in revealed comparative advantage in rice are greater than that seen for the

agriculture sector overall (Figure 7). In Lao PDR, comparative advantage in rice is falling due to increases in production of other agriculture and industrials. For Cambodia and Myanmar (Rest of SEA), in contrast, increases in rice sector comparative advantages are seen, these being greater than comparative advantages in agriculture as a whole.

For the Philippines and Malaysia, the indicators suggest increasing comparative advantage in rice production (albeit remaining less than 1 for Malaysia). For the Philippines, this is part of improvements seen for agriculture overall. For Indonesia, comparative advantages in rice production are falling, and to a greater extent than those seen in other agricultural sectors. Growth is seen in the Indonesian food sector, suggesting that some adjustment is occurring, potentially opening up opportunities to change the way in which the country participates in agro-food trade and regional production. Nevertheless, the observed falls in comparative advantage in rice in Indonesia have been accompanied by heightened policy efforts which have led increased resource use in the rice sector and increased rice production. A faster rate of fall in RCA in rice than those in other agriculture, combined with greater resources being used by the sector, suggests that such policies are likely to be adversely impacting the overall productivity and competitiveness of the rice sector.

Figure 7. Changes in revealed comparative advantage, rice and other sectors

% changes based on trade in value added between 2004 and 2014



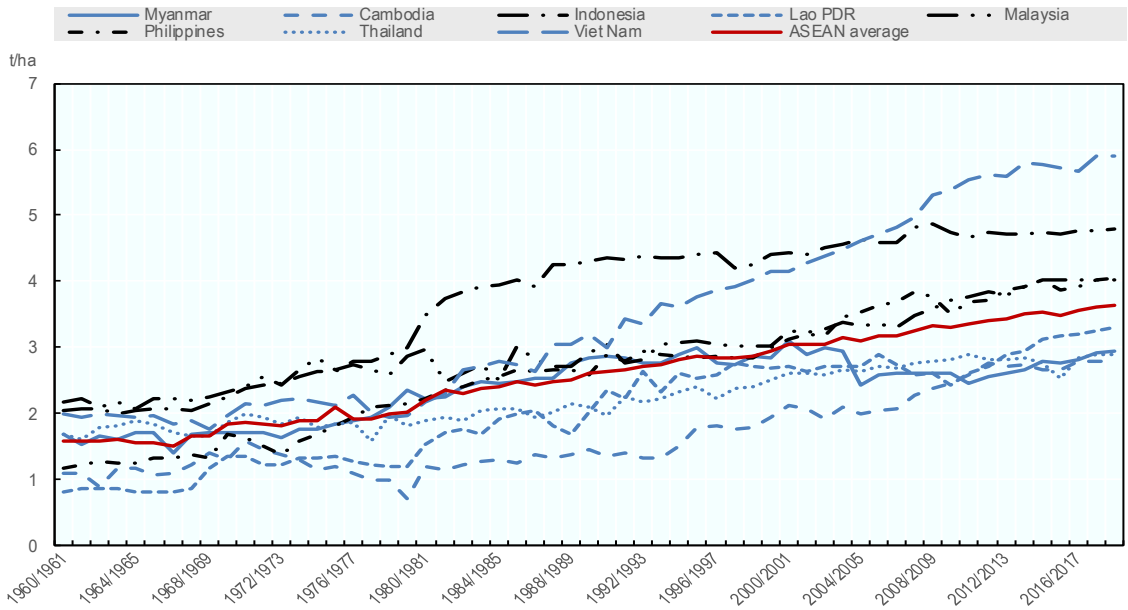
Note: RCA: Revealed Comparative Advantage. Comparative advantage indicators calculated on a total value added traded basis. For example, calculated on the value added traded that originated in the paddy rice or processed rice sector. This includes paddy rice sector value added that forms part of gross processed rice export values, and that which may be part of other products (such as other food products or livestock when rice is used as feed) that are traded on international markets. Rest of Southeast Asia (SEA) includes Myanmar along with Timor-Leste.
Source: Greenville and Kawasaki (2018).

In terms of yield, differences do not always follow the differences observed in production (Figure 8). A number of net importing – or traditional net importing – countries have higher yields than mainland producers. Viet Nam is the only exception, due to a sustained period of strong yield growth since the early 1990s. Higher yields in importing countries are likely to be partly explained by pressures for "induced innovation" (Hayami and Ruttan, 1985). That is, relatively limited suitable land resources, combined with the competition from mainland rice producers who have a natural comparative advantage due to land and water

availability, a creates strong incentive exists for producers in these countries to seek productivity improvements to remain competitive.

Figure 8. Rice yields across ASEAN

Tonnes per hectare, 1961-2018



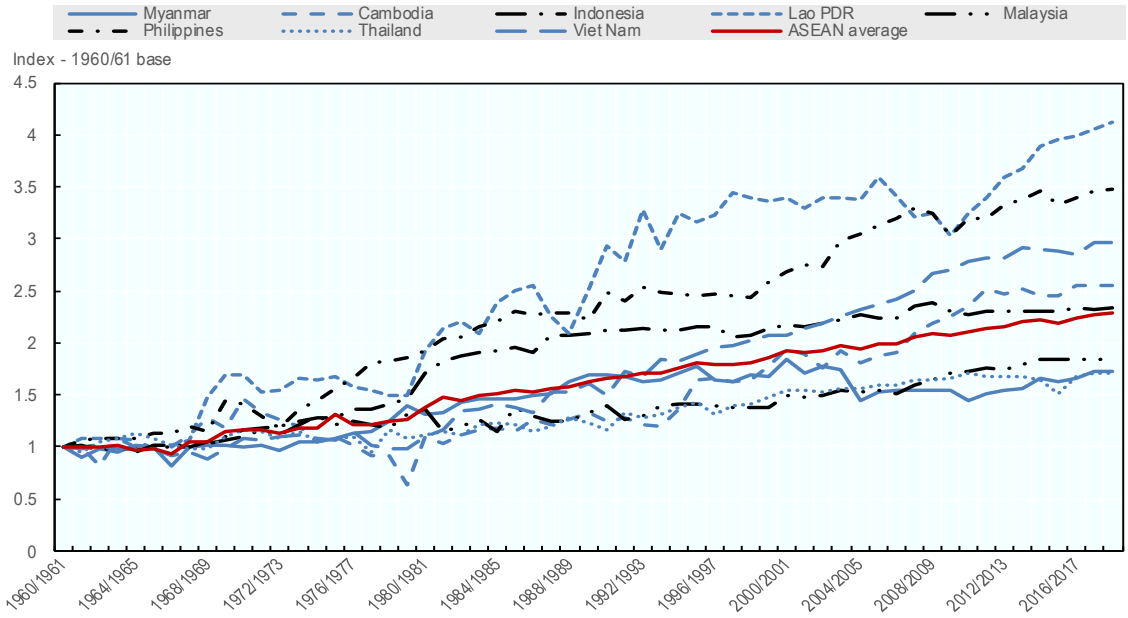
Source: USDA (2018b), *Production, Supply and Distribution Online*, http://apps.fas.usda.gov/psdonline/psdquery.aspx.

Looking at yield growth also reveals that some of the emerging rice producers – Lao PDR and Cambodia, for example – are significantly improving their performance (Figure 9). Lao PDR in particular has maintained strong growth in rice yields over time. Nevertheless, as it started from a low base, it has remained well below ASEAN highest yields over time, with the gap increasing until the late 1990s, after which it has remained stable. Turning to the importing regions, the Philippines has maintained growth over time, while in Indonesia, recent years have seen a plateau in yields, particularly since the policy push towards self-sufficiency which has effectively encouraged more marginal and lower-yielding production.

Trends in per capita rice for food consumption vary across the region (Figure 10). With the exception of Indonesia, net exporting countries generally have higher consumption rates. Rice consumption is influenced by a number of factors, including availability, price, incomes of the population and cultural habits. For example, per capita consumption of rice in Malaysia is generally lower than that of other ASEAN countries due to higher per capita incomes that have contributed to a substitution away from rice to other food products.

Figure 9. Relative rice yield growth across ASEAN

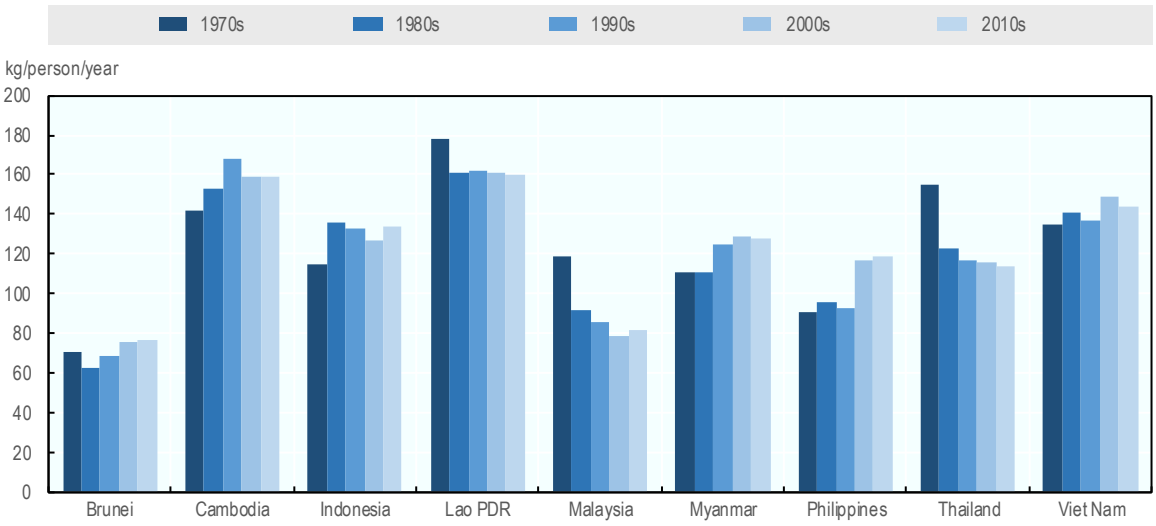
Index values, 1961 base



Source: USDA (2018b), *Production, Supply and Distribution Online*, http://apps.fas.usda.gov/psdonline/psdquery.aspx.

Figure 10. Rice consumption per capita across ASEAN

Average decadal rice consumption



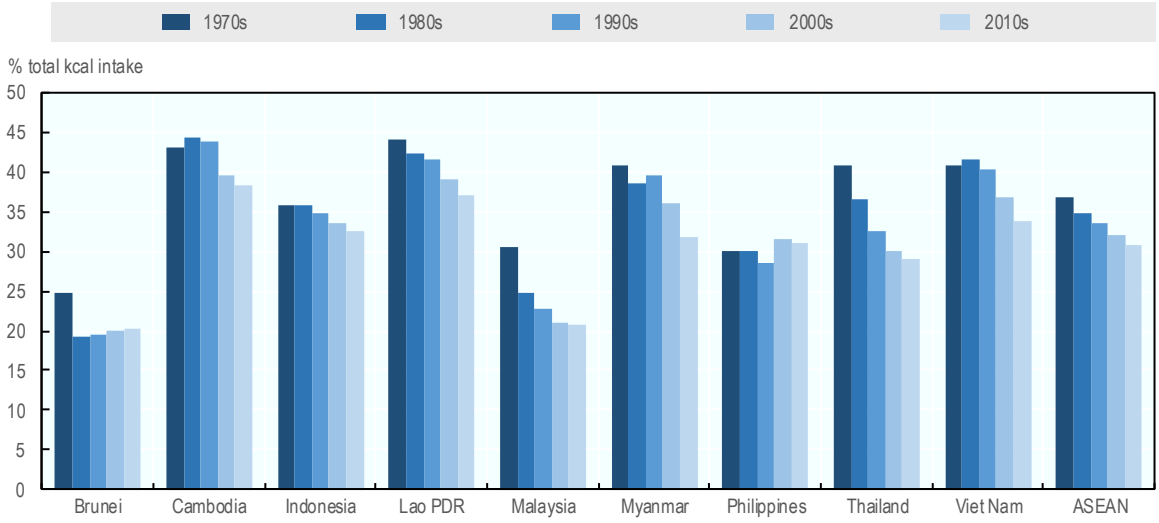
Note: Consumption drawn from FAO food balance sheets, and represents rice used for food, expressed as kg per capita per year. Decade averages taken as the simple average over each decade, with 2010s being incomplete (covering 2010-13).
Source: FAO (2018), *FAOSTAT*, http://faostat.fao.org/.

For some countries, per capita consumption has fallen over time – a trend which is particularly evident for Malaysia and Thailand. For others, such as Indonesia and the Philippines, the opposite is true. However, rice for food consumption is only part of the story. In certain countries such as Myanmar, some published statistics report significant consumption of rice for animal feed. United States Department of Agriculture (USDA) data, for example, suggests that total domestic consumption of rice is higher than other estimates, mainly due to the amounts accounted for by feed consumption. Furthermore, USDA estimates suggest that the recent increases in consumption in Viet Nam and Myanmar are also larger than that shown in Figure 10.

The importance of rice in meeting total caloric consumption has fallen in almost all ASEAN countries since the 1960s (Figure 11). The rates of change have been most significant for both Thailand and Malaysia, indicating that diets have diversified most in these countries compared with the 1960s. In contrast, the importance of rice in the average diet has increased in the Philippines – and indeed in Brunei Darussalam more recently, albeit to a lesser extent and from a much smaller base.

Figure 11. Share of rice in total caloric intake

Average percentage of total caloric intake per person per day



Note: kcal consumption drawn from FAO food balance sheets, and represents kcal from rice (milled) as a share of total kcal. Decade averages taken as the simple average over each decade, with 2010s being incomplete (2010-13).
Source: FAO (2018), *FAOSTAT*, http://faostat.fao.org/.

4. Rice policies in ASEAN

Agricultural policy settings in ASEAN are heavily focused on rice, both due to the crop's status as the region's main staple product, and to past and continuing concerns over food security. The policies applied have been extensively reviewed in previous OECD work – see Chapter 3 of OECD (2017a) – and thus are only briefly summarised below.

Policy measures directed towards self-sufficiency dominate

Rice policies have often been based on attempts by member states to achieve self-sufficiency in production. Almost all ASEAN members have some form of

self-sufficiency policy in place – a policy push that has increased in intensity since the 2008 global food price crisis.

Much of the policy push towards self-sufficiency is based on a desire to no longer be vulnerable to world price movements – in other words, as a means to insure against high international prices. This is essentially a domestic solution to an international policy problem, as much of the food price spikes in 2007-08, and especially those for rice, were largely driven by policy factors and not global imbalances in supply and demand (Alavi et al., 2012; OECD, 2008; Piesse and Thirtle, 2009; Naylor and Falcon, 2010; Headey, 2011).

Self-sufficiency policies are often supported by production targets for a particular commodity or set of commodities. Across ASEAN, almost all countries have some form of self-sufficiency related target (Table 1). Within this, Indonesia has the most ambitious set of targets, which have been expanded upon since 2012 and which aim for self-sufficiency across all main staple products. The Philippines is the only country which has coupled a drive for self-sufficiency in its two main staple crops (rice and maize) with attempts to diversify individual diets by encouraging consumption of a wider set of food products (Philippines Government, 2011).

Table 1. Self-sufficiency targets in ASEAN

Country	Self-sufficiency target
Brunei Darussalam	Rice self-sufficiency of 20% by 2015 and 60% over the longer term (2035)
Cambodia	No specific self-sufficiency targets
Indonesia	Complete self-sufficiency (100% of domestic production) targets for rice, maize and soybeans by 2017 and beef and sugar by 2019
Lao PDR	Production targets for rice ~ 4.2 mil tonnes by 2015 and rate of increase targets for other products. Absolute quantity targets of food production for some commodities
Malaysia	Self-sufficiency targets for rice of 90% of domestic consumption plus other production targets
Myanmar	No specific self-sufficiency targets
Philippines	Self-sufficiency in rice previously set for 2013 but later abandoned set year target. Self-sufficiency in maize production by 2013
Singapore	Increase self-sufficiency levels to 30% for eggs, 15% for fish and 10% for leafy vegetables
Thailand	No specific self-sufficiency targets
Viet Nam	Maintain a 2.5% rice yield increase per year until 2020, and the set aside of 3.8 m ha of land specifically for rice production

Source: OECD (2017a).

However, self-sufficiency for some is likely to come at a cost, and moreover may not be achievable. For example, despite strong yields in countries such as Indonesia, some research has suggested that achieving self-sufficiency in island and peninsula states will be difficult. Making use of agricultural production information on yields and available resources, such as land and water, Clarete (2013) suggests that – even in the presence of expected yield improvements, based on a continuation of historical trends – there is only a small probability that countries such as Indonesia and the Philippines could achieve self-sufficiency over the long run if historical shocks to yield are replicated in the future. Over the long term, Clarete (2013) suggests that there is only a small likelihood that Indonesia will become self-sufficient in rice production, and only a 5% likelihood for the Philippines. It was noted, however, that if sustained yield improvements were indeed achieved, self-sufficiency over the long run may be possible, but this would come at a significant cost, as high domestic prices would be needed to encourage production – and to discourage consumption.

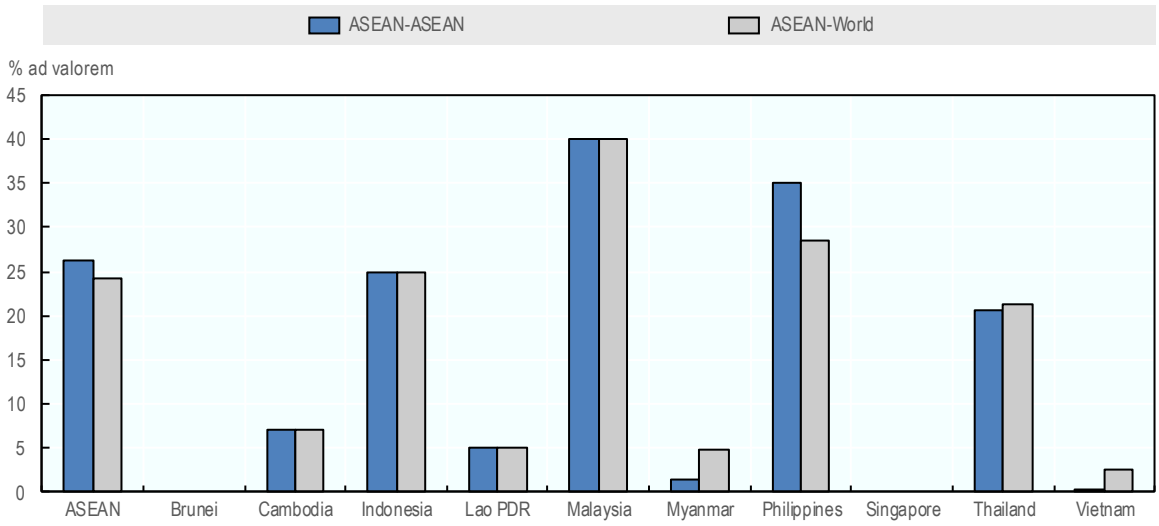
Self-sufficiency and domestic production are supported by trade policy

Tariffs

Trade in rice within ASEAN has been excluded from the broader regional integration efforts set out in the AFTA. As such, the same tariff barriers apply to trade in rice between ASEAN member states as trade in rice from non-members (Figure 12). In other words, there is no preference given to other ASEAN member states when it comes to imports of rice. There are two exceptions, with both Myanmar and Viet Nam applying lower tariffs on intra-ASEAN trade in rice. Both, however, are rice exporters with imports likely feeding into their own production activities as intermediate inputs and being subsequently re-exported by both countries.

Figure 12. Intra and external rice tariffs, 2015-16

Applied *ad valorem* tariffs in 2015-16



Source: WITS (2018), *World Integrated Trade Solution*, https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx.

Export restrictions

Beyond import barriers, a number of countries have implemented restrictions on the export of rice. These have been used in response to price rises on either domestic or international markets and usually are attempts to manage prices for domestic consumers. Myanmar, for example, imposed export bans on rice in 2004 and 2008 after a natural disaster, and limits to previously-licensed export amounts were put in place in 2011 and 2013. Prior to these bans and explicit restrictions, in 2001, an informal agreement was reached with millers and exporters to release stocks and restrict exports (World Bank, 2014). Lao PDR also implemented export bans in 2010 in response to rapidly rising prices (Durevall and van der Weide, 2014). The possibility of using export bans in Lao PDR exists for both provincial and national governments (Eliste and Santos, 2012).

Beyond ad hoc restrictions and bans, a number of rice-exporting countries in ASEAN also use licensing arrangements to control the level and value of exports. Part of the motivation behind such measures is to manage domestic prices and supplies in the long term. For

example, in Viet Nam, rice exports are centrally controlled through licensing arrangements and state-owned enterprises (OECD, 2017a).

Furthermore, following the rice price crisis in 2007-08, governments in Thailand and Viet Nam discussed the possibility of co-ordinating on international supplies in an attempt to influence world prices (Freedman, 2013). This, coupled with Thailand's revamped paddy pledging scheme (which subsequently failed and has been dismantled) that led to the accumulation of significant stocks, created further uncertainty in regional and world markets.

Non-tariff measures

A range of non-tariff measures for rice, and for agro-food trade more broadly, exist within ASEAN. For all ASEAN economies, and for all goods, while tariffs levels fell from 8.9% in 2000 to 4.5% in 2015, the number of non-tariff measures in force rose from 1 634 to 5 975 (Ing, Fernandez de Cordoba and Cadot, 2016).

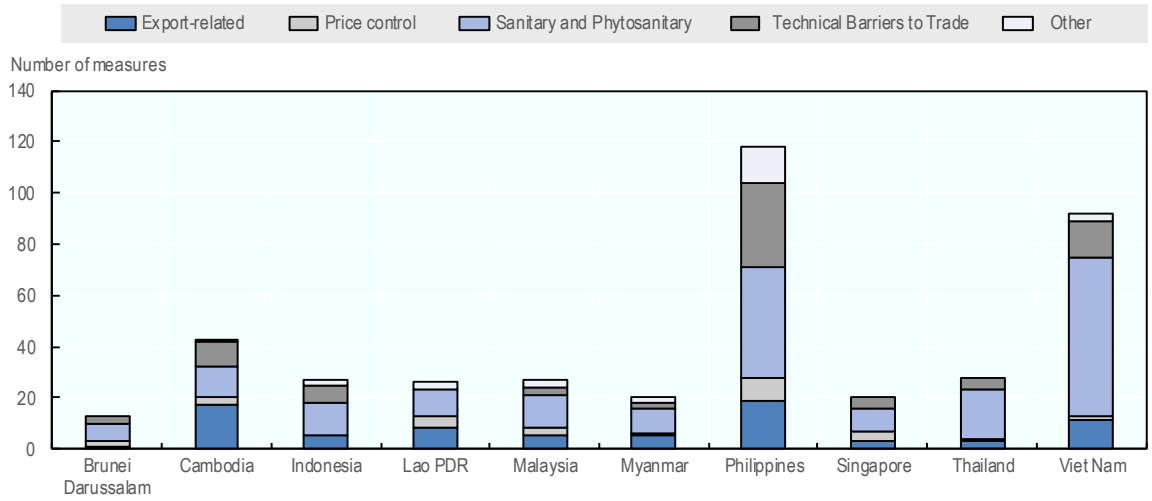
The types of non-tariff measures vary, with sanitary and phytosanitary (SPS) measures the most prevalent, accounting for close to 50% of all measures in force in 2018 (Figure 13). This was followed by both technical barriers to trade (TBT) and export-related measures, each accounting for around 20% of all measures applied by ASEAN member states.

A number of countries also use licensing and/or bans on private imports of rice (outside nominated monopoly importers) to control imports. This occurs in Indonesia, Malaysia and the Philippines (OECD, 2017a). Such policies allow governments to effectively place quantitative restrictions on rice imports.

Both the Philippines and Viet Nam impose the largest number of measures. For the Philippines, there are a wide range of different measures in place, while for Viet Nam, the predominant measures relate to SPS provisions.

Figure 13. Non-tariff measures applied to rice by ASEAN member states

Number of measures in currently in force (2018)

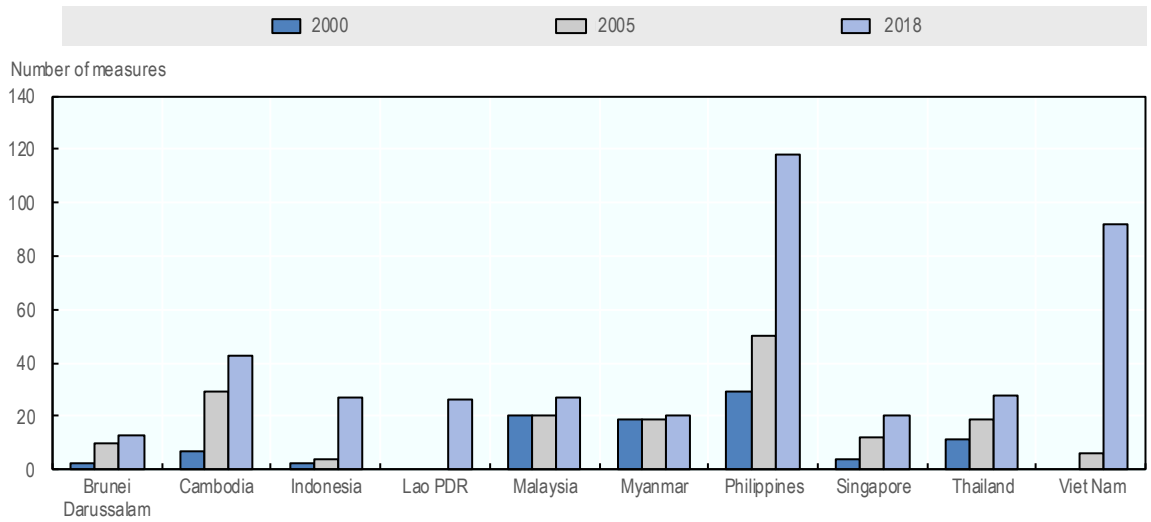


Note: Those applied to HS codes 100610, 100620, 100630, 100640, 110230 and 110314. "Other" includes contingent trade protective measures, pre-shipment inspection, quantity controls and "other measures".
Source: UNCTAD-ERIA-WTO (2018).

Across ASEAN member states, 414 non-tariff measures were applied to rice trade in 2018. This figure has increased dramatically since 2000, when only 94 measures were in force. This increase in the use of non-tariff measures has been observed in most ASEAN member states, with the exception of Malaysia and Myanmar, where the number of provisions have remained relatively stable (Figure 14). Of the increase in measures, most new measures relate to SPS arrangements (accounting for 50% of the increase), followed by additional TBTs and export-related measures.

Figure 14. Change in number of non-tariff measures applied to rice, 2000 to 2018

Number of measures in force by year



Note: Those applied to HS codes 100610, 100620, 100630, 100640, 110230 and 110314.
Source: UNCTAD-ERIA-WTO (2018).

Non-tariff measures can have significant price effects, with the type of measure being particularly important. In Indonesia, for example, Marks (2015) estimates that in 2015, the impact of non-tariff measures on the price of domestic rice was very significant. Overall, tariff and non-tariff measures created an effective tariff – as measured by the nominal rate of assistance – of around 67%, with only 8 percentage points of this due to restrictions outside the quantitative limits created by licensing. These policies translated into an effective rate of assistance (the amount domestic prices are increased) of between 150% to 200% (Marks, 2015).

Stockholding policies are also prevalent

Beyond the supply side, some countries have also sought to intervene in markets with the expressed aim of stabilising prices for the benefit of both producers and consumers. This intervention has taken the form of public stockholding policies, most notably in Indonesia, Malaysia and the Philippines. These provisions of the programmes in these countries are summarised below (OECD, 2017; 2018).

- In Indonesia, the stockholding programme is administered by the Bureau of Logistics (Badan Urusan Logisitk), which is responsible for rice procurement (both from farmers and millers), the management of public stocks and the distribution of subsidised rice to the poor, release at times of emergency and the sale of rice at times when prices rise in an attempt to manage domestic prices.

- In Malaysia, a private company, Padiberas Nasional (Bernas), manages national stocks on behalf of the government. Bernas has exclusive import rights and is required to fulfil a number of non-commercial obligations. These non-commercial obligations include managing the stockpile; the purchase of paddy from farmers at the Guaranteed Minimum Price (GMP), to act as a buyer of last resort for farmers; to manage the Bumiputera Rice Millers Schemes; and to distribute the Paddy Price subsidies to farmers.
- In the Philippines, the National Food Authority (NFA) runs the stockholding programme and has a mandate to stabilise prices at both producer and consumer levels and thus ensure food security. The NFA also administers imports through permits and allocations that are granted to them by the NFA via auctions.

All other ASEAN members also have some form of stockholding programme (OECD, 2017a). In Brunei Darussalam, Cambodia, Lao PDR, Singapore and Viet Nam, these are predominately restricted to emergency stocks for use when disasters occur. In Thailand, government stocks were built at a time when efforts were made to influence world prices. Myanmar has made use of a private-public partnership with the Myanmar Rice Federation to gain access to stocks in times of emergencies.

Various input and output programmes exist

In a number of ASEAN countries, programmes are in place to influence the cost of inputs and the price of outputs. For those with stockholding schemes that extend beyond emergency management, minimum or administered price schemes are in place to influence the price of paddy rice. Similarly, Thailand, through its Paddy Pledging Scheme, has occasionally sought to influence the price received by rice farmers for their crops, most notably in the post-2011 period, when rice farmers were paid 50% more than the market price. This resulted in a large accumulation of stocks and downward pressure on international prices before it ceased (Permani and Vanzetti, 2014; OECD, 2017-SEA).

Viet Nam also has a target price for rice with a view to increasing the profit margin for producers (OECD, 2015a). However, the indirect application of the scheme, through subsidies for temporary storage, has had little to negative impacts on price (OECD, 2015a). Other countries such as Lao PDR and Myanmar have regulations that allow the possibility to influence the prices received by rice farmers, but there is little evidence as to whether the measures have been used or, if so, whether they have had an impact (OECD, 2017a).

On the input side, all countries have invested in irrigation infrastructure to promote production and ensure a stable supply. Some also subsidise variable inputs such as fertilisers – this is the case in Malaysia, Indonesia, and previously in Myanmar and the Philippines (OECD, 2017a).

Regional rice-related policies and programmes

In an attempt to find a regional solution to individual country stockholding programmes, ASEAN has at various times sought to develop a regional rice reserve (Box 2). The ASEAN Plus Three Emergency Rice Reserve (APTERR) in its current form, established following the global food price crisis in 2007-08, seeks to hold physical rice reserves that would serve the needs of ASEAN member states when the demand in any member country cannot be fulfilled by own production or the international market (Mujahid and Kornher, 2016). Each ASEAN member state is part of APTERR, pledging part of their own stocks for use in the

scheme if required, together with Japan, Korea and the People's Republic China (hereafter "China"). After a trial period, APTERR came into full operation in 2012.

The stocks held within APTERR remain owned and controlled by the respective governments who contribute them, and are used for meeting the needs of any other member countries in the event of emergency. The owning governments are responsible for the management cost of their stocks to ensure the stocks remain fit for human consumption. Another type of APTERR stock is a stockpiled emergency rice reserve, which takes the form of cash or rice, and in this instance is owned collectively by APTERR member countries and managed by the APTERR secretariat under the supervision of the APTERR council (Mujahid and Kornher, 2016).

Box 2. The ASEAN Plus Three Emergency Rice Reserve

ASEAN members have long sought to build co-operation around the public stockholding of rice to prepare for emergencies. In 1979, the Agreement of the ASEAN Food Security Reserve was signed (originally by Indonesia, Malaysia, the Philippines, Singapore and Thailand), which established the ASEAN Emergency Rice Reserve. This agreement sets out an amount of domestically-held stocks that are earmarked to meet emergency requirements in the region. The agreement does not require the holding of physical stocks, but rather a commitment to provide a set amount of rice in emergency situations (Briones, 2014). This agreement was later expanded as ASEAN grew.

In 2002, a more regional scheme was trialled which expanded beyond ASEAN members to include China, Japan and Korea. The scheme was called the East Asia Emergency Rice Reserve (EAERR), and consisted of rice that would be donated in the face of acute emergency within member countries. Under this scheme, 13 000 tonnes of rice were distributed in Cambodia, Indonesia, Lao PDR, Myanmar, and the Philippines (Briones, 2014).

The EAERR was later converted into the current ASEAN Plus Three Emergency Rice Reserve (APTERR) through an agreement that came into force in 2012. In total, 787 000 tonnes of rice are earmarked by members, based on historical allocations from the preceding schemes. The three non-ASEAN members account for the largest amounts of earmarked stocks, accounting for 700 000 tonnes of the total pledged amount.

Stocks can be released from APTERR under different "tiers", or types of agreements between member countries (OECD, 2017a):

- Under Tier 1, stand-by arrangements between countries are negotiated which pre-specify the quantity, quality and terms and conditions of release in an effort to avoid negotiations after an emergency has occurred. The system is formalised by three-year renewable forward contracts between countries. Price does not need to be part of the contract, but if it is not, a formula for determining price must be agreed within the contract. Delivery is intended to be one month or earlier after the request.
- Under Tier 2, earmarked stocks under the scheme can be released on the basis of bilateral negotiations between members that take place after an emergency has occurred.
- Under Tier 3, stockpiled rice can be released to help meet the needs of acute emergency situations.

By virtue of the release provisions and the way that stocks are held and managed, the scheme relies heavily on the political will and commitment of member states and partners (Mujahid and Kornher, 2016).

APTERR has been increasingly called upon to provide emergency supplies of rice, albeit in relatively few instances. The most significant time followed a natural disaster in the Philippines in late 2013, when the Philippine government sought emergency supplies of rice from APTERR. In total, 6 730 tonnes of rice was delivered over an 18-month period, with rice received from China (800 tonnes in March 2014), Thailand (5 000 tonnes in April 2014), Malaysia (350 tonnes in August 2014), and Japan (580 tonnes in March 2015).

Recently, between 2017 and 2018, rice supplies have also been released from APTERR for other natural disasters and emergency situations (under Tier 3). These have been contributed by key partner members and not drawn from ASEAN member stocks (although domestic non-APTERR stocks have been used by some member states). Between 2017 and 2018, Japan provided 950 tonnes of rice, of which 225 tonnes was distributed to the Philippines following the Marawi crisis, 500 tonnes following the floods in Myanmar, and 225 tonnes following floods and landslides in Lao PDR. Korea also contributed 10 750 tonnes, of which 178 tonnes was distributed to Cambodia post droughts and floods in the period, 267 to the people of Rakhine State in Myanmar, 233 to combat poverty in Kachin State Myanmar and 10 000 tonnes in response to Typhoon Damrey in Viet Nam. A further 72 tonnes remains in storage in Cambodia. However, to date, APTERR has not been used in times of emergency crisis caused by a sudden economic downturn or shock, and thus has not yet been tested in a situation similar to that seen during the food price crisis in 2007-08.

5. Price differences and levels across ASEAN

Across ASEAN member states, prices will vary even if markets were free from policy interventions and trade was prevalent. Countries across the region have different production costs, transportation and processing margins, and distances between them mean that costs exists in transporting rice from one country to the next. In sum, member states with production surpluses would be expected to have lower domestic prices than those where production is lower or more costly. The amount of trade will depend on the underlying differences in production, transport and processing costs along with the trade costs. Trade would then be expected to normalise prices once the cost of transport are taking into consideration.

However, the story of prices in the region is complicated by the presence of government policies. As noted above, a wide range of tariff and non-tariff measures influence regional rice trade which have the potential to create more significant gaps in prices across the region. These gaps can influence both the absolute price of rice and trends in rice prices (discussed in the following section).

For this report, data on domestic wholesale rice prices, for the most commonly consumed variety and quality of rice, were collected for seven ASEAN members. Data for Brunei Darussalam and Malaysia were not available. For Brunei Darussalam, high incomes, significant imports, and low levels of applied tariffs (zero between 2015-16) are likely to mean the regional export price, adjusted for transport, sets the domestic wholesale price. For Malaysia, significant impediments to trade exist with both tariff and non-tariff measures (in particular the monopoly import rights provided to Bernas) used. Thus wholesale prices are likely to differ to those in Brunei Darussalam, with price outcomes in Indonesia and the Philippines more representative of the Malaysian wholesale price (see Annex B for details) – a result found in Furuhashi and Gay (2017).

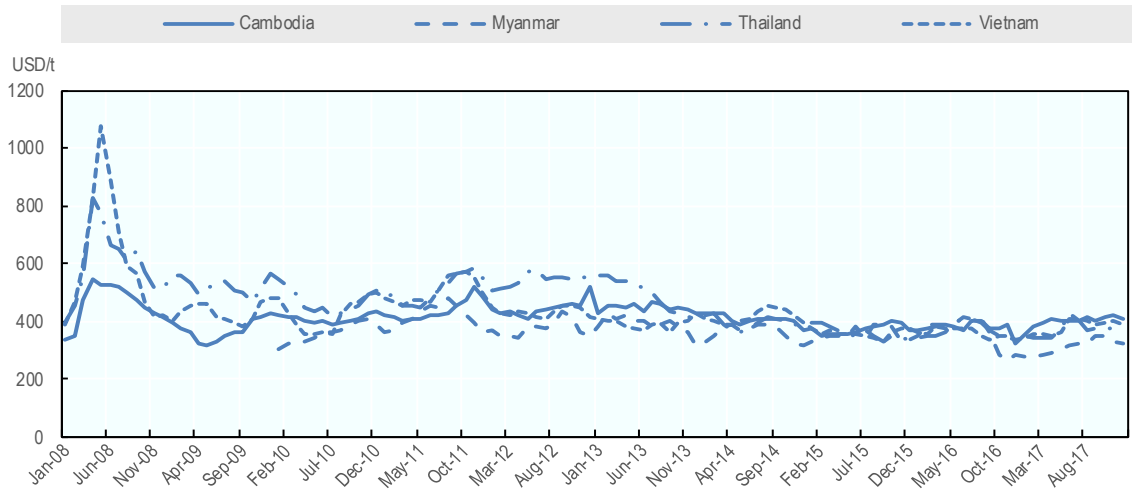
For Singapore, in the absence of monthly wholesale data, import unit values were explored. The monthly import unit value, however, differed significantly from the annual import value, raising questions over the coverage of the monthly data. The annual data showed a consistent price gap between Thai 5% broken rice and the import unit value (although quantities and unit values of Thai rice varied) – around 50% of the wholesale price. While some of the price gap can be explained by transport costs, the majority relates to consumed demands for quality and the possible effect of non-tariff measures. Thus while no comparable monthly data is available, prima facie, the price series so consistent movements indicating a fair degree of integration.

Prices across surplus producers relatively similar

Across the main producing and exporting countries in ASEAN wholesale rice prices are very similar (Figure 15). Over the period examined, the price band in which main exporter prices have sat has narrowed – from USD 191 per tonne in 2008, to USD 91 per tonne in 2017, but falling to USD 42 per tonne in 2015. Overall, the region's rice prices have been stable to falling in nominal terms over the period, representing real price declines in surplus producers on the back of continued productivity improvements. The tight band, and general similar movements suggests that across these producers, prices are, prima facie, integrated.

Figure 15. ASEAN exporter domestic rice prices

USD/tonne, nominal domestic prices 2008-17



Source: Annex B.

Prices for some are significantly higher than surplus producers

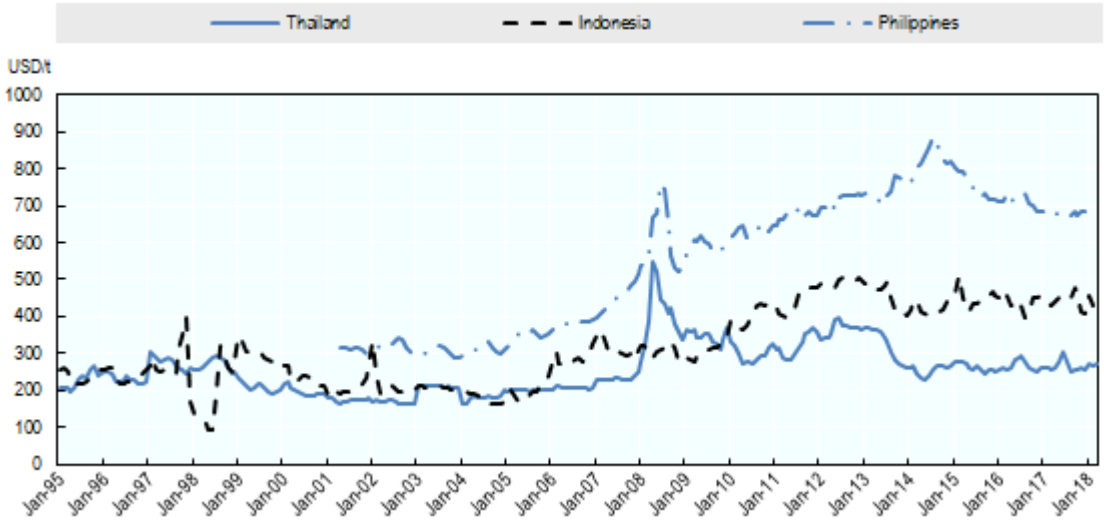
The impact of a number of the policies in place in some countries have caused domestic prices to rise above their international peers. Most notable in this respect are the prices observed in Indonesia and the Philippines. Both these ASEAN members have significantly higher domestic rice prices compared to similar traded products – in this case, Thai 15% broken rice including transportation cost from Thailand to each country (Thai price taken as the indicative regional price). Prices were, on average during 2017 1.8 and 2.6 times higher than the landed Thai rice price. For both, the gap have widened over time.

One notable difference, however, relates to the impact of the rice price crisis in 2007-08. The spike in rice prices is noticeable in both the Philippines and Thai price data, but is not

apparent in the Indonesian data. This shows that Indonesia's policy was successful in preventing the international price spike from being transferred to the domestic market. Despite this, it represented a single event across the 22 years of observed prices, indicating the policy has some longer run costs. Furthermore, for the price series depicted on Figure 15, the standard deviation in price movements over the periods where data are available are higher in both Indonesia and the Philippines (107 and 182 respectively) compared to the Thai price (67 with transport costs included and 70 without). Effectively, this shows that domestic production is likely to transfer more volatility to price than if no trade barriers existed. However, volatility is sensitive to the period chosen and at times, the Thai price is more volatile than either the Philippine or Indonesian prices. These higher prices in both countries have been found to have negative impacts on food security, increasing rates of undernourishment (OECD, 2017b; 2015c).

Figure 16. Indonesia, Philippine and adjusted Thai price

USD/tonne, nominal domestic prices



Note: Thai price represents 15% broken rice with adjustment for transport costs based on Thailand-Singapore per tonne estimated cost of insurance and freight (difference between fob and cif price).
Source: Annex B.

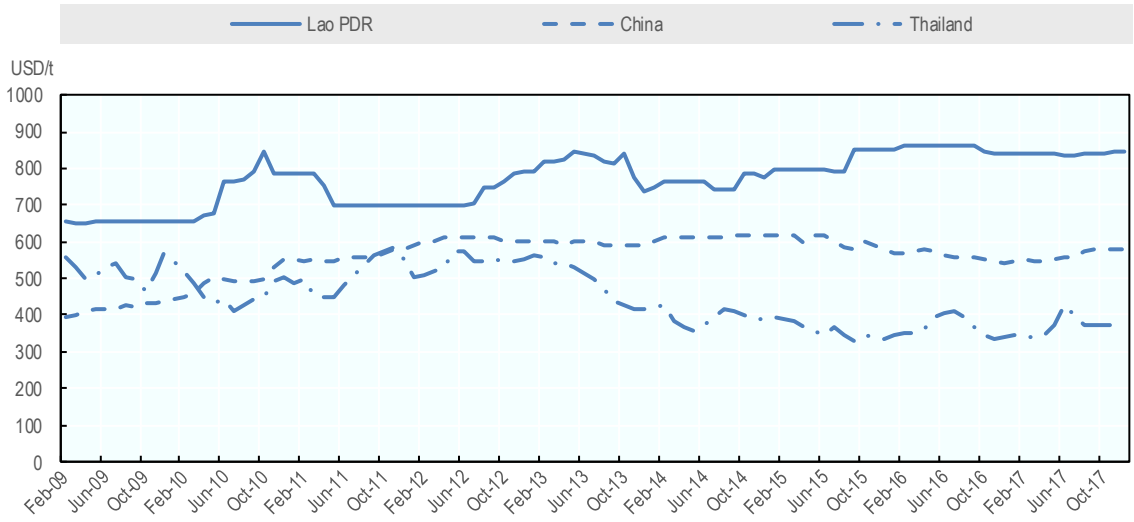
Prices for Lao PDR have changed in recent years

While clear patterns and similarities can be seen in prices across most ASEAN countries, wholesale rice prices in Lao PDR appear to follow a different pattern (Figure 17). Part of the reasons behind the difference may be the comparisons being made – with the typical rice consumed in Lao PDR being glutinous rather than regular rice. This makes direct comparisons difficult as although the series is representative of ordinary rice, 85% of consumption is made up of glutinous rice creating unique demand and supply influences on ordinary rice (Loening, 2011). In other studies – such as Durevall and van der Weide (2014), evidence is presented to clear relationships between Lao PDR and regional prices. Indeed, for glutinous rice, the study finds that there is a long run dependence of Lao PDR prices on regional prices when exploring the price movements between 2001 and 2011. Furthermore, rice prices in Lao PDR where found to be consistently below both Vietnamese and Thai glutinous rice prices, as would be expected given Lao PDR's relative level of development and the past use of export restrictions.

The data collected for this study, while over a shorter time series, suggests similar relationships for the initial period. However, movements post 2014 show a different pattern to Thai price changes and show a more stable to increasing trend – potentially more closely related to price movements in China.

Figure 17. Lao PDR, Chinese and Thai rice prices

USD/tonne, nominal domestic prices



Note: Likely differences in quality and varieties make direct price comparisons on levels not possible.
Source: Annex B.

6. Current state of rice market integration

There is limited empirical evidence on the extent of current rice market integration in the ASEAN. Market integration in prices generally occurs when prices move together – essentially picking up the fact that prices are responding in the same way to similar market signals or information. Generally consistent trends or movements provide some evidence around the extent of market integration. The other aspect relates to price gaps which are not explained by transport and other marketing or quality costs that can differentiate markets. However, a number of studies have focused on the international trade in rice as well as relationships between major rice exporting countries, typically Thailand and Viet Nam.

Yavapolkul, Gopinath and Gulati (2006), for example, identified the existence of partial rice market integration based on export prices from the world's main exporters of India, Thailand, Viet Nam and the United States. The authors found that US and Thai rice prices more strongly influenced Vietnamese and Indian rice export prices that in reverse. Similarly, Chen and Saghaian (2016) examined the nature of rice export market integration and price transmission dynamics across Thailand, Viet Nam and the United States, and concluded that the international rice export market is well integrated and representative of price competition (Chen and Saghaian [2016], p. 455).

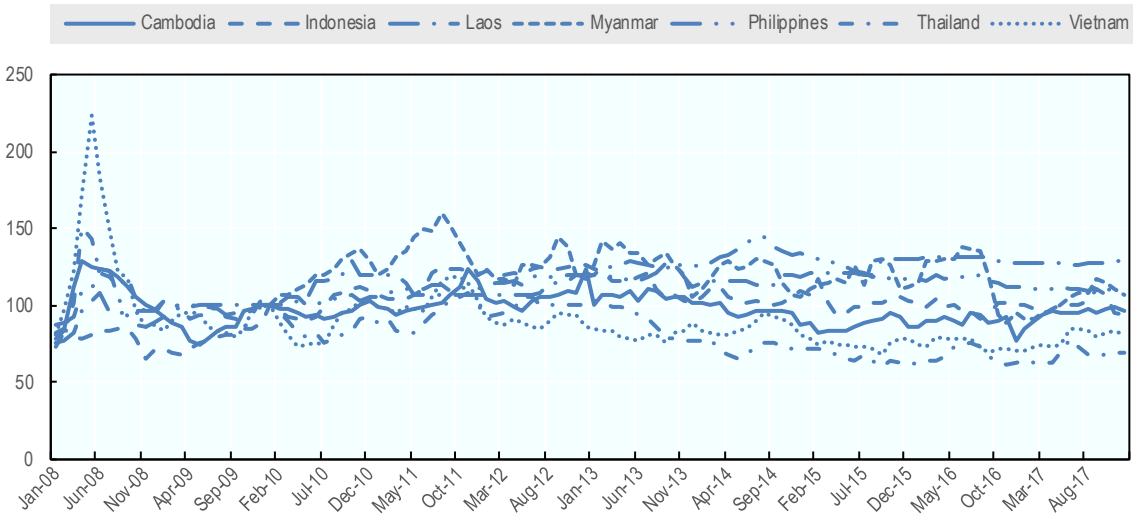
Ghoshray (2008) also found evidence of integration between Thailand and Viet Nam price for high-and medium-quality rice. Durevall and van der Weide (2014) find evidence of price integration between Lao PDR, Thai and Vietnamese glutinous rice prices. Lastly, Myint and Bauer (2010) find evidence of very weak integration between Thai and

Myanmar rice prices, with limitations in integration linked to government control and intervention in export markets that have limited price transmission.

Looking at prices movements overall (through rebasing prices off a common starting point) shows broadly similar price movements across the region – albeit with some prices following others with a delay (Figure 18).

Figure 18. Movements in rice prices across the region

USD price per kg, index values, January 2010 = 100



Source: Annex B.

One approach that can shed light on market integration is to use pairwise correlations of monthly wholesale rice price levels over the period for which data has been collected. Correlation coefficients can provide a directly-interpretable measure of the direction and strength of correlation (or co-movement) between the two rice price series. They sit within a range from -1 (perfect negative correlation) to +1 (perfect positive correlation).[2] Markets which are integrated would typically be associated with higher correlation between the price levels or price changes of rice in two countries, which would suggest that the respective country rice prices move together closely and respond similarly to regional or international events or shocks.

However, caution needs to be taken in terms of the direction of correlation – positive or negative. In integrated markets, prices could go either way, with price rises being transmitted or, as prices rise, markets may shift to alternative supplies and thus negative correlations may be present. Thus, non-zero correlations in the first instance may provide an indicative measure of in market integration.

Data on correlations in USD terms of rice prices within ASEAN and China provide indicative evidence of price integration across the region (Table 2). Prices in Viet Nam and Thailand exhibit the strongest positive correlation, potentially linked to the external environment which they face as the majority of rice is exported to non-ASEAN countries.

[2] It should also be mentioned that pairwise correlation are only one statistical measure, and may be subject to bias due to masking the existence of trends or cycles in prices, such as seasonality and inflation effects.

For Singapore, based on annual data very high correlations exist between Thai and import unit value prices (0.96) despite the fact that imports of Thai rice constitute around 30% of all rice imports in volume terms.

Table 2. Contemporaneous correlation in rice prices, ASEAN and selected key partners

Correlation coefficients in monthly USD per kg prices, 2008 to 2017

	Cambodia	Indonesia	Lao PDR	Myanmar	Philippines	Thailand	Viet Nam	China
Cambodia	1.00	0.31	-0.16	0.39	0.08	0.67	0.64	0.36
Indonesia		1.00	0.42	0.47	0.51	-0.05	-0.15	0.71
Lao PDR			1.00	-0.15	-0.44	-0.32	-0.50	-0.32
Myanmar				1.00	0.08	0.48	0.50	0.17
Philippines					1.00	-0.34	-0.12	0.83
Thailand						1.00	0.75	-0.27
Viet Nam							1.00	-0.16
China								1.00

Source: Author estimates.

However, correlations in monthly prices may not capture the price transmission path between ASEAN countries well nor do they properly test for integration in prices. Given the dominance of Thailand and Viet Nam in exports, and time delays between production, purchase and delivery, prices in other ASEAN members may more closely follow lagged Thai and Viet Nam prices. Furthermore, the events of food price crisis, and the policy instruments employed at that time may have also disrupted the patterns seen, thus it is worth exploring alternative periods as well.

Taking lagged Thai and Viet Nam prices (12 months), and comparing starting periods of 2012 to 2017 and 2010 to 2017 indicate fairly robust correlations between ASEAN members and non-members (Figure 19). Furthermore, correlations have increased over time – particularly in the Philippines. The increased correlation in rice prices over time occurs in normal time comparisons and is further complemented by a number of reductions in price gaps for some ASEAN member states. For example, from 2014 onwards, correlations in real time rice prices are positive for most intra-ASEAN comparisons (with the exception of Lao PDR – see below). These all support findings that ASEAN rice markets have begun to become more integrated over time, particularly from 2012 and 2013 onwards.

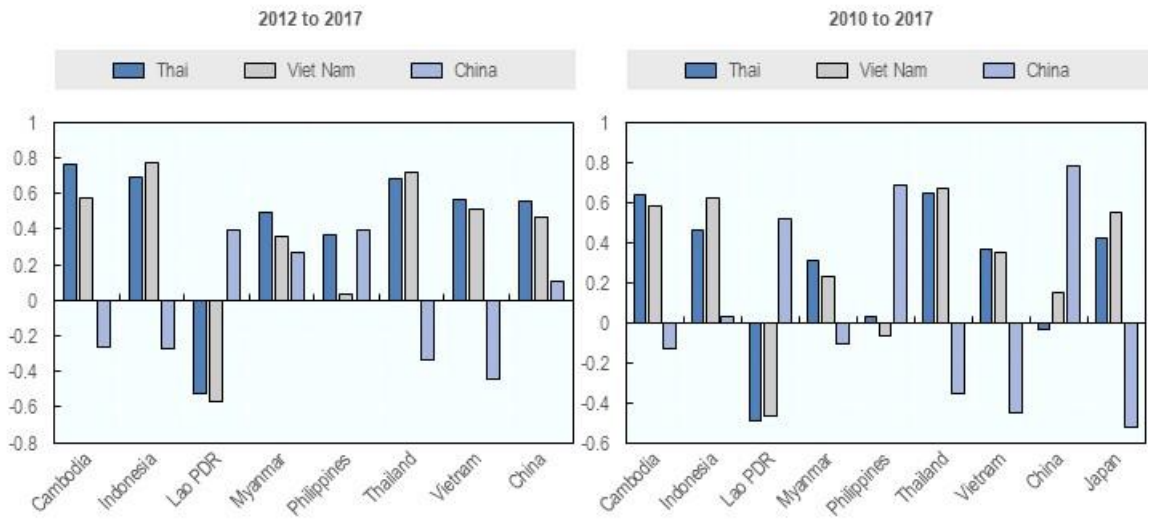
What is noticeable is the negative correlations that exist between Lao PDR and ASEAN members. This is contrasted with the positive correlation that exists between Lao PDR and China. Proximity and reported closer economic and trade relationships between China and Lao PDR are likely driving this result and are also likely to explain Lao PDR's different price path as discussed above.

More formally, tests for co-integration in rice prices across the region find that overall the region is integrated (see Annex C for details). Examining all ASEAN countries and China suggest that there are a number of co-integrating relationships that extend beyond just Viet Nam and Thailand. However, bilateral tests confirm the importance of these two countries. In fact, from 2012 Viet Nam rice prices are co-integrated with all ASEAN member rice prices and that of China. For Thailand, over the period there are less bilateral co-integrating relationships, although prices are integrated with Viet Nam and so through this relationship to the rest of ASEAN. For Lao PDR and China, despite the negative correlations with ASEAN and closer positive relationship to China, Chinese and Lao PDR

prices are not co-integrated. Overall, for China, despite policy barriers that limit trade, the relationship between Chinese and Thai and Vietnamese prices has developed over time, possibly due to changes in their trade policy stance, meaning China may become a more influential force in regional rice prices in the future.

Figure 19. Correlation with main producers, 12 month lag

Correlation coefficients for ASEAN and selected key partners, 12 month price lag



Note: Correlation coefficients represent pairwise estimates for the periods shown.
Source: Author estimates.

Policies create price gaps rather than break price relationships

The proceeding analysis find evidence that prices across ASEAN general move together. That is, despite the relatively thin level of trade that exists – around 2% of production – price transmission occurs across the region and indeed with a number of other large rice consuming and producing countries. The range of interventions therefore generally create price gaps rather than create other forms of market impediments. For ASEAN members, steps to further integrate rice markets should thus revolve around removing these trade cost pressures, allowing prices to come together across the region. That said, during the rice price crisis there was a clear break in price transmission between Indonesian and other ASEAN member states (to their benefit). Thus the policies related to import licensing must also be reformed as part of integration efforts.

The one possible exception to this is Lao PDR. Although over the period between 2012 and 2017, Lao PDR prices remain co-integrated with those of Viet Nam, since 2014 prices in Lao PDR have followed a different path to those seen elsewhere across ASEAN. There are two possible causes of this change in price determination within Lao PDR. The first relates to the product itself. The predominate type of rice consumed, and for which prices have been collected is glutinous or ‘sticky’ rice. This rice has different characteristics and faces different demand pressures that other forms of long and short grain rice. The second relates to informal trade with China. Anecdotal evidence suggests that with increased investment from China into Lao PDR, combined with increased demand for sticky rice by Chinese consumers, informal trade in rice between Lao PDR and China has increased. These factors may have disrupted the usual price determination path for rice in Lao PDR. As production responds and trade becomes more formalised, it would be expected that prices would begin

to move once again in line with those elsewhere in the region as Chinese and other ASEAN rice prices appear to follow similar paths. Irrespective for Lao PDR, it is likely that other measures to both formalise trade and to allow producers to respond to price signals from the increased demand from China will be required for it to fully benefit from regional rice market integration. Having stable trading arrangements should, in theory, provide greater incentives for increased investment by rice farmers in production, helping to better integrate prices.

7. Impacts of rice market integration

The integration of rice markets within ASEAN, in line with the AEC Blueprint, has the potential to enable ASEAN members to reduce both food insecurity and the *risk* of food insecurity. This study aims to explore the range of policy reforms that can deliver benefits for food security while providing a feasible adjustment pathway for rice producers adversely affected by increased competition from other ASEAN members.

In this section, the impacts of rice market integration on ASEAN member states, with a particular focus on the impacts on producers, are presented.

Rice market integration can promote food security

The benefits of ASEAN rice market integration for food security are significant. While ASEAN has made strong inroads towards eliminating food insecurity, significant numbers of households remain food insecure. As the region as a whole is a net exporter of rice, availability of staple foods from a simple supply perspective is not an issue. Instead, food insecurity is largely due to the lack of access to *affordable* food, including rice. The affordability of rice is directly influenced by the policy measures in use, and as discussed, large price gaps exist between some countries and major rice producers.

Further integration of the ASEAN rice market would close these price gaps. For poor households in countries with relatively high domestic prices, there are clear gains to be derived from access to more affordable staple foods. On the other hand, integration will also place upward pressure on prices in exporting countries, depending on the supply response seen, and may adversely affect poor net rice consuming households in these countries. For net sellers, or those with scope to diversify consumption, higher prices are accompanied by higher incomes, helping to address the other element of food affordability – the ability to pay. Furthermore, as mentioned, the overall price impacts will be determined by the supply response by producers to higher prices, which can be quite significant, as witnessed in the response to the food price rises of 2007-08 and beyond.

Recently-completed work by the OECD (2017a) has shown that the balance of lower prices in importing regions and higher prices in exporting regions on undernourishment is significantly positive for ASEAN as a whole (Box 3). Rice market integration, in the absence of shocks to production through either regional droughts or individual country shocks to production, was found to lead to a 5% reduction in the number of households experiencing undernourishment – expressed differently, around a 1 percentage point reduction in ASEAN's total undernourishment rate (Figure 20). This comprised gains in food security in Indonesia and the Philippines but, given the possible price effects, some rises in undernourishment in Myanmar and Viet Nam when the income effects of increased rice prices are excluded.

Box 3. ASEAN rice market integration can enhance regional food security

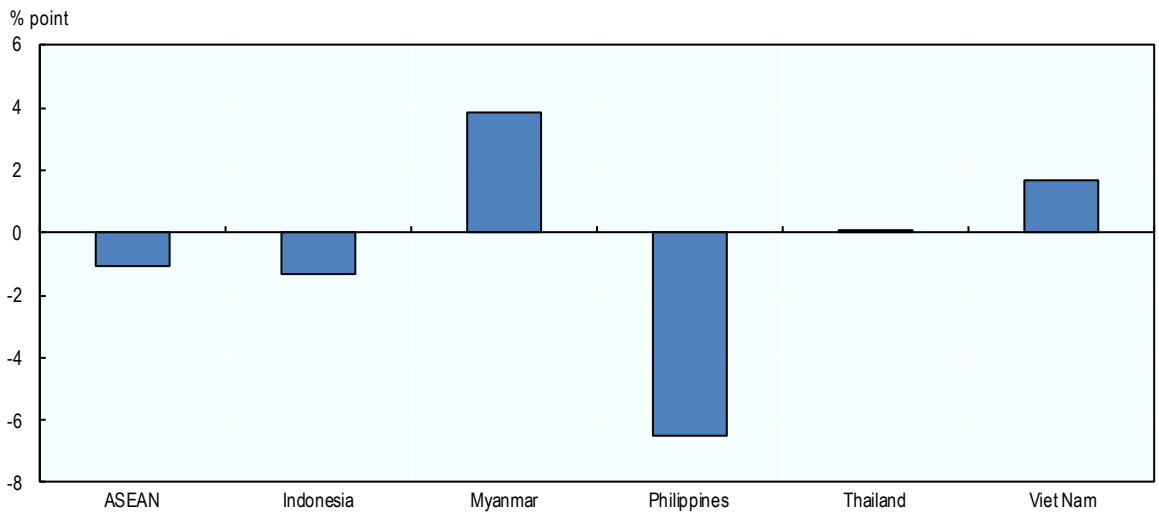
Recent OECD analysis supports findings on the positive links between regional rice market integration and food security. The analysis explored both tariff reductions and, more importantly, further reforms that see full integration and the convergence of producer prices across the region. The analysis shows that there is much to be gained – in terms of managing risk and improving food security – from moving towards regionally-integrated rice markets.

In total, ASEAN rice market integration would reduce undernourished populations by 5% in the five countries examined (Indonesia, Myanmar, the Philippines, Thailand and Viet Nam). Undernourishment in two rice-importing countries – Indonesia and the Philippines – would noticeably fall as a result of the resulting decreases in domestic prices (prices in Indonesia, Malaysia and the Philippines were projected to fall by 39%, 26% and 45% respectively). The integration of regional rice markets would also help to mitigate the otherwise large impact of weather risks in the region. In particular, increased consumer access to rice in both Indonesia and the Philippines could offset the food insecurity impact of a regional *El Niño* or of domestic crop failure, which are identified as the largest risks to food security for these two countries. While the regional *El Niño* scenario increases the undernourished population in five ASEAN member states by 49% under the current rice trade regime, integrating the regional rice market could mitigate the impact to an 11% increase. However, integration would have negative impacts on producers in importing countries and poor consumers in exporting countries due to the price effects created. While safety nets can help to mitigate the potential negative effects of these increases on poor households, it is also likely that the gradual integration of the regional rice market would actually prevent a sharp – or indeed any – increase in rice prices in exporting countries.

Source: OECD (2017a) and Furuhashi and Gay (2017).

Figure 20. Impact of rice market integration on undernourishment in ASEAN

Percentage point reduction in the share of population that is undernourished



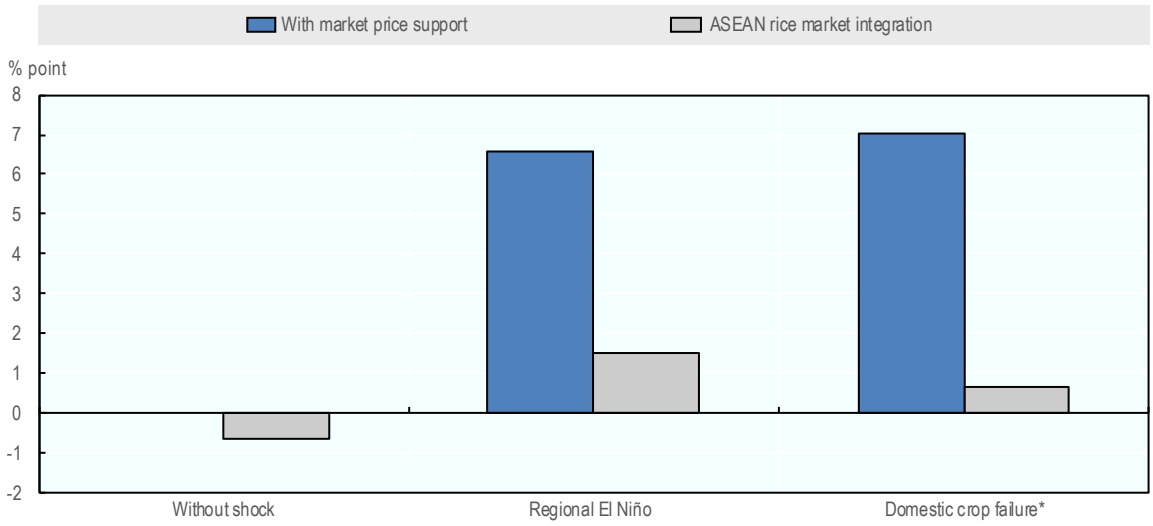
Note: ASEAN estimates derived from the five countries examined: Indonesia, Myanmar, the Philippines, Thailand and Viet Nam. No income effects from higher returns from rice production in Myanmar and Viet Nam are included.
Source: OECD (2017a).

The greatest benefit of rice market integration occurs through its ability to reduce the risk of undernourishment for the region. The region has, and is expected to continue to have, production shocks associated with droughts or other environmental events that reduce production in any given year. Based on past events, the expected future impacts of such events on undernourishment with and without rice market integration can be calculated

(OECD, 2017a). Doing so reveals the very significant benefit that rice market integration has on the risk of food insecurity. With current policies, ASEAN undernourishment rates when faced with these events is expected to increase by 6.6% across ASEAN for a regional *El Niño* and 7% in any ASEAN member state for a domestic crop failure event (based on a weighted average across ASEAN member states of impacts) (Figure 21). In both cases, rice market integration reduces these risks, decreasing, by 5 and 6 percentage points respectively, the numbers who face undernourishment when such events do occur. However, for exporting countries like Viet Nam and Myanmar, a regional shock may place greater pressure on domestic prices. In essence, increased trade helps to reduce volatility in markets when faced with shocks – a finding supported by theoretical evidence also (Martin, 2017).

Figure 21. Changes in undernourishment with and without production shocks

Percentage point change in share of the population that is undernourished in ASEAN overall or on average in an ASEAN member state



Note: Domestic crop failure represents the weighted average impact for any given ASEAN member state from a domestic crop failure related event occurring. Regional *El Niño* estimates represent the total ASEAN wide impact as also depicted for the "Without shock" results. ASEAN estimates derived from the five countries examined: Indonesia, Myanmar, the Philippines, Thailand and Viet Nam.
Source: OECD (2017a).

Rice market integration requires the elimination of tariffs and some non-tariff barriers

ASEAN rice market integration involves the removal of persistent trade barriers that create price gaps between member states (Section 6). As outlined above, for those where data are available, regional rice markets appear largely integrated in the sense that wholesale rice prices move together. The main impact of the measures in use is to create price gaps. In other words, the tariff and non-tariff measures are increase trade costs rather than preventing price transmission from occurring. Such barriers can also increase price volatility (Martin, 2017). Thus removing these barriers should close the price gaps observed across the region, reducing rice prices for the region's poor, and also reduce the volatility in prices and potential price increases when shocks do occur.

Rice trade has been excluded from the AFTA, and positive tariffs are applied by most ASEAN members – with the regional average applied rate of just over 25%. Removing these and allowing tariff free trade in all rice products is a necessary step towards market integration and will begin to close the price gaps observed across the region.

To complement the removal of tariffs, countries which use import licensing and have monopoly import arrangements need to phase these out. Such arrangements exist in Indonesia, Malaysia and the Philippines. In doing so, rice trade between these countries and the rest of the region can be normalised, with private traders filling the role of ensuring supplies to consumers. Such arrangements should continue to be supported by emergency support measures, such as through regional stocks (discussed below) and relief assistance, preferably in the form of cash transfers, to vulnerable households.

Beyond these measures, steps can be taken within the existing ASEAN framework to examine the range of other non-tariff measures in place. The approach should be to identify options to harmonise and streamline the number of provisions applied to rice trade which has increased significantly over the past 10 to 15 years. While it is beyond the scope of this study to identify individual measures, a 5% reduction in trade costs associated with these is assumed to be feasible.

The impact of removing tariffs across ASEAN and import licensing restrictions in Indonesia, Malaysia and the Philippines, and moving towards harmonisation in other non-tariff measures is set out below. The results have been estimated using the OECD METRO model using a combination of reductions in applied tariffs and trade costs associated with non-tariff measures (Box 4).

Rice market integration needs to be supported by domestic policy reforms

The removal of tariff and non-tariff measures will enhance trade flows in the region and provide a means to close price gaps observed between ASEAN countries. However, a number of ASEAN member states have other measures that create barriers to producers changing what they produce – either directly or through the incentives provided (OECD, 2017a). Some of the direct barriers relate to requires placed on land. In some ASEAN countries, such as Malaysia and Viet Nam, requirements are placed on some land that make changing farming activities difficult. In Viet Nam, steps have been taken to dismantle these provisions already, however, if they remain in place they have the potential to trap farmers in rice production when other alternative and more profitable activities exist.

A number of indirect incentives are created by agricultural policy settings across the region also. The rice centric nature of agricultural policy in a number of countries has created additional incentives for rice production – through measures such as subsidies to inputs like fertilisers, machinery or credit or additional provisions for land such as targeted irrigation investments. Removing some of the direct barriers, and reducing or neutralising across different agricultural activities the indirect incentives will aid to promote a more integrated rice market and help farmers diversify into other activities if required.

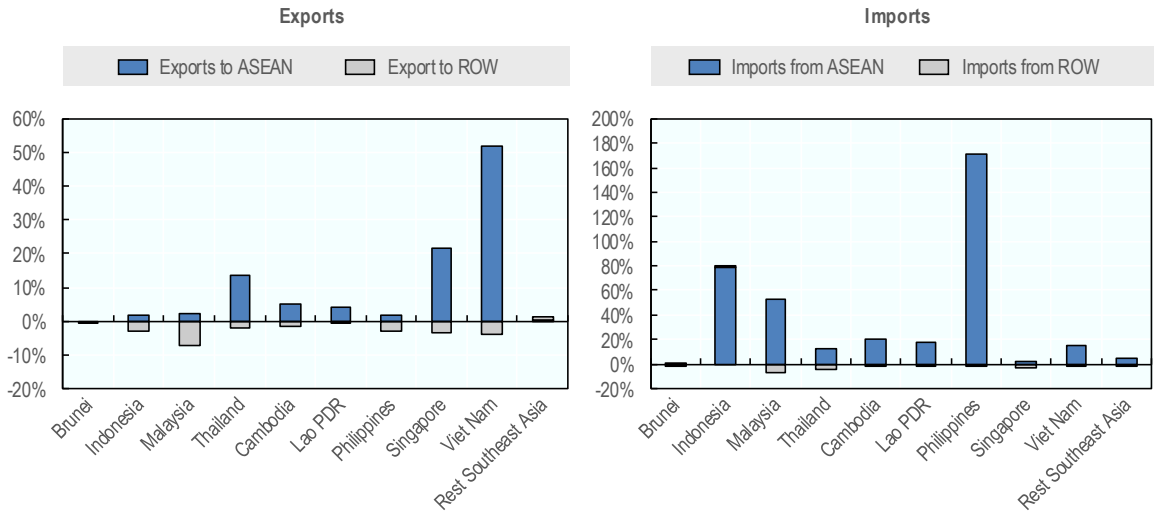
Integration would increase regional trade and promote growth

Rice market integration promotes rice trade in the region – the key mechanism that helps promote food security in the region (Figure 22). Exports of rice are sourced from Viet Nam, Thailand and to a lesser extent from Cambodia, Lao PDR and Myanmar (modelled as "Rest of Southeast Asia"). Singapore also records increases in exports of rice, but these are re-exports sourced from within ASEAN. The increase in exports create some displacement

of exports to other regions around the world, but these impacts are estimated to be relatively small, with the bulk of the increased trade estimated to flow from additional production as producers in exporting countries respond to additional demand.

Figure 22. Changes in rice exports and imports for ASEAN members from market integration

% change from base, quantity of processed rice



Note: Rest of Southeast Asia is used to represent Myanmar (it is a combined Myanmar and Timor-Leste region).
Source: Author estimates.

Imports across the region increase in all countries. The greatest increases are seen in the Philippines, Indonesia and Malaysia. For a number of exporting countries, imports come in the form of intermediate inputs for use in domestic processing sectors – such as additional paddy rice imports from Lao PDR to Viet Nam. Such flows are indicative of a more integrated value chain in the region that is created when trade barriers are reduced, and shows that flow-on effects are possible across the region – for example, the increased demand in Indonesia contributes to increased paddy production in Lao PDR which is processed and exported through Viet Nam.

Beyond the trade effects, integration has flow-on effects on a number of agro-food sectors across ASEAN members. In line with the limited trade effects, at least in the short to medium term for Cambodia, Lao PDR and Myanmar (represented by Rest of Southeast Asia), integration is estimated to have little impact on total agro-food sector value added in these countries (Figure 23). However, as rice sectors within these countries grow, and trade linkages develop, it would be expected that access to an integrated regional rice market would provide greater opportunities for growth. Indeed, accessing global value chains through using both foreign intermediates in the production of agro-food products, and in accessing foreign final demand has been shown to have a positive impact on growth in all agro-food sectors – including that of processed and paddy rice (Greenville and Kawasaki, 2018).

Box 4. Modelling rice market integration in METRO

In 2015, the OECD launched a new global computable general equilibrium (CGE) trade model, known as METRO (ModElling TRade at the OECD) (OECD, 2015b). CGE models are computer simulation models that use data to explore the economic impact of changes in policy, technology and other factors. They show how different sectors inside one economy are linked and how multiple economies are connected to each other, and how resources such as labour, capital and natural resources are best allocated across all economic activities. The METRO model builds on the GLOBE model developed by McDonald and Thierfelder (2013).

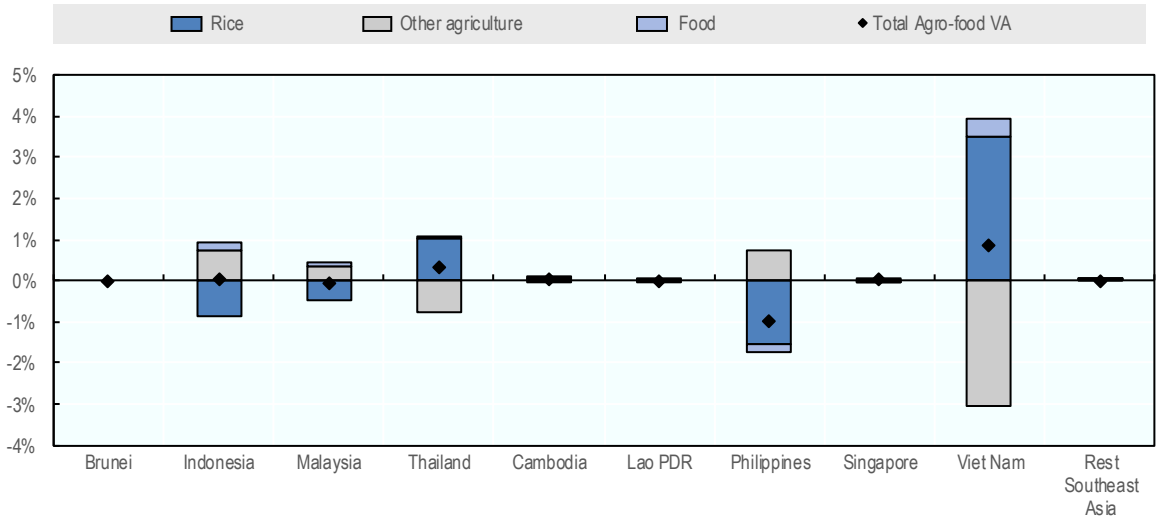
The METRO database currently covers 61 economies across 57 economic sectors. It is based on the GTAP (Global Trade Analysis Project) database, and uniquely incorporates recent OECD statistical developments. METRO allows users to analyse global value chains (GVCs) by drawing on the OECD-WTO Trade in Value Added (TiVA) database, providing a platform to more fully integrate structural policy issues in the analysis of trade policy. METRO also features an extensive library of trade-related policies, including current border tariff rates and export restrictions, as well as domestic taxes and support. Using METRO, it is now possible to track trade flows by their use (that is, intermediate, household, government and investment) in addition to bilateral links between source and destination markets. This will greatly enhance the ability to model movements of goods and services, especially along global value chains.

Integration of ASEAN rice markets is assessed through the reduction in *ad valorem* and specific tariffs on intra-ASEAN rice trade to zero, together with a reduction in the cost of non-tariff measures by 5% on all intra-ASEAN rice trade (for both paddy rice and processed rice). The reduction in the cost of non-tariff measures in Indonesia and the Philippines is modelled at 80% to represent the significant impact of the import licensing regimes in place. All non-tariff measures are modelled as iceberg costs. Rice market integration is complemented by three additional trade reform scenarios which include:

1. *Broader intra-ASEAN agro-food trade reform*: includes rice market integration plus the removal of remaining tariffs on all agro-food products and a 5% reduction in trade costs associated with non-tariff measures on these products;
2. *Broader agro-food trade reform with key partners*: includes the shocks of broader intra-ASEAN agro-food trade removal with the addition of tariffs between ASEAN members and key partners of Australia, New Zealand, Japan, Korea, China and India being set to zero with the excluding of rice tariffs; and
3. *Broader multilateral reform*: rice market integration scenario complemented by a reduction in world agro-food tariffs to zero.

Figure 23. Integration and agro-food value added

% change in value added in agriculture and food sectors with rice market integration



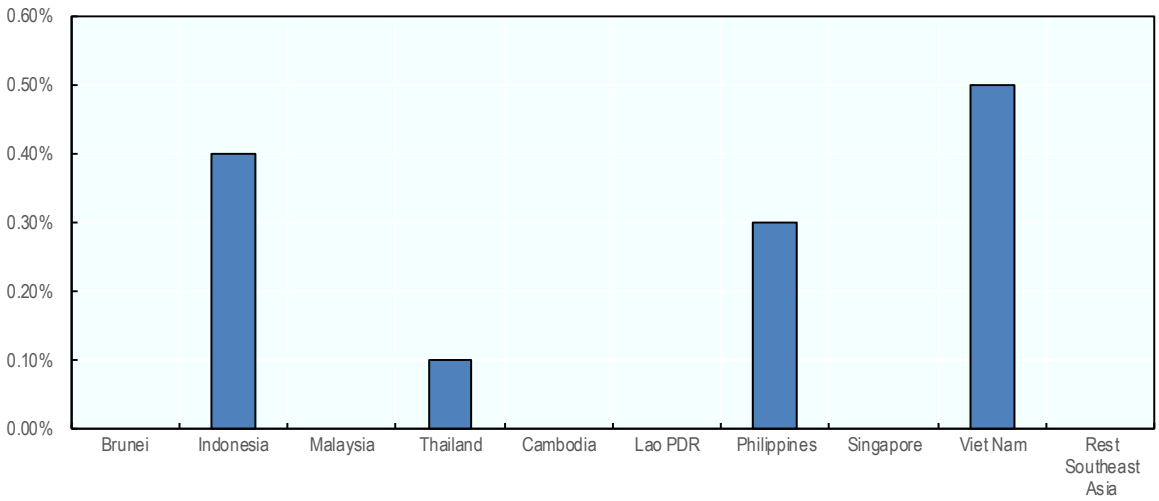
Note: Rest of Southeast Asia is used to represent Myanmar (it is a combined Myanmar and Timor-Leste region).
Source: Author estimates.

The largest growth impacts, in value added terms, are seen for Thailand and Viet Nam as their rice sectors expand due to greater access to regional markets. Positive effects are seen for Indonesia also, but through an expansion of its food sector through greater access to imported rice used in the production of food products, and through a shift in production away from rice to other agricultural products. And while similar changes are seen in both Malaysia and the Philippines, the contraction in rice sector activity is more significant, leading to falls in the total agro-food value added.

However, while agricultural value added falls in the Philippines, there are positive overall gains from rice market integration (Figure 24). Viewed in terms of changes in final demand (used as a proxy for welfare as it represents changes in total consumption), consumers overall gain from the reforms. Similarly, consumers in Indonesia, Thailand and Viet Nam also benefit. For Viet Nam, such positive consumption gains are fuelled by higher incomes rather than lower prices, which are important as they will help offset the potential impacts on food security from increases in rice prices induced by market integration.

Figure 24. Changes in final demand from rice market integration

% change from base



Note: Aggregate impacts on final demand in Brunei, Malaysia, Cambodia, Lao PDR, Singapore and Rest of Southeast Asia (representative of Myanmar) are close to zero.
Source: Author estimates.

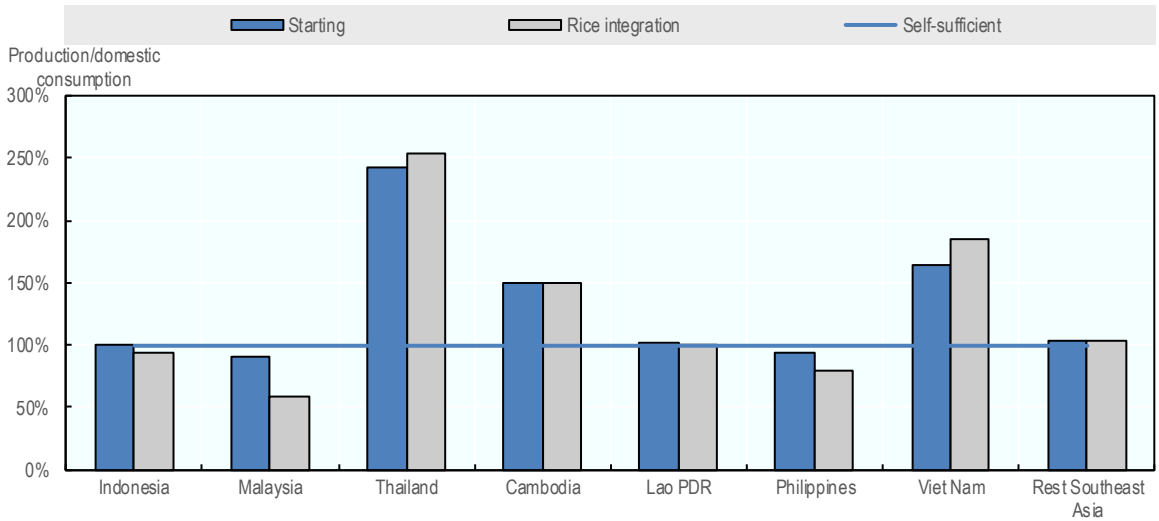
Integration needs to be supported by steps to build trust in regional markets

A key aspect of the benefits of rice market integration is that any one country's rice production risks are shared across all ASEAN member states. That is, there is one large production base in ASEAN for the region's key food security crop. This means that more trade will occur at any given time, and production will shift in part to areas with greater comparative advantages in rice production.

Integration will thus mean that not all countries are able to maintain their current levels of rice production and self-sufficiency rates (Figure 25). However, ASEAN as a whole will remain self-sufficient and a large net exporter of rice. Indeed, it will produce more rice in aggregate at a lower overall cost to consumers.

Figure 25. Self-sufficiency rates across ASEAN with rice market integration

% production divided by domestic consumption



Note: Rest of Southeast Asia is used to represent Myanmar (it is a combined Myanmar and Timor-Leste region).
Source: Author estimates.

Importantly, even for those countries where current domestic prices are high and self-sufficiency rates are expected to fall, the majority of rice supply will remain sourced from domestic production. Countries like Indonesia and the Philippines will continue to produce the overwhelming majority of rice at home – with projected self-sufficiency rates in the order of 90% and 80% respectively. Also for Malaysia, while falls in self-sufficiency rates are expected to be large, close to 60% of rice would continue to be domestically produced. Similar changes and self-sufficiency rates were also estimated by OECD (2017a) and Furuhashi and Gay (2017). These figures highlight that in countries where steps have been taken to increase self-sufficiency rates, despite the large price gaps for some, there remains a large and internationally-competitive domestic rice sector, which, at times of crisis in other countries, will respond to increase supply for the region.

The changes in self-sufficiency rates also indicate the marginal cost of the policy measures. In Indonesia, the 10% increase in rice demand filled by domestic production in 2017 came at a cost of USD 6.4 billion, or USD 1 760 per tonne of rice – around 7 times the regional import price in 2017. In the Philippines the cost of increasing domestic production was greater, at around 2 950 per tonne to satisfy an extra 14% of domestic consumption from domestic supplies – more than 11 times above the regional import price.[3]

More trade, however, needs to be supported by steps to improve the confidence of both buyers (consumers and governments) and sellers (farmers) of rice. The potential supply response from producers in exporting countries, and the increase in import demand, relies in them knowing that they have markets in which to sell and buy. Within the ASEAN

[3] The marginal cost of the policies was computed by calculating the difference between the total consumption cost of rice at wholesale prices in Indonesia and the Philippines at prevailing wholesale prices, and that at regional import prices (Thai 15% broken adjusted for transport costs). The cost difference was then divided by the marginal increase in production created by the policy measures – 10% of domestic consumption in Indonesia and 14% in the Philippines.

framework, a number of steps can be taken to help build this trust and capture the benefits from rice market integration.

Enhancing trust in trade

An immediate step that can be taken would be to include a ban on export restrictions on rice (and on agro-food products more broadly) within the AFTA. Export restrictions and the threat thereof, combined with the policy responses of importing countries, were largely responsible for the price spike that occurred in 2007/08 (OECD, 2017-SEA; Alavi et al., 2012; OECD, 2008; Piesse and Thirtle, 2009; Naylor and Falcon, 2010; Headey, 2011).

The need for bans to export restrictions is more important in the context of a lack of disciplines on these within the multilateral rules-based system. Korinek and Bartos (2012) highlight that export restrictions and duties have not been given the same degree of attention in multilateral trade agreements and negotiations as the elimination of import tariffs and quantitative restrictions. The WTO provides a general prohibition on quantitative export restrictions but the broad and, at times, ambiguous exceptions mean that these provisions have little direct impact. Under WTO rules, member economies are obliged to notify of their use of export restrictions, but even for this implementation has been patchy, and there have been no sanctions for non-reporting.

Placing a ban on export restrictions between ASEAN member states in the first instance, with a view to covering all rice (and agro-food) exports, would benefit both producers and consumers in the region. For producers, taking away the threat of export restrictions can improve prices as it reduces the risk associated with imports from these countries, making them a more reliable supply option and thereby increasing demand through creating a greater incentive for consumers in international and regional markets to choose the rice they produce. It also promotes greater investment in the value chain, increasing value-adding opportunities. Consumers in turn benefit from producer responses to their greater trust in export markets. With greater trust, producers would be able to make more appropriate investments in rice production, basing decision on supplying both domestic and regional markets. This can lead to scale economies and decrease consumer prices overall while maintaining profitability for producers. Lastly, to the benefit of both producers and consumers, it can reduce inter-seasonal price movements as producers do not fear the closure of international and regional markets and so are unlikely to rush to sell as soon as harvest is complete.

For ASEAN, a ban on export restrictions would be a visible step towards the endorsement of regional rice market integration by all member states, and would complement a medium-term reduction in tariffs and regulatory efforts to harmonise non-tariff measures.

Another area where trust in trade could be enhanced is through limiting the use of special safeguards on rice imports within the region or at least providing greater disciplines on their use. With phased implementation of tariff and other reforms, the likelihood of surges in imports will be lessened. However, changes in domestic condition that alter competitiveness and supplies may still create instances of more rapid changes in imports. The notion of integrated markets is underpinned by the idea of moving towards one production base, and as such, any surges in response to underlying domestic supply issues do not pose a regional problem. However, it is possible that governments would face pressures to limit the adjustment pressures in such situations, and thus greater clarity and stricter limits within AFTA would help limit the sudden and unexpected application of provisions and create more trust between exporters and importers.

Enhancing the effectiveness of APTERR to help build trust in regional markets

The ADB (2014) has identified a number of possible reforms to APTERR which could help enhance its effectiveness and help build trust in regional rice markets. The first issue identified relates to the size of stockholdings by ASEAN member states. Currently, around two-thirds of stocks held within APTERR are owned by the plus three members (China, Korea and Japan). Referring to an initial investigation on what overall stock level is appropriate to manage food insecurity risks across the region, the ABD has called upon ASEAN member states to increase their commitment to the scheme through increases in stock held as part of the scheme.

The second issue identified by the ADB (2014) relates to making use of private and other international organisation resources and expertise. It has been suggested that rather than hold public stocks, APTERR, on behalf of ASEAN member states, should look at ways to contract with the private sector and civil society through institutional multi-party arrangements such as forward contracts and management contracts. This could enhance the efficiency of the stockholding itself and allow for greater supplies to be accessed at times of emergency without the need to hold additional stocks at all times. The last area of improvement identified relates to making use of expertise in disaster relief, such as that held by the United Nations World Food Programme (WFP), through partnerships that provide for more effective delivery in times of crisis.

The lack of timeliness of some of the supplies provided by APTERR following a natural disaster in the Philippines in 2013 has led to further reforms of the scheme which should help build trust in regional markets. Currently, the storage of stocks outside the donor country is being trialled, with Japan agreeing to hold some of its emergency stocks in both Cambodia and the Philippines.

Some commenters have suggested that APTERR has the potential to replace the series of country-level systems as its focus is on emergency management across the region, thus avoiding the excessive costs of price stabilisation-based schemes that are often net costly to countries and the food insecure (OECD, 2017; Mujahid and Kornher, 2016; Beaujeu, 2016). One of the largest gains seen from such a scheme is that by sharing risks, the quantum of required physical storage of grain is much reduced, reducing one of the largest cost items of emergency stocks. Such costs could be further reduced with the extension of the scheme to other countries (Mujahid and Kornher, 2016).

Alternatively, a way to reduce both co-ordination costs and provide better coverage is through extending the scheme already being trialled with plus-three members holding stocks within vulnerable ASEAN countries. Japan is already looking to expand its holding of rice in ASEAN countries closer to disaster prone regions but other extensions could be explored. Stocks could be increased or even supplemented by non-ASEAN countries that are likely to face a different set or production risks or not face the same level of food insecurity risks due to higher incomes or availability of substitute products. ASEAN already has a number of key regional partners who could play this role, including both Korea and China, who are already part of the APTERR scheme.

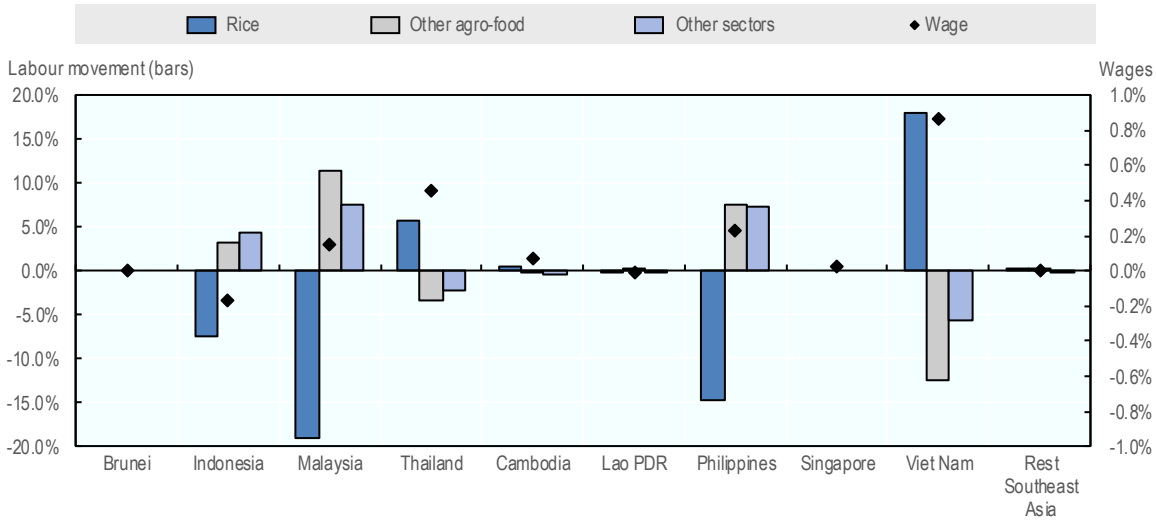
While benefits of rice market integration exist, adjustment is needed

With rice market integration, the changes in production and trade, and resulting value added, create adjustment across the ASEAN rice and agro-food sector. In particular, across ASEAN, labour – rice farmers – move into and out of the sector and their wages are influenced (Figure 26).

Significant changes are seen for Indonesia, Malaysia, Thailand, the Philippines and Viet Nam. For the remaining ASEAN members, due to low current levels of rice trade relative to domestic production, the impacts are much smaller.[4] For the five countries with significant impacts, the two exporting members – Thailand and Viet Nam – both see an increase in the demand for unskilled labour, drawing in workers from other sectors of the economy in response to the more favourable returns in the rice sector. For both countries, the majority of the additional workers come from other agro-food sectors – in other words, other farmers switch to growing rice from other activities. Both Thailand and Viet Nam also experience positive impacts on unskilled labour wages, meaning that integration improves rice farmer incomes. For Viet Nam, the wage and income growth will help offset any food security effect from integration in the form of higher rice prices.

Figure 26. Labour movement and wage effects from rice market integration

% change in unskilled labour demand in rice sector and % change in unskilled labour wage



Note: Labour movement expressed as changes in unskilled labour factor demand relative to base levels of unskilled labour factor demand. The sum of changes therefore equals zero such that movements from or to the rice sector can be observed. Wages are not sector specific with changes representative of changes in the economy overall. Rest of Southeast Asia, a composite region of Myanmar and Timor Leste, is used to provide representative impacts for Myanmar.
Source: Author estimates.

For Indonesia, Malaysia and the Philippines, adjustment follows the opposite path, with labour moving out of the rice sector and, for some, outside the agro-food sector altogether. For Indonesia, the movement of labour outside agro-food overall is greater than the adjustment to other agro-food sectors. Furthermore, where adjustment occurs within the agro-food sector, the majority is to food sectors – downstream processing, both basic and more advanced. This suggests that rice farmers may need to exit the agriculture sector entirely, as rice market integration does not create enough opportunities for farmers to remain in agriculture. This shift also means that wages for unskilled labour would be expected to fall. For Malaysia and the Philippines, while there are more opportunities in

[4] Over a longer period, the effects of integration on possible trade from Cambodia, Lao PDR and Myanmar is likely to be greater. As these countries develop, more farmers are likely to have access to international markets and the capacity to meet the additional requirements of international trade.

other agro-food sectors, there are not enough to create opportunities for rice farmers to remain in the agro-food sector. For both these countries, higher wages for unskilled workers will at least be a compensating factor. Nevertheless, the results point to the finding that for the benefits of rice market integration to be realised, some rice farmers in all three countries would be required to exit the sector.

The adjustment by farmers that is necessary for ASEAN member states to capture the food security and risk-related benefits of rice market integration has several implications:

- Requiring farmers to leave agriculture will impose adjustment costs in Indonesia, Malaysia and the Philippines, making it less feasible for reforms to be successful. One option to reduce these costs is to gradually phase in market integration, and to support adjustment through flanking policies – such as retraining and other income assistance – that seek to support vulnerable households negatively impacted by reform. Furthermore, the provision of support that is more targeted towards measures that can enhance producer productivity and deliver new opportunities for farmers will be important, regardless of integration. A number of these flanking and pro-productivity policies are discussed in detail in OECD (2017a) (Box 5).
- Adjustment pressures are likely to lead to opposition to rice market integration, even though consumers and most poor households will be better off. Adjustment pressures are often localised, and with rice already a politically important crop in all countries, instances where some rice producers are bearing the cost of reform have genuine potential to stifle reform. Gradual and clear implementation, complemented by flanking policies, can help, but requiring farmers to leave agriculture may – despite opening up greater opportunities for the majority of rice farmers who remain in the sector – make rice market integration politically infeasible. Furthermore, flanking policies require government expenditure whereas current policies are largely off budget. Thus, the capacity of some ASEAN member states to provide effective assistance is likely to be limited.
- Other trade reforms to agriculture and food sectors are likely to be required to ease adjustment pressures. For rice producers, moving out of rice production to non-agricultural activities may be too difficult – it is difficult and often costly for low-skilled individuals to shift into other areas of the economy, and for some, impossible. Both geographic and skill-based factors can inhibit any shift in labour, and therefore steps taken to integrate rice markets may marginalise households who cannot make a transition, notwithstanding the presence of effective assistance. Whether other agro-food reforms can help to ease the identified adjustment pressures is examined in the following section.

8. Capturing the benefits of rice market integration through broader reforms to agro-food trade

The preceding analysis suggests that in order to capture the benefits from the regional integration of rice markets, some significant adjustment is required for rice producers in Indonesia, Malaysia and the Philippines. For Indonesia in particular, this adjustment is likely to pose problems as rice producers are likely to be required to move from the agricultural sector into other activities in order for the economy to adjust. Moreover, some of these activities are likely to be difficult for producers to move into as they require different skillsets and relocation to different areas. Furthermore, wage impacts on unskilled labour, including those remaining in agriculture, are likely to cause social dislocation and hardship.

For ASEAN member states, this necessary adjustment, while not impossible, may not be feasible. Mobilising the necessary resources and implementing programmes to provide rice producers with the required skills to move out of agriculture may be difficult, and the absence of social security systems could undermine the possible economic and food security benefits on offer from rice market integration.

The question for ASEAN member states whose agriculture sector is overall negatively affected by rice market integration is to ascertain what other reform opportunities exist that would help rice producers remain in agriculture, and whether these reforms could improve agricultural incomes. In essence, a strategy to ease the adjustment pressures from rice market integration would be to explore other policies that enable growth in other agriculture and food sectors. Of particular importance for some ASEAN countries is that to be done in a manner that does not require significant fiscal resources, which may be unavailable (although increasing investments in agricultural productivity that promotes infrastructure and innovation systems – human and physical – would be worthwhile). If such reforms can be identified, leveraging ASEAN's comparative advantage in agriculture would provide a means to enhance the potential economic and food security benefits flowing from rice market integration.

In this light, given that within ASEAN impediments exist to agricultural trade in general, opportunities from broader *agro-food* trade integration are likely to provide a more feasible means to capture the benefits of rice market integration. ASEAN could also look to broader trade engagement with its key partners and in multilateral fora as a further tool to create benefits for its agricultural producers and citizens. These are explored in this section.

Box 5. Supporting adjustment through flanking policies

Several policies to help improve agriculture and fishery sectors and vulnerable households were identified in OECD (2017a) as a means to enhance regional food security and reduce the risk of food insecurity. These policies were aimed to enhancing supply, providing economic opportunities for producers and developments systems when adverse event happen – or economic circumstances change – vulnerable households are not left behind. Three key policy recommendations were identified:

1. Providing targeted support to vulnerable households.
   a. Improve access to food by poor households through conditional cash transfers or other targeted redistributive efforts such as food vouchers.
   b. Provide training programmes to enable agricultural and fisheries producers to make better production and investment decisions, including through diversification to alternative activities.
2. Implement trade and domestic policy reforms

a. Gradually reduce trade barriers with a view to creating an open and competitive regional market, for rice in particular, and pursue more open markets with greater private sector involvement among a wider set of international trading partners (explored further in this report).

b. Reduce distorting forms of domestic support to fisheries and agriculture.

3. Promote sustainable agricultural and fisheries productivity growth.

a. Strengthen the enabling environment through improving environmental governance; regulations on land, water and biodiversity resources; investments in infrastructure, agricultural R&D and agricultural innovation systems; improving rural land market rights and access, and increasing access to credit for farmers.

b. Improve sustainable resource management of fisheries through the adoption of inclusively-defined, science-based and measurable long-term management targets, for example.

Looking beyond rice: Integration of agro-food trade is key

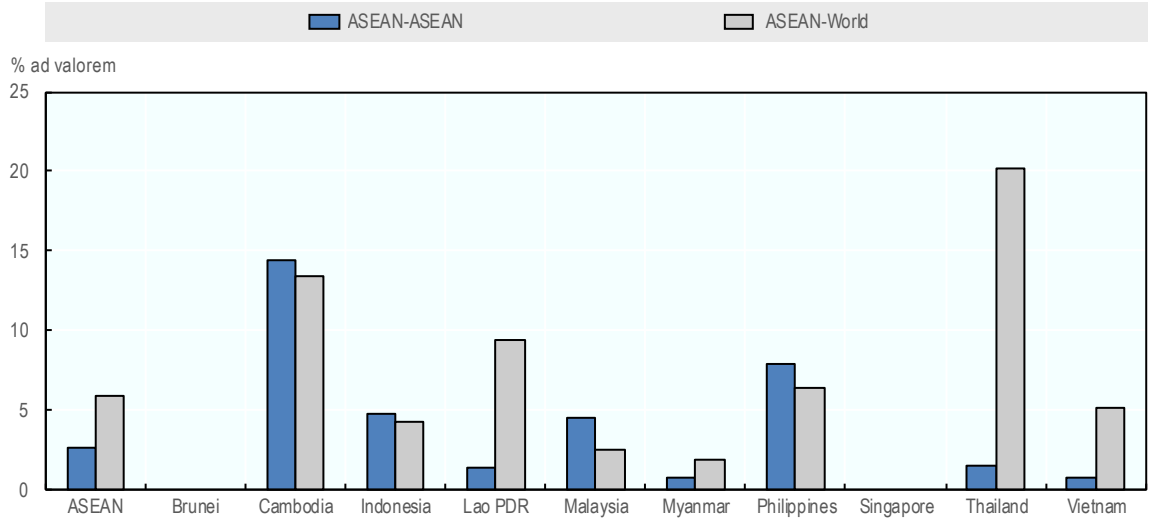
Creating opportunities in *other* agro-food sectors to provide alternative employment and production opportunities is likely to offer a more feasible path to capturing the benefits of rice market integration. This section explores what complementary trade reform options are available for ASEAN countries that could provide additional opportunities for growth in agro-food sectors across the region.

The broader landscape of barriers to agro-food trade in the region

Rice is not the only agricultural commodity that has been left out of ASEAN integration efforts. Mujahid and Kornher (2016) show that within the ASEAN free trade agreement, a number of tariffs have been maintained on cereals and sugar products. More broadly, analysis of tariffs applied to non-rice agro-food trade indicates that while within ASEAN overall, weighted applied tariffs are low – at only 2.5% in 2015-16 – significant duties are still applied by some member states (Figure 27).

Figure 27. Intra-ASEAN and external agro-food tariffs, 2015-16

Weighted average applied tariffs in 2015-16 on non-rice agro-food tariffs

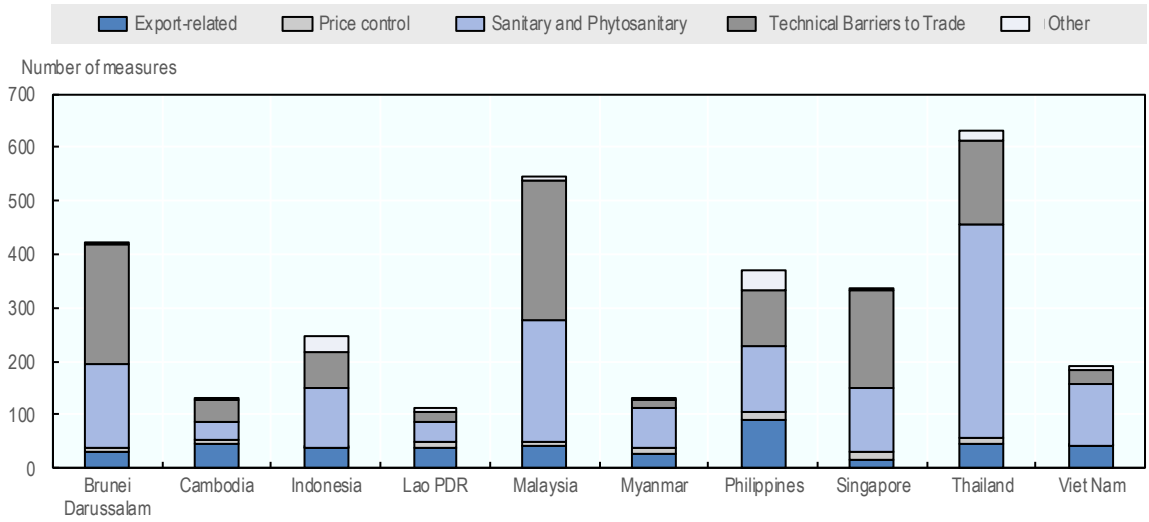


Source: WITS (2018), *World Integrated Trade Solution*, https://wits.worldbank.org/WITS/WITS/Restricted/Login.aspx.

As with rice trade, a number of non-tariff measures are applied to agro-food trade within the region – including rice trade, 3 114 non-tariff measures were in force in 2018 (Figure 28). The majority of provisions applied relate to SPS and TBT measures, which are generally in place to ensure product safety and to protect human, plant and animal health in importing countries. Thailand has the greatest number of provisions, followed by Malaysia and Brunei Darussalam. However, the countries with greater non-tariff measures applied to agro-food overall are not the same as those which apply more measures to rice trade (the Philippines and Viet Nam had the largest number of provisions).

Figure 28. Number of non-tariff measures applied to agro-food trade in ASEAN

Number of measures in effect in 2018



Note: "Other" includes contingent trade protective measures, pre-shipment inspection, quantity controls and "other measures".
Source: UNCTAD-ERIA-WTO (2018).

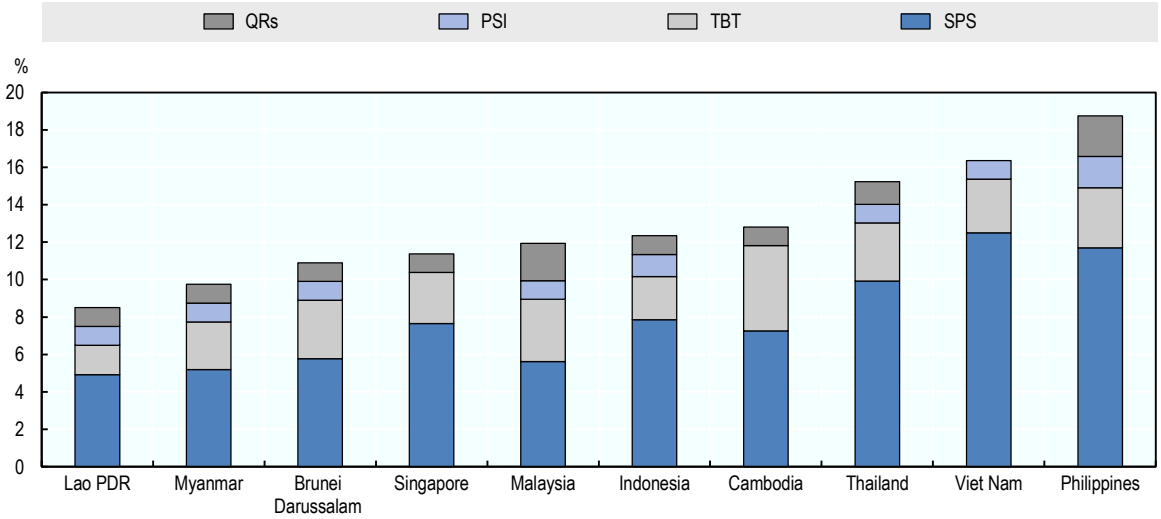
While all countries use non-tariff measures, both the number and variety of the measures applied across ASEAN member states means that intra-regional trade is also inhibited. Across ASEAN member states, SPS arrangements are the most heterogeneous (Figure 29), with the Philippines having the largest proportion of lines with different requirements – close to 20%. Looking at similarities on a bilateral basis (Figure 30), while each ASEAN member is more likely to apply a measure that is similar to one or more of its ASEAN trading partners, rates are still on average below 30%. Similarities with non-ASEAN trading partners are lower still, showing a range of regulatory differences among some of ASEAN's main trading partners. This suggests that while differences exist, non-tariff measures are more similar within ASEAN than between ASEAN and other trading partners, potentially making it less costly to bring these systems closer together.

Non-tariff measures and the differences between them across ASEAN can increase trade costs within the region. One way to view these is to examine the extent to which NTMs raise the unit cost of products traded and to use this information to calculate an *ad valorem* tariff equivalent (Figure 31). The estimates suggest that the combined effects of non-tariff measures, on average across ASEAN facing all trade (intra and external), are akin to an equivalent tariff of 18% – over twice the applied tariffs on agro-food trade. The largest effects of these measures are seen in the Cambodia and Myanmar, with SPS and TBT

respectively accounting for the largest increases in trade costs. However, not all of the value of the *ad valorem* equivalent can be seen as an inefficient trade cost, as part of this cost may be due to legitimate regulatory constraints on trade. This is particularly the case for TBT and SPS measures, which represent the largest cost effects of NTMs for ASEAN member states, reflecting their greater use. Despite this, the significant number and differences that exist in provisions across ASEAN suggest that some scope exists for reducing trade costs.

Figure 29. Heterogeneity scores for agro-food NTMs across ASEAN

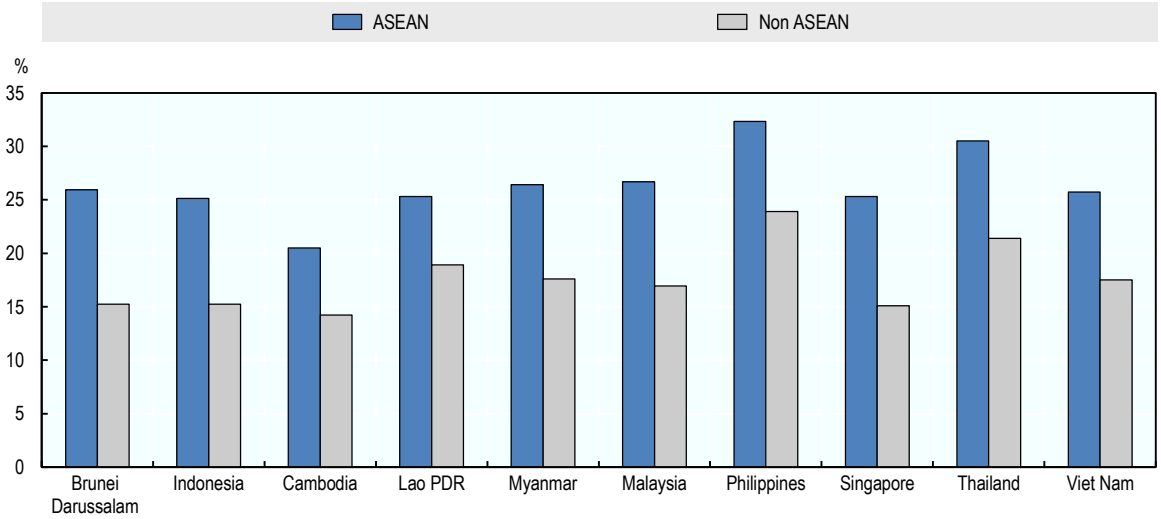
% of different types of NTMs per product line by type of measure (HS2 level)



Note: QRs are quantitative restrictions; PSI is pre-shipment inspection; TBT means technical barriers to trade and SPS means sanitary and phyto-sanitary.
Source: Greenville and Kawasaki (2018).

Figure 30. NTM similarity scores for ASEAN member states

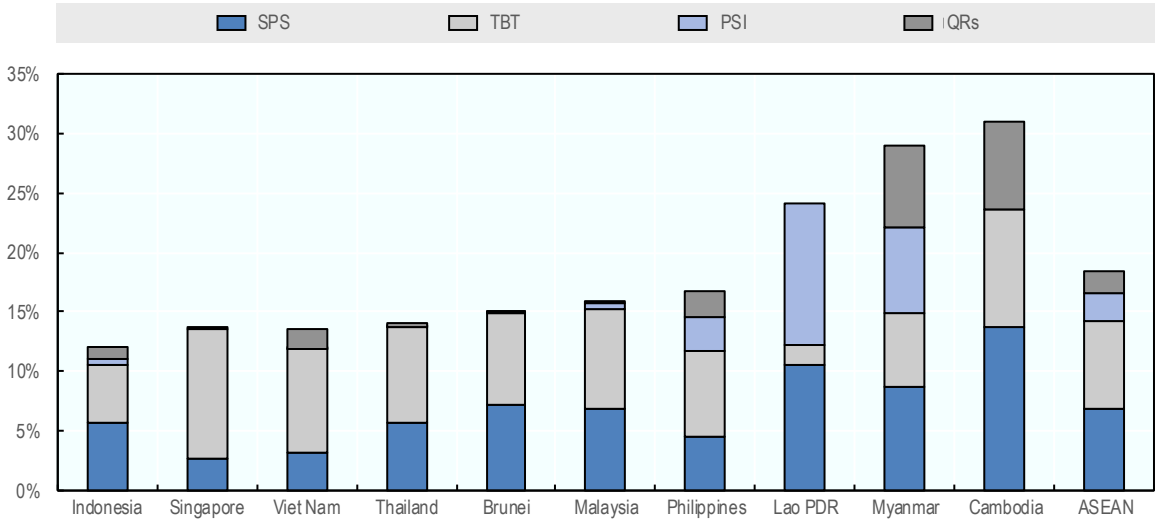
Share of similar NTMs between trading partners



Note: Calculated at the product level (HS2). Indicates the share of similar type of NTMs between two partners for a product.
Source: Greenville and Kawasaki (2018).

Figure 31. *Ad valorem* equivalent of NTMs in ASEAN

Applied on agro-food products



Note: Represents the tariff equivalent effect of NTMs. QRs are quantitative restrictions; PSI is pre-shipment inspection; TBT means technical barriers to trade and SPS means sanitary and phyto-sanitary.
Source: Cadot, Gourdon and van Tongeren (2018).

ASEAN integration frameworks – AEC, AFTA and CEPT – all cover non-tariff measures to some extent with the view to eliminating barriers and reducing costs. With respect to agro-food trade, however, the frameworks do not go far beyond the multilateral agreements, with the establishment of the ASEAN Committee on SPS (Ahamat, 2016). This committee seeks to exchange information, facilitate co-operation, seeks to settle disputes through consultation and aid in reporting of SPS matters.

ASEAN has also taken a number of practical steps in seeking to reduce the costs of non-tariff measures in the region. ASEAN has established 880 common maximum residue limits for 71 kinds of pesticides used on vegetables and fruits (CIMB Research Institute, 2017). However differences in implementation are still reported across the region with Cambodia, Malaysia, Singapore, Thailand, and Viet Nam being found to develop their own and a mix of Codex standards; Lao PDR and the Philippines using Codex and Brunei, Indonesia, and Myanmar having alternative approaches (Li and Beghin, 2012; Saraithong, 2017). The differences across the region suggest that more can be done on the implementation side to reduce compliance costs associated with different requirements.

Beyond maximum residue limits, broader development of food safety systems in a co-ordinated fashion has been suggested as one approach to help reduce compliance costs associated with non-tariff measures. Cadot, Munadi and Ing (2013) suggest the side-by-side development of domestic regulatory instruments, such as food safety systems, as a means to prevent the development of non-tariff barriers in ASEAN. ASEAN has a number of working groups in place for this to progress through mutual recognition arrangements, however AFBA (2013) suggest that progress has been slow, with Food Industry Asia identifying differentiated implementation at the national level as a key impediment to efforts to reduce non-tariff barriers related to food safety (FIA, 2018). The AFBA (2013) suggested that co-ordinated development and adoption of domestic food safety systems, applying good regulatory practice principles, will help the region's producers and traders in creating value. They also suggest more can be done in the area of

mutual recognition across ASEAN member states (AFBA, 2014). In a similar light, Food Industry Asia has identified six priority areas for non-tariff barrier reductions in the field: nutrition labelling; halal certification; pre-market product registration; import/export certification; authorisation of food ingredients; additives and flavour; contaminant limits and analytical methods (FIA, 2018). Furthermore, ensuring domestic standards match trading requirements helps to reduce the costs trading as producers can more easily switch between markets depending on changes in demand and supply – in essence providing a more seamless production base to feed ASEAN consumers. For example, the AFBA estimated that the differences in nutrition labelling requirements have contributed to poor export engagement by ASEAN producers (AFBA, 2018).

Benefits from agro-food integration help to reduce potential adjustment costs

Extending reforms so that rice market integration is complemented with both the elimination of tariffs and quotas on all agro-food trade and a reduction in the trade costs associated with non-tariff measures by 5%, can help to reduce the potential adjustment costs associated with rice market integration. Opening up agro-food trade in ASEAN more generally provides agricultural producers, and in particular rice producers in affected countries, with greater opportunities to remain in the sector. In doing so, it can help avoid, or at least lessen, the adjustment pressures created if farmers have to leave the agro-food sector.

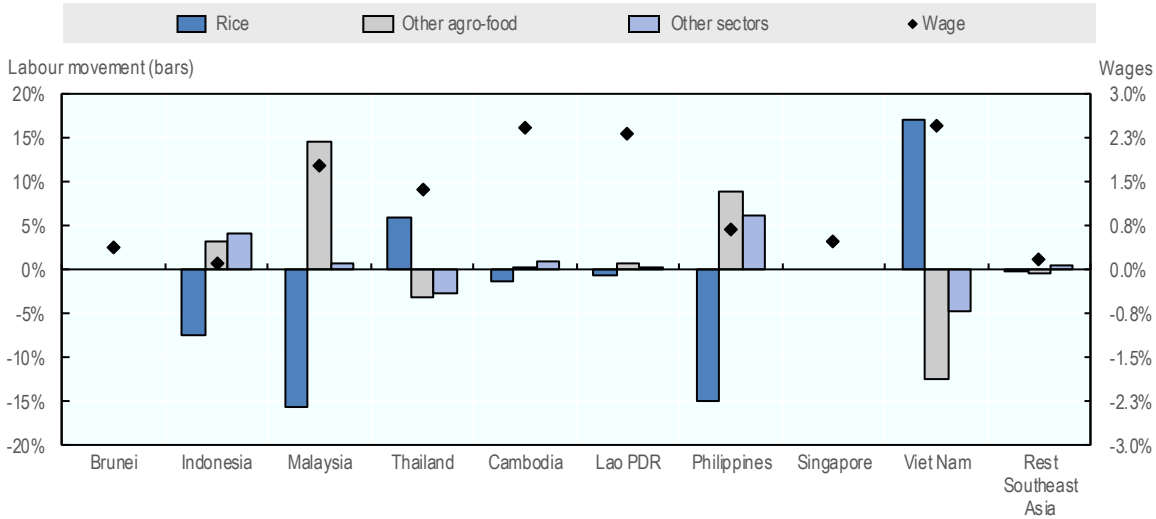
Examining the impacts of broader reforms indicates that for Malaysia, more open agro-food trade within ASEAN can generate significant new employment opportunities within agriculture (Figure 32). The estimated adjustment, based on factor demand for unskilled labour, suggests that broader agro-food market integration can help most rice farmers remain in the agro-food sector post reform.

For both Indonesia and the Philippines, agro-food integration would create more opportunities within the agro-food sector for those farmers displaced from rice farming than under the rice market integration scenario. This lessens the need for rice producers to leave the agro-food sector altogether. However, labour demand would nevertheless be insufficient to absorb the all of the movement out of the rice sector, still presenting Indonesia and the Philippines with significant adjustment pressures. The possible agro-food sector based opportunities are greater in the Philippines than in Indonesia.

The observed impact on unskilled labour wages in both countries is positive, suggesting that the new opportunities created would have the potential to provide greater incomes for those leaving the rice sector. The wage and industry changes also show the alternative opportunities for the least developed ASEAN members to grow agro-food sectors beyond rice, with both Lao PDR and Cambodia seeing small shifts away from rice into other agro-food and non-agro-food sectors, but moves that are accompanied by much larger unskilled wage growth. Beyond the immediate benefits, promoting freer trade in the region and the resulting greater diversification in agricultural production activities may have possible resilience benefits in the face of climate change. The extent of this, and the sustainability consideration, however, have not been explored in this study.

Figure 32. Adjustment impacts of broader ASEAN agro-food trade integration

% change in unskilled labour demand in rice sector and % change in unskilled labour wage



Note: Labour movement expressed as changes in unskilled labour factor demand relative to base levels of unskilled labour factor demand. The sum of changes therefore equals zero such that movements from or to the rice sector can be observed. Wages are not sector specific with changes representative of changes in the economy overall. Rest of Southeast Asia, a composite region of Myanmar and Timor Leste, is used to provide representative impacts for Myanmar.
Source: Author estimates.

Steps could be taken to improve access of small producers to regional markets

Despite the inclusion of a number of agro-food products in AFTA schedules for zero or close to zero tariffs, data on applied tariffs indicate that significant trade flows still attract tariffs. Part of the reason for this is the cost of complying with Rule of Origin (RoO) requirements.

While RoO requirements are a necessary part of bilateral and regional agreements to ensure that the preferences provided actually flow to members of the agreement, they do create costs for producers and businesses seeking to comply with the provisions. Studies of a number of agreements have pointed to compliance costs ranging from 1.5% to 8% (APC, 2004; Carrere and de Melo, 2004; Cadot et al., 2005). These costs are usually compensated by the offset of the preference margin afforded by the agreement. However, when the preference margin is low, or producers are small, the presence of RoO can be prohibitive to the utilisation of the preferences within the agreement. For ASEAN, the large number of small producers and small businesses in general means that RoO placed on agro-food trade can limit the benefits of integrated agro-food markets for producers. Given this, steps should be taken to help simplify compliance requirements for RoO and, where preference margins are low – e.g. preferential tariff concessions of between 5% and 10% – RoO should be reviewed or at least exemptions provided for small producers.

Including key partners in agro-food trade markets can enhance the gains on offer and ensure a more feasible approach to rice market integration

The remaining adjustment pressures in Indonesia and the Philippines suggest that some of the previously identified barriers to rice market integration remain. Part of the reason for the limited effect on both countries is due to their agro-food trade linkages – often to

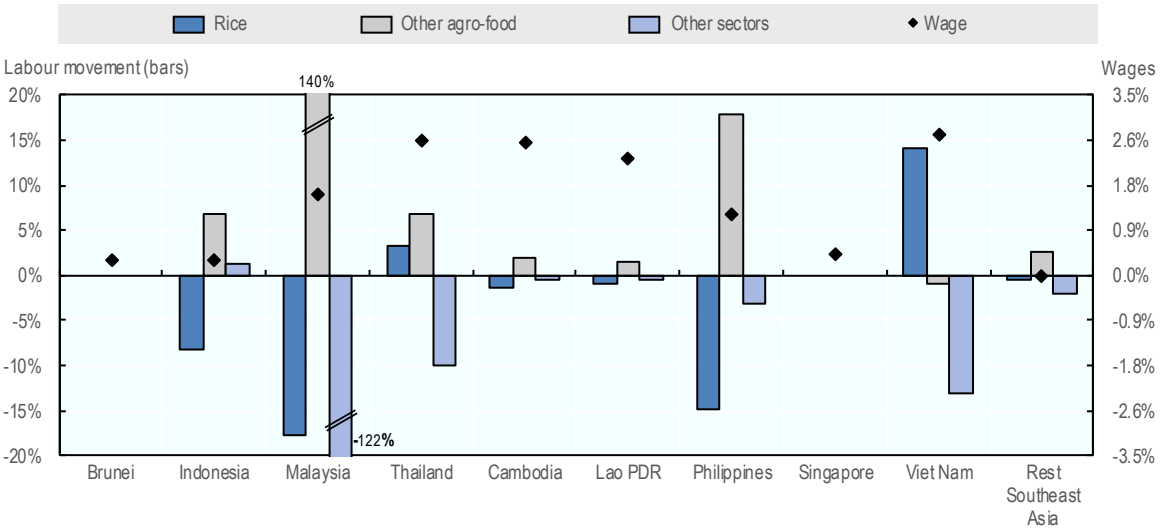
countries outside the region. Thus, complementing intra-ASEAN reforms with opening agro-food markets to other key trading partner countries may create additional opportunities in the agro-food sectors that can ease the adjustment pressures created by rice market integration.

With this in mind, and keeping with ASEAN's current international integration efforts, the impacts of tariff liberalisation with ASEAN's key partners is explored. ASEAN has in place free trade agreements with Australia and New Zealand, Korea, Japan, China and India. All these countries help link ASEAN agricultural producers to the world by both supplying inputs into agro-food production, and providing market opportunities for outputs. In both these ways, freer trade with key partners can lead to agro-food sector growth and create employment opportunities within the sector that may help ease the adjustment pressures created by ASEAN rice market integration.

Agro-food trade integration, combined with a reduction in agro-food tariffs applied to trade between ASEAN members and its key partners (excluding rice), has the potential for ASEAN members to capture the benefits from rice market integration for food security and grow their agro-food sectors. This reform path would see the agro-food sectors in all ASEAN countries grow and, for those which require rice farmers to adjust away from rice production, creates additional opportunities within the agro-food sector not afforded by intra-ASEAN agro-food integration alone (Figure 33).

Figure 33. Adjustment impacts from broader ASEAN agro-food trade integration and trade liberalisation with key partners

% change in unskilled labour demand in rice sector and % change in unskilled labour wage



Note: Labour movement expressed as changes in unskilled labour factor demand relative to base levels of unskilled labour factor demand. The sum of changes therefore equals zero such that movements from or to the rice sector can be observed. Wages are not sector specific with changes representative of changes in the economy overall. Rest of Southeast Asia, a composite region of Myanmar and Timor Leste, is used to provide representative impacts for Myanmar.
Source: Author estimates.

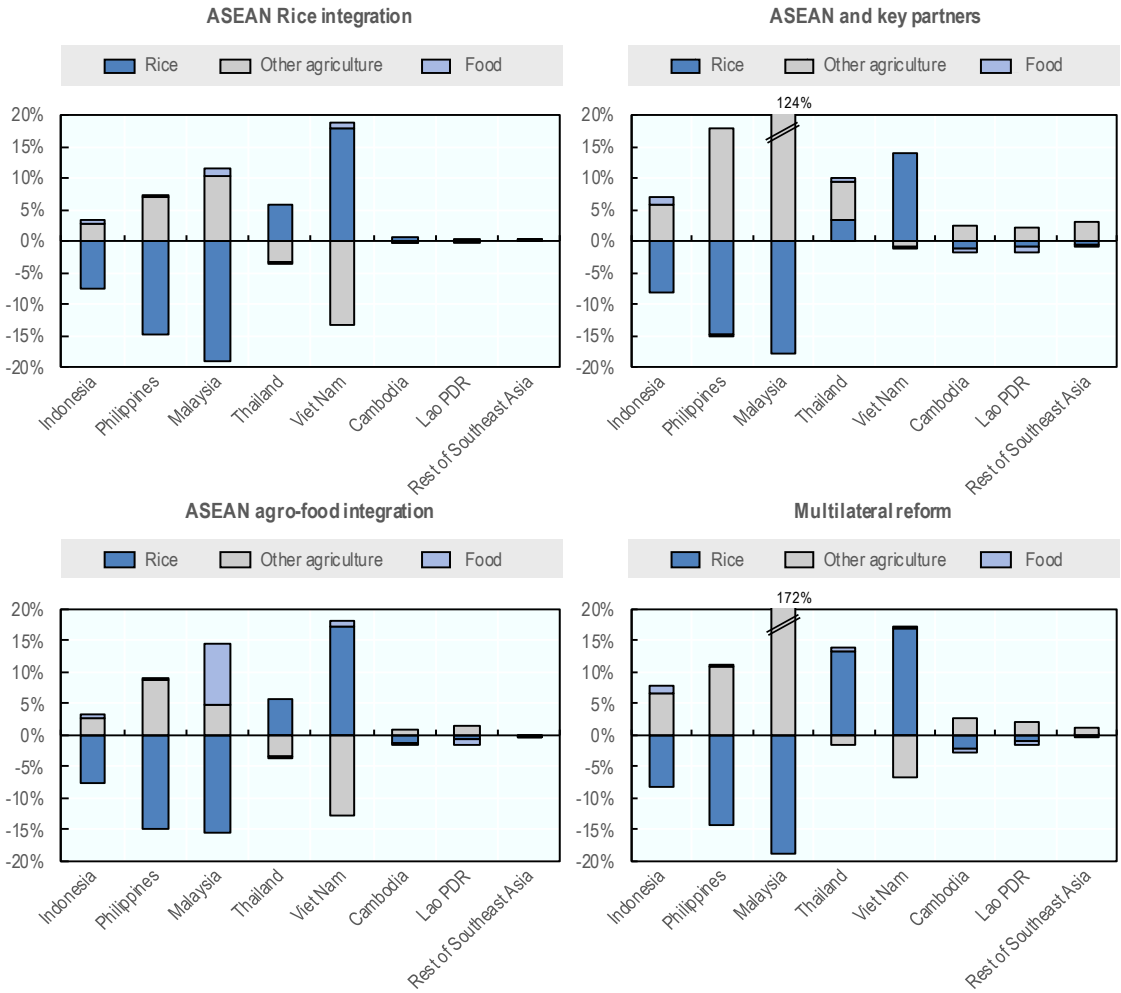
For Malaysia, greater access to key partner agro-food markets more than offsets the movement of labour from the rice sector. Indeed, due to the relatively small size of the sector, the growth in other agro-food sectors' demand for unskilled labour as a result of the

opening of international markets is estimated to be greater than then labour employed in the rice sector in total.

The Philippines also sees modest overall net growth in agro-food labour demand – or employment – as a result of broader reforms. The additional opportunities generated in the sector beyond rice farming would increase overall labour demand in agro-food sectors. For Indonesia, including key partners in agro-food market opening would eliminate most of the required adjustment that needs to occur outside the agro-food sector. Furthermore, the increased shifts of labour demand to within agro-food are mainly to other agricultural activities – that is, farmers can remain being farmers. The largest change is seen in the Philippines where intra-ASEAN agro-food integration creates more demand in food sectors than agricultural sectors. This is reversed when tariff barriers between ASEAN and key partners (excluding rice) are removed (Figure 34).

Figure 34. Movements from rice to other agriculture and food sectors

% change in unskilled labour demand in rice sector



Note: Labour movement expressed as changes in unskilled labour factor demand relative to base levels of unskilled labour factor demand. The sum of changes therefore equals zero such that movements from or to the rice sector can be observed.
Source: Author estimates.

For all ASEAN countries, wages of unskilled labour are also estimated to increase more strongly with freer trade between ASEAN and its key partners. Overall, wage growth is strongest with this broader reform compared with the scenarios only involving ASEAN members.

For Cambodia, Lao PDR and Myanmar (represented by Rest of Southeast Asia), including key partners in market opening helps to develop their agro-food sectors. These countries are not currently heavily integrated in rice trade in the region – although significant potential exists – and have stronger links through other agro-food sectors. Removing distortions in these countries with respect to these other agro-food sectors thus opens new growth opportunities for the agro-food sector. For those which may be adversely impacted by rising rice prices that can occur with market integration (discussed above), the income effects for rural households from this reform may be an important offset, improving access to food through improving rural incomes.

Advocating for a reduction in agricultural trade barriers in the multilateral system is also important

While including key partners in agro-food trade reforms has the potential to generate a more feasible reform path to realise the benefits of rice market integration, multilateral reforms will also help ease adjustment pressures. ASEAN's agro-food sectors have become increasingly engaged in international markets over time. Greenville and Kawasaki (2018) demonstrate that when viewed through the lens of linkages into agro-food GVCs, ASEAN has seen strongest growth in *extra*-regional linkages compared to intra-regional linkages.

Part of the rising international interconnectedness results from the existing barriers to intra-ASEAN trade. Undertaking reforms to integrate rice and agro-food markets, and reducing tariffs with key partners, will all help to grow intra-ASEAN agro-food trade linkages. However, due to similarities between countries, and a relatively small basket of export goods, ASEAN will remain connected with international markets as these will continue to offer growth opportunities that cannot be delivered by growth in regional demand alone. For example, similarities between Malaysia and Indonesia in key export products – palm oil in particular – mean that linkages outside the region are particularly important. For Indonesia, these include some key partners, but also the United States and many developing countries (Box 6).

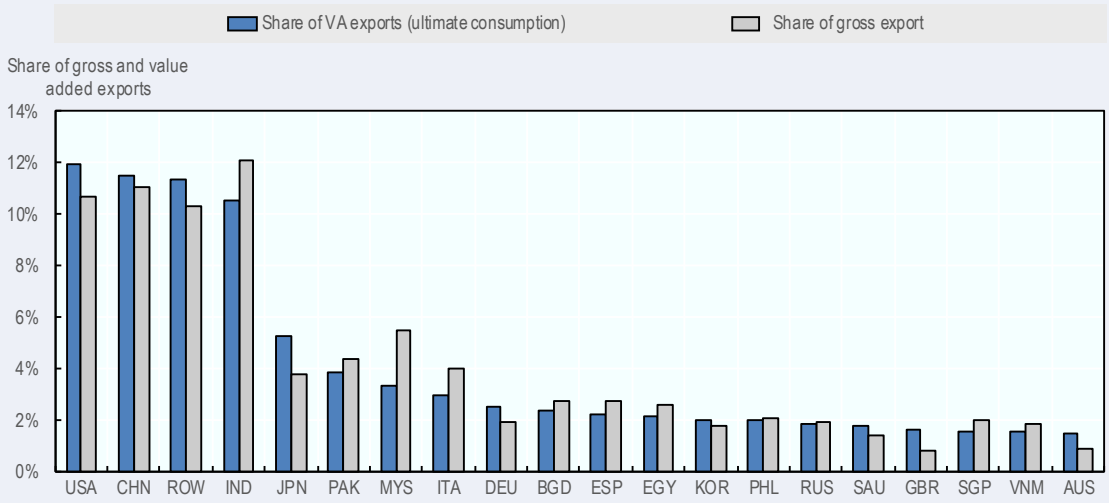
Box 6. Reducing barriers in the United States, China and developing countries important for Indonesia to complement own reforms

For Indonesia in particular, access to international markets outside of ASEAN and its key partners is important for its agro-food sectors. The importance of individual foreign markets for Indonesian agro-food exports is shown in Figure 35. While key partners of China and India are important, Indonesia has strong links (in terms of final destination of value added) to both the USA and a range of other developing countries (included in the aggregate Rest of World [ROW] grouping).

For a number of Indonesia's top final consumption markets for its agro-food value added, the share of consumption of total exported value added exceeds the share of consumption of total exports. While export composition to different countries will lead to differences in the share of domestic value added in gross exports, it is also influenced by exports of value added from Indonesia reaching these markets via third (or fourth or more) countries. Thus, it is not only the bilateral links that are important, but also – due to the increasing presence of global agro-food value chains (Greenville, Kawasaki and Jouanjean, 2018) – the links between bilateral partners and *other* countries.

Figure 35. Gross and value added export destinations for Indonesia, 2014

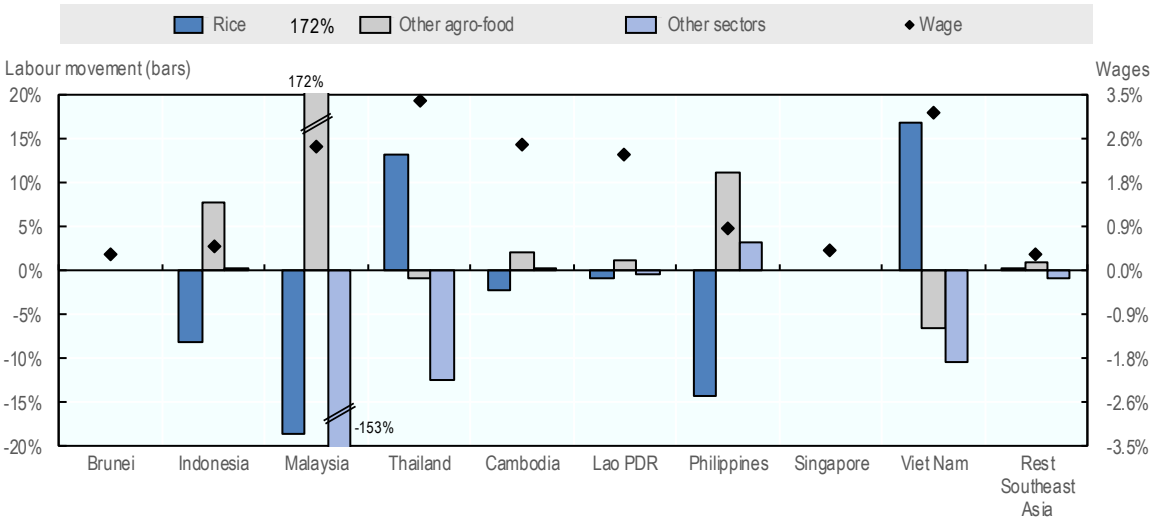
Share of total (%)



Note: Gross exports can be either greater or less than value added exports due to foreign value added and due to indirect exports of value added via third countries.
Source: Author estimates.

Figure 36. Adjustment impacts from multilateral reform and ASEAN rice market integration

% change in unskilled labour demand in rice sector and % change in unskilled labour wage



Note: Labour movement expressed as changes in unskilled labour factor demand relative to base levels of unskilled labour factor demand. The sum of changes therefore equals zero such that movements from or to the rice sector can be observed. Wages are not sector specific with changes representative of changes in the economy overall. Rest of Southeast Asia, a composite region of Myanmar and Timor Leste, is used to provide representative impacts for Myanmar.
Source: Author estimates.

For this reason, ASEAN agro-food sectors have a vested interest in ensuring that world agro-food markets are free from distortions. In the context of rice market integration, world elimination of agro-food tariffs has the potential to generate greater benefits overall and – for Indonesia, Malaysia and the Philippines – to create more opportunities within agro-food sectors than the adjustment away from the rice sectors requires (Figure 36).

Thus for ASEAN members, in seeking to exploit the benefits of rice market integration and further trade liberalisation with key partners, steps should be taken to enhance trade liberalisation at the multilateral level. Given the linkages that ASEAN has with both developed and developing countries, broader-based and non-discriminatory approaches to reducing distortions in agricultural markets will help improve food security and agricultural incomes in the region.

9. Policy implications and conclusions

This study has explored the effects of rice market integration and sought to examine complementary trade policy reforms that may further enhance the benefits for ASEAN member states as they move to integrate rice markets. Rice has remained outside of current integration efforts for various reasons, and the crop holds particular importance as the region's key staple and the fact that it is grown by a large number of often poor producers.

Despite being side-lined from integration efforts which have brought benefits to other areas of the economy across ASEAN, rice market integration would also deliver a number of gains for ASEAN members. Most fundamentally, it has the potential to both reduce the level of undernourishment and the risk of undernourishment across the region. The gains are largest in countries where policies have pushed prices above regional comparators – in particular in Indonesia and Malaysia.

It can also deliver benefits to producers and agro-food sectors. Those with natural comparative advantages stand to gain the most – countries such as Thailand and Viet Nam, and to a lesser extent Cambodia, Lao PDR and Myanmar. However at the same time, rice market integration in isolation will impose adjustment costs in rice producers in Indonesia, Malaysia and the Philippines. In all three countries, for the benefits from integration to be captured, rice farmers would need to leave the sector – and agriculture altogether often – and find employment opportunities elsewhere. While flanking policies such as targeted support will help ease these costs, other reform options exist that can create value within agro-food sectors across the region and which may therefore help to ease the adjustment pressures for these three countries. In particular, complementing rice market integration with broader agro-food market integration, and the elimination of agro-food tariffs with existing key partners (excluding rice), will not along increase agro-food production in all ASEAN countries – creating new opportunities for displaced rice farmers – but also create conditions where unskilled wages can rise. In other words, new and better paid opportunities.

To get there, this report has identified a number of reforms that need to take place to both integrate rice markets and to bring regional agro-food markets closer together and closer to key partner markets. These are:

- The removal of rice from the general exception list within ASEAN Free Trade Area's (AFTA) Common Effective Preferential Tariff agreement with a view to transitioning to zero tariffs over the medium term.

- The removal of all quantitative restrictions and import licensing provisions applied to rice, in particular:
  - Building trust in the regional rice market, through:
    - Placing bans on export restrictions on rice as part of the AFTA.
    - Strengthening the ASEAN Plus Three Emergency Rice Reserve and its programme of holding donor stocks in vulnerable areas, exploring the possibility of including other key partner countries.
- Undertaking broader regional agro-food trade reforms to integrate agro-food markets, through:
  - Seeking to harmonise SPS and TBT arrangements across the region, to reduce the trade costs while still meeting objectives. For example, by:
    - Further developing and implementing regional import standards related to food safety (such as the work on maximum residue limits).
    - Exploring ways to develop consistent domestic food safety systems – across the region and between domestic and import standards – to reduce the transaction costs associated with regional trade.
  - Seeking to lessen the impact of rules of origin (RoO) and provide greater access to regional markets for small producers eliminate RoO on products with a low preference margin or provide exemptions for small exporters.
- Pursuing further reductions in agro-food tariff barriers with key partners within existing free trade agreement frameworks.
  - Deepening the existing free trade area agreements by moving to reciprocal zero tariffs on all agro-food trade. Doing so will increase economic opportunities within agro-food sectors in all member countries, thereby easing adjustment pressures created from rice market integration.
- Contributing to ongoing multilateral efforts to eliminate distortions in agricultural markets. Such a move can improve the region's agricultural sector performance and the food security of its populations.

References

ADB (2014), *Food Security and Resilience of the Association of Southeast Asian Nations Member States to Food Price Volatility*, Technical Assistance Report, Asian Development Bank, Manilla.

AFBA (ASEAN Food and Beverage Association) (2018*), Nutrition Labelling on Prepackaged Food: Impact on Trade in ASEAN*, AFBA Singapore.

AFBA (ASEAN Food and Beverage Association) (2014), *White Paper ASEAN Harmonisation in the Food Sector*, AFBA Singapore.

AFBA (ASEAN Food and Beverage Association) (2013), *Harmonisation of Food Standards in ASEAN: A Shared Vision for Regulatory Convergence*, AFBA Singapore.

Ahamat, H. (2016), *Reducing Non-tariff Barriers in a More Integrated ASEAN: Will ASEAN Economic Community (AEC) Be the Best Option?*, Faculty of Law Universiti Kebangsaan Malaysia.

Alavi, H.R., A. Htenas, R. Kopicki, A.W. Shepherd and R. Clarete (2012), *Trusting Trade and the Private Sector for Food Security in Southeast Asia*, World Bank, Washington, DC.

APC (Australian Productivity Commission) 2004, *Rules of Origin Under the Australia–New Zealand Closer Economic Relations Trade Agreement*, Research Report, Canberra.

ASEAN (2018a), *History: The Founding of ASEAN*, ASEAN, Jakarta, accessed 2 July 2018, http://asean.org/asean/about-asean/history/.

ASEAN (2018b), *The ASEAN Free Trade Area (AFTA)*, ASEAN, Jakarta, accessed 3 July 2018, http://asean.org/asean-economic-community/asean-free-trade-area-afta-council/.

ASEAN (2015), *ASEAN Economic Community* (webpage), www.asean.org/communities/asean-economiccommunity (accessed on 15 June 2015).

Beaujeu, R. (2016), "Alternative policies to buffer stocks for food security", *OECD Food, Agriculture and Fisheries Papers*, No. 97, OECD Publishing, Paris, http://dx.doi.org/10.1787/5jln0434qkzp-en.

Bello, A.L. (2005), "Ensuring food security – A case for ASEAN integration", *Asian Journal of Agriculture and Development*, Vol. 2/1 and 2, Southeast Asian Regional Center for Graduate Study and Research in Agriculture, Philippines, pp. 87-108.

Briones, R. (2014), *Public stockholding in Southeast Asia: Review and Prospects, FAO Expert Meeting on Stocks, Markets and Stability*, 30-31 January 2014, Food and Agriculture Organization of the United Nations, Rome.

Cadot, O., J. Gourdon and F. van Tongeren (2018), "Estimating Ad Valorem Equivalents of Non-Tariff Measures: Combining Price-Based and Quantity-Based Approaches", *OECD Trade Policy Papers*, No. 215, OECD Publishing, Paris, https://doi.org/10.1787/f3cd5bdc-en.

Cadot, O., E. Munadi and L.Y. Ing (2013), "Streamlining NTMs in ASEAN: The way forward", *ERIA Discussion Paper Series*, 2013-24, ERIA, Jakarta.

Cadot, O., Carrere, C., de Melo, J. and B. Tumurchudar (2005), "Product specific rules of origin in EU and US preferential trading arrangements: an assessment", *CERDI Working Papers*, no. 2005-08, Clermont-Ferrand, France.

Carrere, C. and J. de Melo (2004), "Are different rules of origin equally costly? Estimates from NAFTA", *Centre for Economic Policy Research Discussion Paper*, no. 4437.

Chen, B. and S. Saghaian (2016), "Market integration and price transmission in the world rice export markets", *Journal of Agricultural and Resource Economics*, 41(3), 444-457.

CIMB ASEAN Research Institute (2017), "An Analysis of the ASEAN Cooperation in Food Agriculture and Forestry", *AEC Blueprint 2025 Analysis*, vol. 1, no. 21, April 2017.

Clarete, R. (2013), "Rice self-sufficiency and rice trade: Options for food security in ASEAN", Contributed Paper to the 2nd ASEAN Rice Trade Forum, 4-5 June 2013, Yogyakarta, Indonesia.

Dawe, D. (2013), "Geographic determinants of rice self-sufficiency in Southeast Asia", *ESA Working Paper* No. 13-03, Food and Agriculture Organization of the United Nations, Rome.

Durevall, D. and R. van der Weide (2014), "Importing high food prices by exporting: Rice prices in Lao PDR", *Working Papers in Economics*, No. 607, University of Gothenburg, Sweden.

Eliste, P. and N. Santos (2012), *Lao People's Democratic Republic Rice Policy Study*, International Rice Research Institute, World Bank and Food and Agriculture Organization of the United Nations, Rome.

Engle, R. and C.W.J Granger (1987), "Co-integration and error correction: representation, estimation and testing", *Econometrica*, 55, pp. 251-276.

FAO (2018), *FAOSTAT* (database), Food and Agriculture Organization of the United Nations Statistics Division, Rome, http://faostat3.fao.org/home/E (accessed on 18 February 2018).

FIA (2018), *Removing Non-Tariff Barriers in ASEAN Through Regulatory Convergence and Mutual Recognition in the Food Sector*, Food Industry Asia, FIA Communications 11 September 2018, Singapore, https://foodindustry.asia/removing-non-tariff-barriers-in-asean-through-regulatory-convergence-and-mutual-recognition-in-the-food-sector.

Freedman, A. (2013), "Rice security in Southeast Asia: Beggar thy neighbour or cooperation", *The Pacific Review*, 26(5), 433-454.

Furuhashi, G. and H. Gay (2017), "Market implications of the integration scenario of Southeast Asian rice markets", *OECD Food, Agriculture and Fisheries Papers*, No. 108, OECD Publishing, Paris. http://dx.doi.org/10.1787/c81e00c6-en.

Ghoshray, A. (2008), "Asymmetric adjustment of rice export prices: The case of Thailand and Vietnam", *International Journal of Applied Economics*, 5, 80–91.

Greenville, J. and K. Kawasaki (2018), "Agro-food trade, GVCs and agricultural development in ASEAN", *OECD Food, Agriculture and Fisheries Papers*, OECD Publishing, Paris.

Greenville, J., K. Kawasaki and M.A. Jouanjean (2018), "Dynamic changes and effects of agro-food GVCs", *OECD Food, Agriculture and Fisheries Papers*, OECD Publishing, Paris.

Hayami Y. and V. Ruttan (1985), *Agricultural Development: An International Perspective*, Johns Hopkins University Press, Baltimore.

Headey, D. (2011), "Rethinking the global food crisis: The role of trade shocks", *Food Policy*, Vol. 36, Elsevier, Amsterdam, pp. 136-146.

Hoang, H.K. and W.H. Meyers (2015), "Price stabilization and impacts of trade liberalization in the Southeast Asian rice market", *Food Policy*, Vol. 57, Elsevier, Amsterdam, pp. 26-39.

Ing, L.Y., S. Fernandez de Cordoba and O. Cadot (2016), *Non-Tariff Measures in ASEAN*, Economic Research Institute for ASEAN and East Asia and United Nations Conference on Trade and Development.

Johansen, S. (1988), "Statistical analysis of cointegration vectors", *Journal of Economic Dynamics and Control*, Vol. 12, pp. 231-254.

Johansen, S. and K. Juselius (1992), "Structural tests in a multivariate cointegration analysis of the PPP and the UIP for UK", *Journal of Econometrics*, Vol. 53, pp. 211-244.

Johansen, S. and K. Juselius (1990), "Maximum likelihood estimation and inference on cointegration, with applications to the demand for money", *Oxford Bulletin of Economic Statistics*, Vol. 52, pp. 169-210.

Korinek, J. and J. Bartos (2012), "Multilateralising Regionalism: Disciplines on Export Restrictions in Regional Trade Agreements", *OECD Trade Policy Papers*, No. 139, OECD Publishing, Paris, https://doi.org/10.1787/5k962hf7hfnr-en.

Loening, J.L. (2011), *Lao People's Democratic Republic responding to rice price inflation*, Report No. 62776-LA, Sustainable Development Department, World Bank, Washington, DC.

Marks, S.V. (2015), "Non-Tariff Trade Regulations in Indonesia: Nominal and Effective Rates of Protection", *Bulletin of Indonesian Economic Studies*, 53:3, 333-357, https://doi.org/10.1080/00074918.2017.1298721.

Martin, W. (2017), "Agricultural trade and food security", *ADB Working Paper Series*, no. 664, February 2017, Asian Development Bank Institute, Manilla.

McDonald, S., K.E. Thierfelder and T. Walmsley (2013), *Globe v2: A SAM Based Global CGE Model Using GTAP Data*, Model Documentation, available at: www.cgemod.org.uk/.

Mujahid, I. and L. Kornher (2016), "ASEAN food reserve and trade: Review and prospect" in M. Kalkuhl et al. (eds.), *Food Price Volatility and Its Implications for Food Security and Policy*, Springer, Cham, Switzerland, https://doi.org/10.1007/978-3-319-28201-5_17.

Myint, T. and S. Bauer (2010), "Market integration and price causality in the Myanmar rice market", *Asian Journal of Agriculture and Development*, 7(2), 91-105.

Nanang, D. (2000), "A multivariate cointegration test of the law of one price for Canadian softwood lumber markets", *Forest Policy and Economics*, Vol. 1, no. 3-4, pp. 347-355.

Naylor, R.L. and W.P. Falcon (2010), "Food security in an era of economic volatility", *Population and Development Review*, Vol. 36/4, New Jersey, United States, pp. 693-723.

OECD (2018), *The Economic Effects of Public Stockholding Policies for Rice in Asia*, OECD Publishing, Paris, https://doi.org/10.1787/9789264305366-en.

OECD (2017a), *Building Food Security and Managing Risk in Southeast Asia*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264272392-en.

OECD (2017b), Agricultural Policies in the Philippines, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264269088-en.

OECD (2015a), *Agricultural Policies in Viet Nam 2015*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264235151-en.

OECD (2015b), METRO Version 1 Model Documentation, OECD Publishing, Paris, www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=TAD/TC/WP(2014)24/FINAL&docLanguage=En).

OECD (2015c), *Managing Food Insecurity Risk: Analytical Framework and Application to Indonesia*, OECD Publishing, Paris, http://dx.doi.org/10.1787/9789264233874-en.

OECD (2008), "Rising food prices: Causes and consequences", *OECD Policy Brief*, OECD Publishing, Paris, www.oecd.org/trade/agricultural-trade/40847088.pdf.

Permani, R. and D. Vanzetti (2014), *Rice Mountain: An Assessment of the Thai Rice Pledging Program*, Contributed paper prepared for presentation at the 58th AARES Annual Conference, Port Macquarie, New South Wales, 4-7 February 2014.

Philippines Government (2011), "Briefer on the Food Staples Self-Sufficiency Roadmap 2011-2016" (webpage), Official Gazette, Manila.

Piesse, J. and C. Thirtle (2009), "Three bubbles and a panic: An explanatory review of recent food commodity price events", *Food Policy*, Vol. 34, Elsevier, Amsterdam, pp. 119-129.

Ricepedia (2018), *Who Grows Rice*, Ricepedia, accessed 2 July 2018, http://ricepedia.org/rice-as-a-crop/who-grows-rice.

Saraithong, W. (2015), "The protection measurement of non-tariff measures: A case study of ASEAN MRLs", *International Journal of Arts & Sciences*, vol. 8, no. 4, pp. 147-154.

UNCTAD-ERIA-WTO (2018), TRAINS: Non-tariff Measures (NTMs) based on Official Regulations Database, http://asean.i-tip.org/Default.aspx (accessed on 24 July 2018).

USDA (2018a), *Production, Supply and Distribution Online* (database), United States Department of Agriculture, Washington, DC, http://apps.fas.usda.gov/psdonline/psdquery.aspx (accessed on 18 June 2018).

WITS (2018), *World Integrated Trade Solution* (database), World Bank, Washington, DC, http://wits.worldbank.org/default.aspx (accessed on 7 June 2018).

World Bank (2014), *Myanmar: Rice Price Volatility and Poverty Reduction, Economic and Sector Work*, Report No. 89687-MM, World Bank, Washington, DC.

Yavapolkul, N., M. Gopinath and A. Gulati (2006), "Post-Uruguay round price linkages between developed and developing countries: The case of rice and wheat markets", *Agricultural Economics*, 34, 259–272.

Annex A. Region and sector aggregation in the METRO model

Table A.1. Sectors in the model

No.	Code	Description	Comprising
1	pdr	Paddy rice.	Paddy rice
2	wht	Wheat.	Wheat
3	gro	Cereal grains nec.	Cereal grains nec
4	v_f	Vegetables, fruit, nuts.	Vegetables, fruit, nuts
5	osd	Oil seeds.	Oil seeds.
6	c_b	Sugar cane, sugar beet.	Sugar cane, sugar beet
7	pfb	Plant-based fibres.	Plant-based fibres
8	ocr	Crops nec.	Crops nec.
9	ctl	Cattle, sheep, goats, horses.	Cattle, sheep, goats, horses
10	oap	Animal products nec.	Animal products nec
11	rmk	Raw milk.	Raw milk.
12	wol	Wool, silk-worm cocoons.	Wool, silk-worm cocoons
13	frs	Forestry.	Forestry
14	fsh	Fishing.	Fishing
15	cmt	Meat: cattle, sheep, goats, horse.	Meat: cattle, sheep, goats, horses
16	omt	Meat products nec.	Meat products nec
17	vol	Vegetable oils and fats.	Vegetable oils and fats
18	mil	Dairy products.	Dairy products
19	pcr	Processed rice.	Processed rice
20	sgr	Sugar.	Sugar
21	ofd	Food products nec.	Food products nec
22	b_t	Beverages and tobacco products.	Beverages and tobacco products
23	ext	Mining and Extraction	Coal, Oil, Gas, Minerals nec
24	tex	Textiles and Clothing	Textiles, Wearing apparel
25	lmc	Light Manufacturing	Leather products, Wood products, Paper products, publishing, Metal products, Motor vehicles and parts, Transport equipment nec, Manufactures nec
26	hmc	Heavy Manufacturing	Petroleum, coal products, Chemical, rubber, plastic prods, Mineral products nec, Ferrous metals, Metals nec, Electronic equipment, Machinery and equipment nec.
27	utc	Utilities and Construction	Electricity, Gas manufacture, distribution, Water, Construction
28	trd		Trade
29	trn	Transport	Transport nec, Sea transport, Air transport
30	bus	Business Services	Communication, Financial services nec, Insurance, Business services nec
31	ots	Other	Recreation and other services, PubAdmin/Defence/Health/Educat, Dwellings

Table A.2. Countries and regions in the model

No.	Code	Description	Comprising
1	AUS	Australia	Australia
2	NZL	New Zealand	New Zealand
3	CHN	China	China
4	KOR	Korea	Korea, **Republic of**
5	XEA	Rest of East Asia	Hong Kong; Mongolia; Chinese Taipei; Rest of East Asia; Brunei Darussalam
6	JPN	Japan	Japan
7	IDN	Indonesia	Indonesia
8	MYS	Malaysia	Malaysia
9	THA	Thailand	Thailand
10	KHM	Cambodia	Cambodia
11	LAO	Lao PDR	Lao People's Democratic Republic
12	PHL	Philippines	Philippines
13	SGP	Singapore	Singapore
14	VNM	Viet Nam	Viet Nam
15	XSE	Rest of Southeast Asia	Myanmar
16	IND	India	India
17	MEX	Mexico	Mexico
18	CAN	Canada	Canada
19	USA	USA	United States
20	ARG	Argentina	Argentina
21	CHL	Chile	Chile
22	BRA	Brazil	Brazil
23	CRI	Costa Rica	Costa Rica
24	XLA	Rest of Latin America	Bolivia, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Rest of South America, Guatemala, Honduras, Nicaragua, Panama, El Salvador, Rest of Central America, Dominican Republic, Jamaica, Puerto Rico, Trinidad and Tobago, Caribbean.
25	XEU	EU27	Austria, Belgium, Cyprus[1,2], Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, Bulgaria, Croatia, Romania
26	GBR	UK	United Kingdom
27	CHE	Switzerland	Switzerland
28	KAZ	Kazakhstan	Kazakhstan
29	UKR	Ukraine	Ukraine
30	RUS	Russia	Russian Federation
31	ZAF	South Africa	South Africa
32	XMN	Middle East and North Africa	Bahrain, Iran Islamic Republic of, Israel, Jordan, Kuwait, Oman, Qatar, Saudi Arabia, Turkey, United Arab Emirates, Rest of Western Asia, Egypt, Morocco, Tunisia, Rest of North Africa.
33	XSS	Sub-Saharan Africa	Benin, Burkina Faso, Cameroon, Cote d'Ivoire, Ghana, Guinea, Nigeria, Senegal, Togo, Rest of Western Africa, Central Africa, South Central Africa, Ethiopia, Kenya, Madagascar, Malawi, Mauritius, Mozambique, Rwanda, Tanzania, Uganda, Zambia, Zimbabwe, Rest of Eastern Africa, Botswana, Namibia, Rest of South African Customs .
34	XRW	ROW	Rest of Oceania, Rest of South Asia, Rest of North America, Rest of EFTA, Albania, Belarus, Rest of Eastern Europe, Rest of Europe, Norway, Kyrgyzstan, Tajikistan, Rest of Former Soviet Union, Armenia, Azerbaijan, Georgia, Rest of the World.

1. *Note by Turkey*: The information in this document with reference to "Cyprus" relates to the southern part of the Island. There is no single authority representing both Turkish and Greek Cypriot people on the Island. Turkey recognises the Turkish Republic of Northern Cyprus (TRNC). Until a lasting and equitable solution is found within the context of the United Nations, Turkey shall preserve its position concerning the "Cyprus issue."
2. *Note by all the European Union Member States of the OECD and the European Union*: The Republic of Cyprus is recognised by all members of the United Nations with the exception of Turkey. The information in this document relates to the area under the effective control of the Government of the Republic of Cyprus.

Annex B. Data source for domestic rice prices

Table B.1. Sources of rice price details

Country	Country-level regions / markets	Rice commodity	Data availability	Data source(s)
ASEAN Region				
Cambodia	Phnom Penh, Battambang, Banteay Meanchey, Kampong Chhnang (Average)	Mix	01/2006 – 04/2018	Food and Agricultural Organization of United Nations (FAO-GIEWS)
Indonesia	Overall	Milled, first quality	01/1989 – 04/2018	Organisation for Economic Co-operation and Development (OECD)
Lao PDR	Vientiane Capital	Ordinary, first quality	01/2006 – 12/2017	FAO-GIEWS and USAID Famine Early Warning System (FEWS) Network
Myanmar	Yangon	Emata (long grain), first quality	01/2010 – 04/2018	Food and Agricultural Organization of United Nations (FAO-GIEWS)
Philippines	Overall	Regular milled rice	01/2006 – 12/2017	Philippines Statistics Authority and OECD
Thailand	Overall	100% highest quality	01/2000 – 03/2018	Bank of Thailand and Food and Agricultural Organization of United Nations (FAO-GIEWS)
Viet Nam	Overall	Double water polished, 5% broken	01/2008 – 04/2018	US Department of Agriculture (USDA), Economic Research Service
Other Asian countries				
China	Hunan Province	Indica (milled)	02/2009 – 12/2017	FAO-GIEWS and USAID Famine Early Warning System (FEWS) Network

Annex C. Formal tests for co-integration of regional rice prices

The pairwise correlation analysis presented in Section 6 may lead to misleading results if price series exhibit non-stationarity. What this means is that the prices series do not have a constant mean over time and instead drift over the period – a common occurrence in most price series due to inflationary pressures. Thus, the correlations represent similarities in the general increases in prices rather than anything about the underlying market movements.

To more formally test integration in price series, co-integration analysis is often conducted. This analysis is used to explore whether price series movement are related based on the law of one price. The law of one price simple states that prices for the same (or similar) goods in two different markets should be the same once market margins are accounted for. In other words, two prices series should be equal when these margins – transport and other market costs – are taken into account. If not, traders would seek to arbitrage between the markets until any price differences are eliminated.

In the case of rice, if the policy measures in place create price gaps akin to other steps in the marketing chain, but still let price markets driven by market fundamentals transmit, then prices should follow this relationship. It also infers that rice sold in each market, although likely differing in quality, are substitutes to some degree.

The econometric approach used to formally test co-integration in this set out by Engle and Granger (1987). The approach requires testing the presence of a co-integrating relationship for series that exhibit the same 'trend' over. This trend is defined based on the notion of whether the series has a stationary mean or not, and if not, whether the series have the same non-stationary process. For example, a series may not have a stationary mean, but when the first difference is taken, the resulting series does. The series would be known to be integrated in the first order – I(1) – or be said to have a 'unit root'. In such an instance, test begin with exploring whether the different series are integrated of the same order, and if so, whether evidence of a co-integrating relationship exists. Series integrated of the same order are said to be co-integrated when the residuals of the regression of one against the other exhibit a stationary trend – that is, the residuals are I(0). It does not suggest that the price series need to be at the same level.

However, Nanang (2000) points out that the use of the co-integration method of Engle and Granger (1987) may suffer from simultaneous equation bias if more than two price series are modelled. In this study, there are seven prices series within ASEAN and a further with China. The issue arises because under the assumption of the law of one price all prices are determined simultaneously. This means that simultaneity needs to be taken into account. Furthermore, the number of co-integration vectors may be more than one (there may be up to seven) but it is not possible to determine more than one vector in the Engle and Granger method. In other words, integration in regional prices may not always flow from one country to another – say from Thailand or Viet Nam to other countries.

To overcome these issues the Johansen maximum likelihood procedure is used (Johansen, 1988, Johansen and Juselius, 1990, Johansen and Juselius, 1992). This procedure allows for a test of the number of co-integrating relationships across a broader set of price series and can be complemented by pair-wise tests. Tests are conducted to find the number of son-integration relationships such that the residuals are I(0).

Testing for stationarity

As noted in Section 6, the price series exhibit different trends over the entire period but from 2012, more stability in the series is found. This is picked up in greater pairwise correlations between the price variables from 2012 onwards and an apparent shift to a more co-integrated prices across the region. This stability has been driven by changes in policy use and programmes with no export restriction or threats thereof occurring post 2012 and also Thailand ending its revised paddy pledging and stockholding programme. Given this, co-integration test are conducted on the monthly rice price series in USD from 2012 to 2017, noting also that for Indonesia and the Philippines in particular, the prior period of intervention were successful in preventing price transmission of the price spikes observed following the application and threat of export restrictions.

Test for I(1) using the Augmented Dicky-Fuller tests are given in Table C.1. All series were found to non-stationary means over the period examined – I(1) – and thus tests for co-integration are possible.

Table C.1. Unit root tests

Augmented Dicky-Fuller (ADF) tests with critical values

Country	Test statistic	1% critical value	5% critical value	10% critical value	Result
Cambodia	-0.938	-2.611	-1.95	-1.61	I(1)
Indonesia	-0.972	-2.611	-1.95	-1.61	I(1)
Lao PDR	1.02	-2.611	-1.95	-1.61	I(1)
Myanmar	-0.46	-2.611	-1.95	-1.61	I(1)
Philippines	-0.037	-2.611	-1.95	-1.61	I(1)
Thailand	-1.267	-2.611	-1.95	-1.61	I(1)
Viet Nam	-0.842	-2.611	-1.95	-1.61	I(1)
China	-0.062	-2.611	-1.95	-1.61	I(1)

Note: Null hypothesis of unit root. Random walk tested (no constant in ADF test) with 2 lags.
Source: Author estimates.

Testing for co-integration

Results from the Johansen maximum likelihood procedure are given in Table C.2. For the analysis, five lags were chosen to correct for serial correlation in the data. While no precise test for lags is possible, studies using monte-carlo simulation have suggested that with larger number of lags, the possibility of getting incorrect conclusions increases. The results suggest that there are six co-integrating relationships within the eight price series – that is that prices within and across the region are mostly co-integrated.

Table C.2. Johansen tests for co-integration

For ASEAN plus China rice prices post-2012

Maximum rank	Parms	LL	Eigenvalue	Trace statistic	5% Critical value
0	264	1783.7497	.	301.5761	156
1	279	1828.9073	0.71475	211.2609	124.2
2	292	1863.6072	0.61859	141.861	94.15
3	303	1889.0451	0.50669	90.9852	68.52
4	312	1904.7483	0.35351	59.5789	47.21
5	319	1919.0222	0.32733	31.031	29.68
6	**324**	**1927.984**	**0.22037**	**13.1075***	**15.41**
7	327	1932.3999	0.11544	4.2757	3.76
8	328	1934.5377	0.05766		

Note: Test estimated with 5 lags.
Source: Author estimates.

To explore further, the bilateral relationships were also examined. These were explored using the Engle and Granger procedure where the two price series are regressed against each other and a unit-root test preformed on the residuals. The results from the ADF unit root tests are presented in Table C.3. The statistic provided is that of the unit-root test where the null hypothesis if I(1) is rejected if the estimate is significant. The model is fitted under the assumption of random walk (no constant) but not with random walk with drift (with a constant). Two lags are introduced to control for serial correlation.

Table C.3. Engle Granger co-integration tests

Co-integration tests between ASEAN and Thai and Vietnamese prices

	Thailand			Viet Nam		
	Test statistic	1% critical value	5% critical value	Test statistic	1% critical value	5% critical value
Cambodia	-1.922	-2.598	-1.95	-3.586*	-2.598	-1.95
Indonesia	-2.124*	-2.598	-1.95	-3.224*	-2.598	-1.95
Lao PDR	-1.771	-2.598	-1.95	-3.244*	-2.598	-1.95
Myanmar	-3.137*	-2.603	-1.95	-3.837*	-2.603	-1.95
Philippines	-1.666	-2.598	-1.95	-2.918*	-2.598	-1.95
Thailand				-3.357*	-2.598	-1.95
Viet Nam	-3.233*	-2.598	-1.95			
China	-1.771	-2.599	-1.95	-2.853*	-2.599	-1.95

Note: No constant term is included in the bilateral regression model. Specified as random walk with 2 lags (to correct for serial correlation).
* represents significant at a 5% critical value.
Source: Author estimates.

The analysis suggests that Viet Nam is co-integrated with all ASEAN countries along with that of China. That is, all bilateral price series between Viet Nam and other ASEAN countries were found to be co-integrated, including those of Lao PDR and China. However, despite the increasing correlation in prices between Lao PDR and China, prices are not yet co-integrated. Thus, the co-integration tests are suggestive of the price setting role of Viet Nam over the period examined – in ASEAN and beyond.