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# Implications for Indonesia of Asia's Rise in the Global Economy

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## Abstract

This paper projects Indonesia's production and trade patterns to 2020 and 2030 in the course of global economic development under various growth and policy scenarios. We employ the GTAP model and Version 8.1 of the GTAP database, along with supplementary data from a range of sources to support projections of the global economy. The baseline projection assumes trade-related policies do not change in each region but that endowments and real GDP do change, at exogenously selected rates. This enables us to analyse how potential global changes may impact the Indonesian economy over this and the next decade. We then consider the impacts of three potential policy reforms by 2020: an increase in global rice exports, as might be associated with the opening of Myanmar; Indonesia's recently-imposed export taxes on unprocessed primary products; and implementation of Indonesia's new Food Law.

**Keywords:** Global economy-wide model projections; Indonesian economic growth and structural change; Food policy; Export taxes

**JEL codes:** D58, F13, F15, F17, Q17

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# Implications for Indonesia of Asia's Rise in the Global Economy

## INTRODUCTION

Over the past five years, Indonesia's economy has grown at around 6% per year. That is not quite as high as in China and India, but it is still very impressive by the standards of other developing countries – and sharply contrasts with recession-hit developed economies. The rapid growth in emerging economies, particularly in Asia, is altering the global industrial centre of gravity away from just the north Atlantic. It has also raised the demand for primary products in the international marketplace, consistent with the fastest growth in emerging economies being concentrated in natural resource-poor countries such as China and India. That in turn is stimulating growth in demand for exports from natural resource-rich economies. This is a continuation of a process begun in Japan in the 1950s and followed by Korea and Taiwan from the late 1960s and then by some Southeast Asian countries (Anderson and Smith 1981). However, because the earlier Northeast Asian group represents just 3% of the world's population, its rapid industrial growth was accommodated by the rest of the world without much difficulty, including in primary product markets. China and India, by contrast, account for more than two-fifths of the world's population and so their rapid and persistent industrial output and income growth has far greater significance for goods markets, and also for such issues as food and energy security and greenhouse gas emissions.

How might these on-going developments affect markets over the next two decades? This paper focuses on the potential consequences for Indonesia. It does so by first assuming a continuation of recent growth rates and no policy changes (the core scenario to 2020 and 2030), before then examining potential economic consequences of also implementing some recently announced policies. The estimated effects by 2020 of three policy shocks are considered. One is external to, but of considerable policy interest in Indonesia, namely a significant increase in international rice market competition that might be associated with the opening up Myanmar's economy (which some believe could substantially depress the international rice price); the others are Indonesia's recently-imposed export restrictions on unprocessed primary products and the implementation of the new Food Law that was

promulgated in November 2012 (both of which may dampen the country's agricultural exports and imports and also national economic welfare). Those recent trade policy changes in Indonesia may be in response to the latest 'Dutch disease' pressure on food production and manufacturing, which raises the question as to how appropriate they are, especially if the recent high prices for the country's primary product exports were to soon fall back to trend levels.

Trade and development theory, and the historical experience to date with Asian industrialization, provide a guide as to what to expect both in and beyond the region over the next decade or two.[1] That theory and history is briefly summarized in the following section as a way of anticipating likely future trends in Indonesia and elsewhere. Those expectations are then tested in the third section, using the latest Version 8.1 of the GTAP global economy-wide model to project the world economy to 2020 and 2030. Results are presented for a 2030 scenario before turning to scenarios for 2020 that also incorporate the three policy changes mentioned above. Some caveats are then listed prior to the final section, which draws out policy implications for Indonesia.

## THEORY AND PAST EXPERIENCE

Like Northeast Asia's earlier rapidly industrializing economies, China and South Asia are relatively natural resource-poor (Table 1(a)) and densely populated. They are therefore highly complementary with relatively lightly populated economies that are well endowed with agricultural land and/or mineral resources per worker, such as in Australasia, Latin America, the Middle East and parts of Africa. Their complementarity with ASEAN economies is less clear-cut, however. For example, Indonesia is relatively well endowed per worker with minerals and energy raw materials compared with the rest of ASEAN and other Asia. Compared with non-Asian developing countries though, Indonesia is not as well endowed for mining – but it is twice as well endowed with agricultural land per worker as non-Asian developing countries, and this is projected to increase by 2030 (Table 1). These relative factor endowments are consistent with patterns of specialization in primary product trade as of 2005-09 (Table 2).

[1] A similar guide was provided to a modelling exercise that was undertaken just prior to the Asian Financial Crisis (Anderson and Pangestu 1998). The focus of that earlier study, however, was on the effects of implementing the Uruguay Round's multilateral trade agreements by 2005, of China's accession to the WTO, and of prospective regional trade liberalization by APEC countries.

The workhorse theory of comparative cost advantage developed in the 20th century has been used to explain trade specialization patterns including trade between natural resource-rich and resource-poor economies. That theory blends the Heckscher-Ohlin-Samuelson model, which assumes all factors of production are mobile between sectors, with the Ricardo-Viner model which assumes some factors are sector-specific. Such a blend is provided by Krueger (1977) and explored further by Deardorff (1984). They consider two tradable sectors each using intersectorally mobile labour plus one sector-specific factor (natural-resource capital or produced industrial capital). Assuming that labour exhibits diminishing marginal product in each sector, and that there are no services or nontradables and no policy distortions, then at a given set of international prices the real wage in each economy is determined by the aggregate per worker endowment of the two types of capital. The commodity composition of a country's trade – that is, the extent to which a country is a net exporter of primary or industrial products – is determined by its endowment of natural relative to industrial capital compared with that ratio for the rest of the world.

Leamer (1987) develops this model further and relates it to paths of economic development. If the stock of natural resources is unchanged, rapid growth by one or more economies relative to others in their availability of produced capital (physical plus human skills and technological and managerial knowledge) per unit of available labour time would tend to cause those economies to strengthen their comparative advantage in non-primary products. By contrast, a discovery of minerals or energy raw materials would strengthen that country's comparative advantage in mining and weaken its comparative advantage in agricultural and other tradable products, ceteris paribus. It would also boost national income and hence the demand for nontradables, which would cause mobile resources to move into the production of nontradable goods and services, further reducing farm and industrial production (Corden 1984).

Domestic or foreign savings can be invested to enhance the stock and/or improve the quality not only of a country's produced capital but also of its economically exploitable stock of natural resources. Any such increase in the stock of capital (net of depreciation) per worker will put upward pressure on real wages. That will encourage, in all sectors, the use of more labour-saving techniques and the development and/or importation of better technologies that are less labour intensive. Whether it boosts industrialization more than agriculture or other primary production will depend on the relative speed of sector-specific productivity growth that such R&D investments yield. Which types of investment would expand fastest in a free-market setting depends on their expected rates of return. The more densely populated, natural

resource-poor an open economy is, the greater the likelihood that the highest payoff would be in expanding stocks of capital (including technological knowledge) for non-primary sectors. That gives rise to the Rybczynski effect, of pulling mobile resources (most notably labour) out of primary production. If there is also relatively rapid productivity growth in primary sectors (as Martin and Mitra (2001) have found to be the case historically), and especially if that productivity growth is labour-saving, this also pushes labour into non-primary sectors (Martin and Warr 1993).

At early stages of development of a country with a relatively small stock of natural resources per worker, wages would be low and the country would have a comparative cost advantage in unskilled labour-intensive, standard-technology manufactures. Then as the per worker stock of industrial capital grows, there would be a gradual move toward exporting manufactures that are relatively intensive in their use of physical capital, skills and knowledge. Natural resource-abundant economies, however, would invest more in capital specific to primary production and so would be less likely to develop a comparative advantage in manufacturing until a later stage of development, at which time their industrial exports would be relatively capital intensive.

The above theory of changing comparative advantages – which can also be used to explain shocks to that pattern from discovery-driven mining booms or major terms of trade changes imposed from the rest of the world – has been used successfully to explain the evolving trade patterns of Asia's resource-poor first- and second-generation industrializing economies and their resource-rich trading partners (early examples being Anderson and Garnaut 1980 and Anderson and Smith 1981). It has also explained the 20$^{th}$ century evolution, for early- and later-industrializing countries, of the flying geese pattern of comparative advantage, and then of comparative disadvantage, in unskilled labour-intensive manufactures as some rapidly growing economies expand their endowments of industrial capital per worker relative to the rest of the world – the classic example being clothing and textiles (Anderson 1992; Ozawa 2009).

This theory also helps explain changes in the sectoral shares of Indonesia's GDP and exports. After the turmoil of the 1960s, Indonesia derived a below-average (above-average) share of GDP from agriculture (manufacturing), but that reversed with the sharp rise over the past decade in the price of primary products in which Indonesia still has a comparative advantage (Figure 1). The rise in the price of such export products as coal and palm oil led to the share of primary products in Indonesia's merchandise exports rising from 56% to 75% between 2005 and 2011 (WTO 2012). Its index of 'revealed' comparative advantage in

agriculture[2] had fallen from 2.7 in 1965-69 to 1.0 in 2000-02, but by 2009-11 it was back to 2.4.

Another element that complicates the task of predicting trade outcomes has to do with domestic demand, the product pattern of which differs across the per-capita income spectrum even when tastes are identical (Markusen 2013). That, together with the fact that per capita incomes, endowments and productivities are expected to grow at different rates in different economies, makes it particularly difficult to predict from theory the future production and trade pattern of a country such as Indonesia that is not extreme in terms of expected output and income growth (Appendix Table A) or relative factor endowments (Table 1). For that reason an empirical modelling approach is called for. In particular, given the interdependence between sectors of growing economies described above, an economy-wide model of the world's national markets is needed to project future production, consumption and international trade developments, given the types of growth rates that we might expect in different economies. Such an approach has the additional advantage of being able to estimate the impacts of policy changes on projected developments.

## EMPIRICAL MODELLING METHODOLOGY AND DATABASE

In this study we employ the GTAP model (Hertel 1997) of the global economy and the latest available Version 8.1 of the GTAP database which is calibrated to 2007 levels of production, consumption, trade and protection for 134 countries or regions (Narayanan, Aguiar and McDougall 2012). The standard GTAP model is perhaps the most widely used CGE model for economy-wide global market analysis, in part due to its robust and explicit assumptions that are fully documented.[3] The Version 8.1 base period of 2007 is ideal for projecting forward to 2030 because 2007 immediately precedes the recent period of temporary spikes in food and fuel prices and the north Atlantic financial crisis and recession.

In its simplest form, the model assumes perfect competition and constant returns to scale in production. The functional forms are nested constant elasticities of substitution (CES) production functions. Land, other natural resources, labour (skilled and unskilled), and physical capital substitute for one another in a value added aggregate, and composite intermediate inputs substitute for value-added at the next CES level in fixed proportions.

[2] The index of 'revealed' comparative advantage in agriculture, following Balassa (1965), is the share of agriculture in Indonesia's exports divided by the share of agricultural products in global merchandise exports.

[3] See www.gtap.org.

Land is specific to agriculture in the GTAP database, but is somewhat mobile amongst alternative agricultural uses over this projection period according to a Constant Elasticity of Transformation (CET) which, through a revenue function, transforms land from one use to another. In the modified version of the GTAP model we use for the current study, natural resources, including coal, oil, gas and other minerals, are specific to the sector in which they are extracted. Labour and produced capital are assumed to be mobile across all uses within a country, but immobile internationally. While aggregate national employment of each productive factor is fixed in the standard macro-economic closure, we use exogenous projections to model expected changes in factor availability over time.

On the demand side there is a national representative household whose expenditure is governed by a Cobb-Douglas aggregate utility function which allocates net national expenditures across private, government, and saving activities. Government demand across composite goods is determined by a Cobb-Douglas assumption (fixed budget shares). Private household demand is represented by a Constant Difference of Elasticities (CDE) functional form, calibrated to replicate a vector of own-price and income elasticities of demand (Hertel, Narayanan and McDougall 2012). In projecting to 2030 we follow Yu et al. (2004) in lowering these elasticities for food crops (see Anderson and Strutt (2013) for further details).[4]

Bilateral international trade flows are handled through the Armington (1969) specification by which products are differentiated by country of origin. These Armington elasticities are the same across countries but are sector-specific, and the import-import elasticities have been estimated at the disaggregated GTAP commodity level (Hertel et al. 2007). For present purposes, where we are dealing with long-term changes, we follow the common modelling practise of doubling the short-to-medium term Armington elasticities. The national balance of trade is determined by the relationship between national savings and investment, with investment allocated for present purposes in response to rates of return (Anderson and Strutt 2013).

The GTAP Version 8.1 database divides each of the 134 economies into 57 sectors: 26 for primary goods, 16 for manufactures and 15 for services. In the present study we

[4] On the prospective decline in per capita demand for rice as Asian incomes rise, see Timmer, Block and Dawe (2010). The modifications we make are based on econometric cross-country estimates of the relationship between per capita incomes and the income elasticities of demand in the full GTAP database for 2007 for its more-than-100 countries. We use that estimated relationship and our assumed per capita income growth rates to generate elasticities that lead to slower growth in demand for food staples in growing economies over the period modelled than if we had used the standard GTAP income elasticities. For example, in the case of Indonesia, the income elasticities for food crops of 0.53 in the standard GTAP database are estimated to reduce by about 45% in our 2030 projections.

initially aggregate the database to 35 countries/country groups and to 34 sectors. To conserve space and highlight key issues, we then further aggregate to 8 regions and just 4 sectors for reporting many results.

## CORE PROJECTION OF THE DATABASE TO 2020 AND 2030

The GTAP database's 2007 baseline for the world economy is projected to provide a baseline for 2020 and 2030 that assumes the 2007 trade-related policies of each country do not change.[5] However, over that 23-year period we assume that national real GDP, population, unskilled and skilled labour, capital, agricultural land, and extractable mineral resources (oil, gas, coal and other minerals) grow at exogenously set rates. The exogenous growth rates for GDP, population, skilled and unskilled labour draw on estimates from the World Bank and CEPII, making use of baseline data sets and aggregation tools from Chappuis and Walmsley (2011). Given that our comparative static model does not include endogenous changes in the capital stock, we also draw on exogenous projections of changes in the capital stock from CEPII's macroeconometric model results (Fouré et al. 2012). Historical trends in agricultural land are estimated from FAOSTAT (summarized in Deininger and Byerlee 2011) and trends in mineral and energy raw material reserves are estimated from BP (2012) and the US Geological Survey (2012 and earlier editions). We generally assume that annual rates of change in fossil fuel reserves over the past two decades continue for each country for the next two decades.[6] For other minerals, in the absence of country-specific data, the unweighed average of the annual rate of growth of global reserves for iron ore, copper, lead, nickel and zinc between 1995 and 2009 for all countries is used (from the US Geological Survey). The assumed growth rates are summarized in Appendix Table A, with the last five columns showing rates of change in natural resources.

Given these exogenous growth rates, the model is able to derive implied rates of growth in total factor productivity and GDP per capita. For any one country the rate of total factor productivity growth is assumed to be the same in each of its manufacturing sectors, somewhat higher in most primary sectors and somewhat lower in services. Higher

[5] The baseline projection to 2030 follows the core baseline developed by Anderson and Strutt (2013).
[6] Past reserves data are from BP (2012). For coal, production data are used as a proxy, since projections of reserves are not available. Data for Vietnam's coal, oil and gas were available for only a decade of what was exceptionally high growth which would have led to implausibly high projections, so they were modified downward. Indonesia's coal reserves are assumed to grow at 3% per year during 2007-20 and then zero thereafter (since as of 2011 it had only 17 years of production in reserves, compared with twice that in China and six times that in both India and the rest of the world – see BP 2012).

productivity growth rates for primary activities were characteristic of the latter half of the 20th century (Martin and Mitra 2001), and are necessary in this projection if the average of real international prices of primary products (relative to the aggregate change for all products) is to remain roughly unchanged.[7]

The assumed rate of China's GDP growth may appear rather high at an average of 8.25% per year from 2007 to 2020. However, it needs to be remembered that China's GDP grew at 9.3% between 2007 and 2012, so our assumption implies a real growth rate for the remainder of this decade of 7.6%. This is to the same as the 7.6% average growth rate for China projected by the World Bank between 2013 and 2016 (World Bank 2014) and marginally above the average annual rate of 7.56% we assume for the subsequent decade to 2030 (leading to the overall average for 2007 to 2030 of 7.95%, as shown in Appendix Table A).

**Impacts on Indonesia's sectoral and trade compositions**

The differences across economies in rates of growth of factor endowments and sectoral factor productivities, and the fact that sectors differ in their relative factor intensities and their shares of GDP, ensure that the structures of production, consumption and trade across sectors within countries, and also between countries, are going to be very different in 2030 than in 2007 as incomes and comparative advantages change.

In particular, the faster-growing developing economies (especially those of Asia) will account for considerably larger shares of the projected global economy over the next two decades. Given our macroeconomic assumptions outlined above, in the core scenario the developing country aggregate share of world GDP (measured in 2007 US$, not PPP dollars in which developing country shares are much larger) is projected to rise from 27% in 2007 to 36% in 2020 and 46% in 2030, and for Indonesia from 0.8% to 1.2% and 1.4% in those same

[7] We chose this calibration which is consistent with the World Bank projections over the next four decades (see Roson and van der Mensbrugghe 2012). An alternative in which agricultural prices fall, as projected in GTAP-based projection studies in the late 20th century (e.g., Anderson et al. 1997), is considered unlikely over the next two decades given the slowdown in agricultural R&D investment since 1990 and its consequent delayed slowing of farm productivity growth (Alston, Babcock and Pardey 2010) and the decline in the real price of manufactures as industrialization in China and other Asian countries booms – as occurred also with the original industrial revolution in the first half of the 19th century (Williamson 2012). It is even less likely for farm products to fall if fossil fuel prices and biofuel mandates in the US, EU and elsewhere are maintained over the next decade. Timilsina et al. (2010) project that by 2020 international prices will be higher in the presence vs the absence of those biofuel mandates for sugar (10%), corn (4%), oilseeds (3%), and wheat and coarse grains (2.2%), while petroleum product prices will be 1.4% lower. For alternative Asian growth assumptions that lead to different price projections, see Anderson and Strutt (2013).

years. By 2030 China is projected to return to its supremacy as the world's top producing country not only of primary products but also of manufactures. This is a ranking China has not held since the mid-19th century when first the UK and then (from 1895) the US became the top-ranked country for industrial production (Allen 2011; Bairoch 1982; Crafts and Venables 2003). It is projected to become much more dominant in many other respects too, including imports of primary products (Figure 2).

Specifically, the Asian developing country share of global exports of all products nearly doubles, rising from 22% to 40% between 2007 and 2030. China's share alone grows from 8% to 21%. The growth of China's export share is entirely at the expense of high-income countries though, as the export shares for the other developing-country regions also grow. In particular, Indonesia's share of global exports rises from 0.9% in 2007 to a projected 1.6% by 2030. The developing country share of primary products in world exports rises slightly, while its share of manufactures in world exports rises dramatically over the projection period, almost doubling (Table 3). Asia's import shares also rise, although not quite so dramatically: the increase for Developing Asia is from 19% to 32% for all products, but the rise is much sharper for China's primary product imports which increase their share of total world imports from 1.3% to 6.5%.

The consequences of continuing Asian industrialization are also evident in the sectoral shares of national trade in our projections: primary products become less important in the aggregate of developing country exports and considerably more important in their imports, and conversely for non-primary products, with the changes being largest in Developing Asia (Tables 3 and 4).[8] In Indonesia, however, the share of farm products in its exports rises, from 12% to 19%. This implies an increase in Indonesia's comparative advantage in farm products at the expense of mineral and energy products (Figure 3). This development is partly because Indonesia's coal reserves are assumed not to grow after 2020 (see footnote 7 above), but it also reflects the fact that China and also India become bigger importers of farm products by 2030 (Table 4). China's growing demand for palm oil imports is a dominant part of this development.

[8] It may seem surprising that high-income countries' comparative advantage in primary products strengthens, but recall that (a) what one part of the world imports the remaining part of the world must export to maintain global equilibrium, (b) the high-income country grouping includes Australia, Canada and New Zealand (and the US in terms of food exports) and (c) we have not allowed for possible agricultural protection growth in emerging Asia in this core scenario.

**Impacts on self-sufficiency and real consumption of farm products**

These changes mean that agricultural self-sufficiency in developing countries as a group is projected in this core scenario to fall, from 100% to 96% between 2007 and 2030. The source of that change is mainly China and to a smaller extent India. Indonesia's agricultural self-sufficiency rises, from 104% to 121%, while that of other ASEAN and of other developing Asian countries falls slightly on average (Table 5).[9] For Indonesia, rice is likely to be the key self-sufficiency concern and we find that rice self-sufficiency increases from 96% to 100% in our 2030 projection.

Self-sufficiency is a poor indicator of food security, however. A more meaningful indicator is real per capita consumption of agricultural and processed food products by households (Tiwari, Skoufias and Sherpa 2013). Between 2007 and 2030, real per capita agricultural and food consumption is projected to increase by 78% for developing countries as a group and by 86% for Indonesia, and to more than double for China and South Asia (Figure 4). These are major improvements in consumption of farm products per capita. Even if income distribution were to worsen in emerging economies over the next two decades, people in virtually all developing country regions could expect to be much better fed by 2030, according to this baseline scenario.

Turning to global consumption shares, the rise in grain consumption is especially great in China because of the expanding demand for livestock products, most of which continue to be produced domestically in this core scenario and to be fed intensively rather than grazed. So even though China's share of the world's direct grain consumption by households grows little, its share of total grain consumed grows from 12% to 32% of the global total. That promises to provide on-going growth in the market for grain and oilseed exports to China. China's share of global consumption of fossil fuels is projected to rise by a similar proportion over this period (from 10% to 25%) and likewise for imports of other non-agricultural primary products (from 10% to 35% – see Figure 2).

[9] It is possible that these populous countries will seek to prevent such a growth in food import dependence in practice, by erecting protectionist barriers at least for food staples, but that is not modelled here. See, however, Anderson and Nelgen (2011).

### Impacts on bilateral trade

In our core scenario it is the phenomenal growth in China's shares of global imports of primary products and exports of manufactures that dominate the bilateral trade picture. The share of Indonesia's exports going to China nearly trebles between 2007 and 2030, rising from 9% to 25%, while the share of its imports that come from China doubles (rising from 13% to 27%, see Figure 5). The same tendency is evident in the projected trade direction of many other natural resource-rich countries, some of which are well ahead of Indonesia in their intensity of trade with China. In 2007 one-sixth of Australia's exports went to China, for example, and by 2030 that Australian share is projected to 44%. These projected bilateral trade outcomes will depend to some extent though on the evolving intensities of Chinese investment in natural resource sectors over the next two decades in various parts of the world, including resource-rich South America and Sub-Saharan Africa in addition to ASEAN and Australia.

## EFFECTS OF POLICY CHANGES

The above projections assume no policy changes from 2007 to 2030. How would the core projection change if we include some of the policy changes that have already taken place? This section examines the possible effects by 2020 of three policy shocks announced since 2007. One that is external to, but of considerable interest to Indonesia's rice policymakers, is the decision by Myanmar to begin opening up its economy, since that will involve its re-entry into the international rice market. The others are Indonesia's recently-imposed export restrictions on unprocessed primary products and the implementation of the new Food Law that was promulgated in November 2012.

### Increased supply in the international rice market

Both Thailand (as the world's main rice exporter) and Indonesia (as prospectively a major rice importer) have a keen interest in what impact Myanmar's gradual opening up will have on international rice markets. In the interwar period, Burma (as Myanmar was then known) was the world's largest rice exporter, supplying about one-third of global exports (Wickizer and Bennett 1941); and its share was almost as high in the 1950s and early 1960s (Barker and Herdt 1985).

Modelling an emergence of Myanmar as a rice exporter is problematic with a model such as GTAP for several reasons. First, data are not available to model Myanmar as a separate country, so in the GTAP database it is included in a residual group with Brunei and Timor Leste. Secondly, since the model is based on proportional changes, it does not lend itself to capturing the effect of a country moving from zero to positive trade. Therefore, as a proxy, we generate these greater rice exports by assuming the supply expansion occurs in Vietnam, which has been the major source of Indonesia's rice imports in recent years and is likely to have a similar impact on Indonesia as would a comparable expansion of rice exports from Myanmar.

To examine the prospect of increased global rice supply with Myanmar re-emerging as a major rice exporter, we model an expansion in rice production and exports between 2007 and 2020 to the extent that the rice self-sufficiency of ASEAN countries other than Indonesia is 131% in 2020, instead of 124% as in the core 2020 projection for that year. Despite this major increase in rice exports in Southeast Asia, our results suggest the impact on Indonesia is relatively minor: rice self-sufficiency falls by just over one percentage point, the drop in the international rice price is only two-thirds of a percentage point, and real food consumption in Indonesia by 2020 is only marginally higher.

**Indonesia's taxes on exports of unprocessed primary products**

In 2012 Indonesia introduced restrictions on exports of a wide range of unprocessed primary products, the aim being to encourage domestic processing of raw materials. The decrees went even further by foreshadowing a ban on unprocessed primary product exports from 2014 (Burke and Resosudarmo 2012).

There remains considerable uncertainty as to whether/when/how some of these measures might be implemented, but to examine their possible effects we ran an alternative scenario to 2020 in which we impose a 20% tax on raw oilseed and on the export of all unprocessed outputs of the non-agricultural mining/extractive sectors (except coal). Given the relatively small proportion of world exports contributed by Indonesia in our 2020 projections, these export taxes lead to only small increases in the international prices of these commodities. For oilseeds and oil, where Indonesia supplies less than 0.2% of world exports, international prices increase by less than 0.1%. They increase by 0.4% for forestry and fish products, where Indonesia supplies 1.7% of the world market. Even in the cases of other

minerals and gas, where Indonesia supplies between 3.7% and 5.4% of the world market, international export prices increases are less than 1%.

Not surprisingly, those price-distorting policies shrink the value of Indonesia's overall exports, which fall by an estimated 0.6% (a 1.3% reduction in the volume of exports). While agriculture and food exports only reduce by 0.7%, the impact of the export taxes on oil, gas and other minerals leads to other primary product exports being more than 17% lower than otherwise. Indonesian exports to China of other primary products reduce by 28% with the export taxes, driving an overall reduction in exports to China of 4% relative to the 2020 core baseline. This leads to China becoming 0.6% less important to Indonesia as an overall export destination, but 2.6% less important for non-agricultural primary exports (see Table 6). These policies also lower real GDP (by 0.1%). Yet they have almost no impact on agricultural self-sufficiency (see Table 7).[10]

**Implementation of Indonesia's Food Law of November 2012**

The new Food Law that was rushed through the parliament in late 2012 explicitly aims to boost food self-sufficiency in Indonesia, including though quotas and bans on imports, restrictions on exports of unprocessed farm products, and greater state involvement in food and feed procurement, distribution and processing. Numerous products are to be targeted, but the full product coverage – and the exact nature and extent of the interventions to be imposed – are yet to be made clear.

To get a sense of what impacts the implementation of just one component of such a food self-sufficiency policy may have, we model the consequences of simply restricting imports of a selection of farm products, via tariffs, such that the self-sufficiency ratio for each of them rises to 99%.[11] The targeted products are rice, coarse grains, oilseeds, vegetable oils, sugar, red meats and dairy products. Such a policy requires huge increases in tariffs on the targeted products to achieve near-self-sufficiency, as reported in Table 8. Some of those tariffs would be above the rates bound under international law at the World Trade Organization, and so would upset trading partners and possibly trigger retaliation against Indonesian exports. They would also divert mobile resources away from palm oil and other farm products in which Indonesia has a comparative advantage. The real exchange rate

[10] We note that impacts would be much more severe if exports from the large vegetable oils and fats sector are also taxed.

[11] The baseline to which this scenario is compared is the updated 2020 database that includes impacts of Indonesia imposing export taxes on selected primary products.

appreciation that such a rise in protectionism triggers means that, instead of Indonesia's share of global farm exports rising from 1.7% to 2.8% of global trade between 2007 and 2020, it only rises to 2%. Such protectionism reduces real GDP more than the previous export-tax scenario (by 0.5% instead of 0.1%) and it lowers consumption of farm products and per capita household welfare.

## SOME QUALIFICATIONS

As with the results from all economy-wide projections modelling, it is necessary to keep in mind numerous qualifications. While results such as those discussed above can provide useful insights into the changing nature of the global economy, they are not forecasts: assumptions inevitably must be made that will not fully capture all aspects of the changing global economy over the time-frame modelled and in this section we highlight some qualifications of the current modelling.

First, we have just 34 sectors/product groups. This leads to gross underestimation of the extent to which firms can take advantage of intra-industry trade through exploiting the increasing opportunities to lower costs through fragmenting the production process into ever-more pieces whose location is footloose (Feenstra 1998). Our underestimate is made even larger by not accommodating endogenous foreign direct investment flows, since they tend to reinforce trade flows in manufactures within Asia (Petri 2012). That linkage between investment and trade in manufactures has become more important in recent years as global value chains strengthen in ways that allow the innovating firms to retain ownership and control of their intellectual capital (Baldwin and Lopez-Gonzales 2013, Cattaneo et al. 2013).

Second, we have assumed constant returns to scale and perfect competition rather than allowing firms to enjoy increasing returns and some degree of monopoly power for their differentiated products. This too leads to underestimates of the changes associated with production and trade growth, particularly in manufactured goods and services (Krugman 2009).

Third, where consumers (including firms importing intermediate inputs) value a greater variety of goods, or a greater range of qualities, intra-industry trade can grow as a result of both economic growth and trade policy reform (Rutherford and Tarr 2002), but that too is not taken into account in the above analysis.

Fourth, our model has not included the new biofuel policies that have been put in place in many countries but have begun to bite severely since our 2007 base year. The new

biofuel mandates and subsidies have had a non-trivial effect of increasing both the mean and the variance of international food prices, and are expected to become even more important over the next decade as the mandates in the United States and EU in particular increase to 2020-21 (see Hertel and Beckman 2011, Hertel and Diffenbaugh 2011, and the references therein). Whether these policies will still be in place in 2030 or even 2020 is a moot point. If the expected dramatic expansion in unconventional gas production materializes (see IEA 2012), and if the resulting fall in fossil fuel prices was enough to cause governments to abandon biofuel mandates, this omission from our modelling may be inconsequential.

Fifth, the effects of climate changes are not included in our projections. It is conceivable that they will affect agriculture in tropical countries more than those in temperate zones (Hertel and Lobell 2012). But they will also affect other sectors (Rosen and van der Mensbrugghe 2012), and the net effects at this stage are too uncertain to include in this analysis.

Sixth, our projection results depend on the underlying macroeconomic assumptions made, including those of relatively rapid growth in the large population bases of China and India. If these economies experienced a significant slowdown, this could have a substantial impact on the outcome.[12] To test the sensitivity of results to growth assumptions made for these economies, Anderson and Strutt (2013) project a 2030 baseline with 25% slower growth in GDP, capital and skilled labour for China and India, along with a global slowdown in primary total factor productivity growth due to the lower consequent prices for primary products. As expected, this slows the expansion of the importance of developing Asia in global exports: its share rises from 22% in 2007 not to 40% (as in the core scenario for 2030) but just to 34%. The share of Indonesia's total exports going to China is projected to rise from 9% in 2007 to 17% instead of 25% as in our core 2030 scenario, reflecting a dampening of import growth by China, meaning Indonesia trades more with other developing countries. Indonesia's agricultural self-sufficiency of 121% in the 2030 core scenario falls to 110% in the slower China/India growth scenario and the increase in China's (and India's) shares of global grain, fuel and mineral consumption is moderated.

[12] Such a slowdown is less likely than some observers fear. According to one of China's most prominent economists and former Senior Vice-President of the World Bank, "China can maintain an 8 percent annual GDP growth rate for many years to come. … China's per capita GDP in 2008 was 21 percent of per capita GDP in the United States. That is roughly the same gap that existed between the United States and Japan in 1951, Singapore in 1967, Taiwan in 1975, and South Korea in 1977. … Japan's average annual growth rate soared to 9.2 percent over the subsequent 20 years, compared to 8.6 percent in Singapore, 8.3 percent in Taiwan, and 7.6 percent in South Korea." (Lin 2013).

Finally, the standard GTAP model used here is comparative static. It therefore does not measure the additional dynamic consequences of trade reform. Dynamic effects arise in numerous ways. One of the more important is through encouragement of the more-efficient firms to take over from the less efficient in each country (Melitz 2003; Melitz and Ottaviano 2008; Bernard et al. 2012; Helpman 2013). Another way is through multinational firms sharing technologies and knowledge across countries within the firm (Markusen 2002). Offshoring is yet another mechanism through which heterogeneous firms are affected by trade liberalization, including via re-locating from small to larger nations (Baldwin and Okuba 2011). It may also alter the political economy of protection, providing stronger opposition from new exporters and thus leading to more opening up of economies (Baldwin and Lopez-Gonzales 2013).

## POLICY IMPLICATIONS AND CONCLUSIONS

Should relatively rapid economic growth in Asia and to a lesser extent in other developing countries continue to characterize world economic development as suggested above, developing Asia's share of global GDP and trade will continue to rise steeply over the next two decades. By 2030, our results indicate that developing Asia is projected to consume around half of the world's grain and fossil fuels (or even more if carbon taxes are introduced in high-income countries but not emerging economies), and three-quarters of the world's other minerals. This is possible because their shares of the world's imports of primary products are projected to more than double between 2007 and 2030 in the core scenario – and paid for with their rapidly rising earnings from exports of manufactures.

These changes in the global economy have significant implications for Indonesia, which increases its share of global exports by four-fifths in the baseline projected period from 2007 to 2030. Indonesia is likely to experience a particularly large increase in the share it contributes to global agriculture and food exports. The actual growth in exports, however, will depend on the rates of growth in other economies, and especially in China and India, to whom Indonesia would be directing a much larger share of its exports than currently.

Our rice policy modelling results suggest that an expansion of global rice exports associated with the opening of Myanmar will lower Indonesia's rice self-sufficiency and the international price of rice only very slightly, while having a small positive impact on overall real output and consumption for Indonesia.

As for our stylized modelling of Indonesia's recently-imposed export restrictions on unprocessed primary products and the implementation of its new Food Law, the results suggest both will have negative overall impacts on the Indonesian economy. Restricting exports to encourage domestic value adding is precisely the opposite of what is needed to take advantage of the increasing fragmentation of production processes that is characterizing the current wave of globalization (Feenstra 1998; Baldwin and Lopez-Gonzales 2013). Although not modelled here, it is also likely to reduce inflows of foreign investment, particularly from China, which would dampen Indonesia's growth.

The new Food Law's attempt to boost food self-sufficiency is shown above to be not only costly but also ineffective as a way of pursuing food security, as it would lead to lower economic welfare and real consumption of farm products. It would also lead to disputes with trading partners insofar as the tariffs or quantitative import restrictions violate Indonesia's commitments at the WTO.

The Food Law also notes that expanding public investments in agricultural R&D and rural infrastructure, and improving the allocation and policing of land and water property rights, could be targeted as well. Those measures would have the advantages of boosting food self-sufficiency through making domestic food production more profitable, and of benefitting both net buyers and net sellers of food – in contrast to food import restrictions which benefit net sellers but at the expense of net buyers of food, producers in other sectors who compete with food producers for land and other mobile resources, and those processing industries using importable farm products as key inputs. Returns from further R&D investments are likely to be especially high because, as a percentage of agricultural GDP, Indonesia's level of investment in recent years has been less than half that of China and India and barely one-seventh that of Malaysia and Brazil (ASTI 2012).

Focusing on growth-enhancing measures such as R&D and infrastructure also would facilitate Indonesia's adjustment to other realities related to the decline in transactions costs of doing business across space and major changes in diets. There is a 'quiet revolution' taking place within many Asian countries that is rapidly altering the staple food supply chain (Reardon et al. 2012). These market forces are transforming farm production systems and food trade in Asia. In particular, farming is becoming more of a part-time activity for many households, so that their economic well-being depends increasingly on earnings from post-farmgate processing and service activities rather than on farm production itself. Those earnings are enhanced the more internationally competitive is the overall economy, whereas they would be diminished if instead the economy chose to be more protectionist. Should the

government still be worried that household income growth in rural areas is lagging that in urban areas, conditional cash transfers could be provided electronically as direct assistance to even remote and small farm households. Indonesia has had initial success in pioneering such social protection mechanisms (Alatas et al. 2013; Skoufias, Tiwari and Zaman 2010), which bodes well for the government to move further in that direction to achieve its food security goals without compromising its opportunities for trade-led economic growth.

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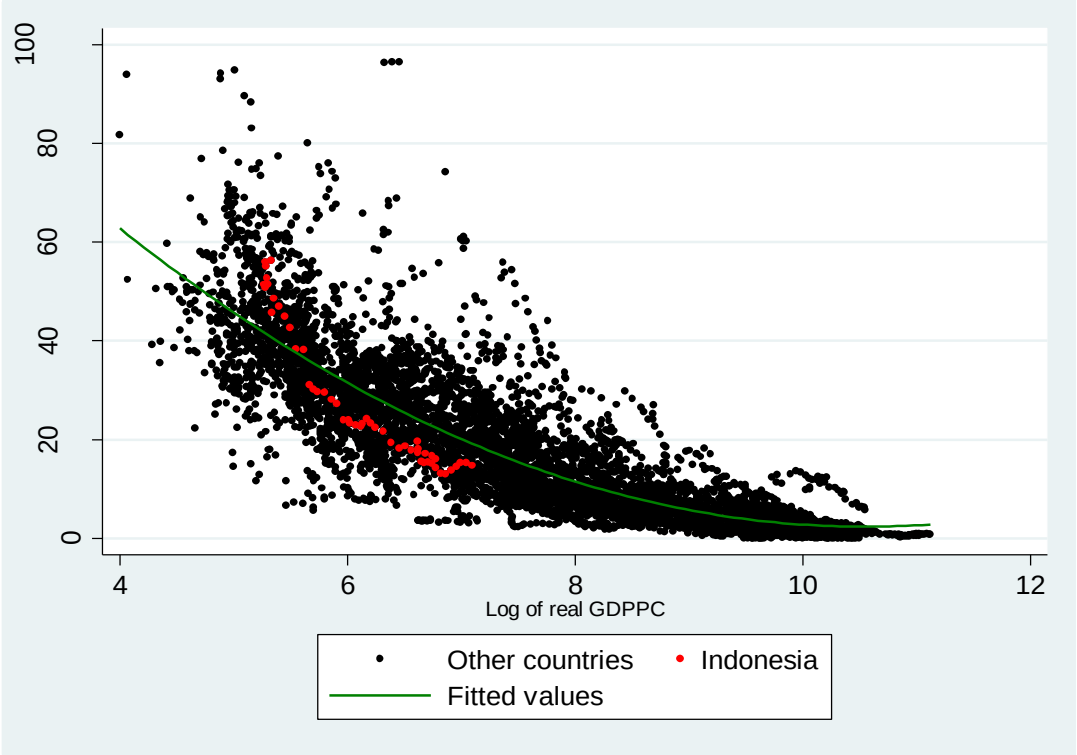
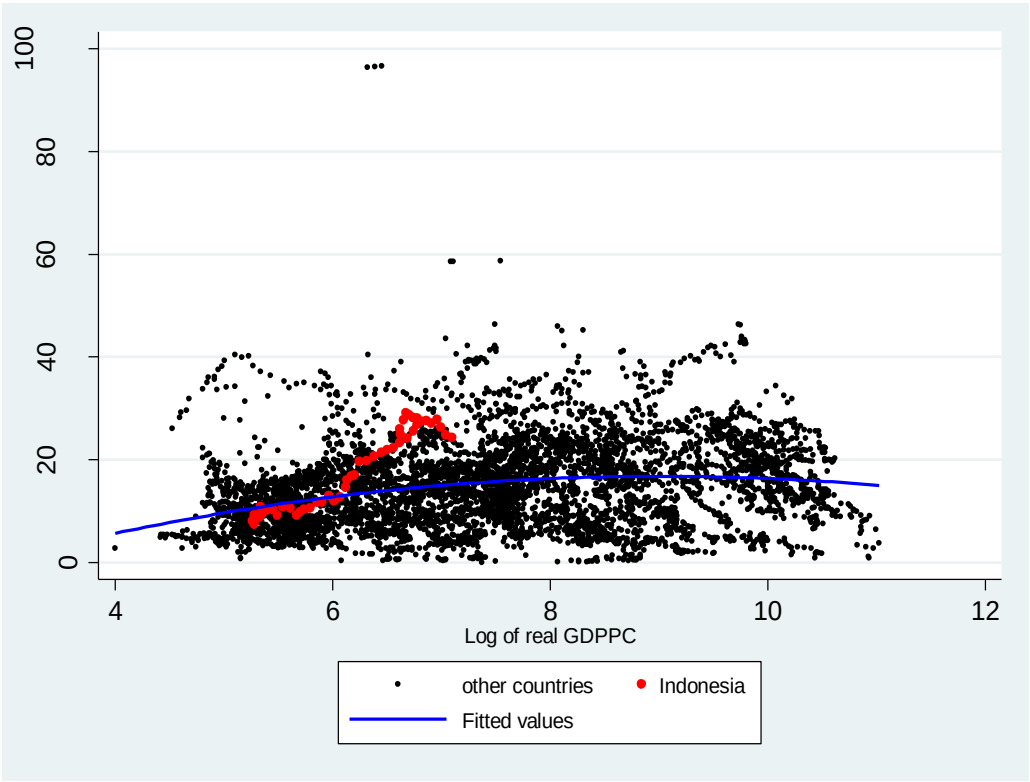
Figure 1: Relationships between sectoral share of GDP and log of real GDP per capita, Indonesia and all countries, 1960 to 2011

(a) agriculture

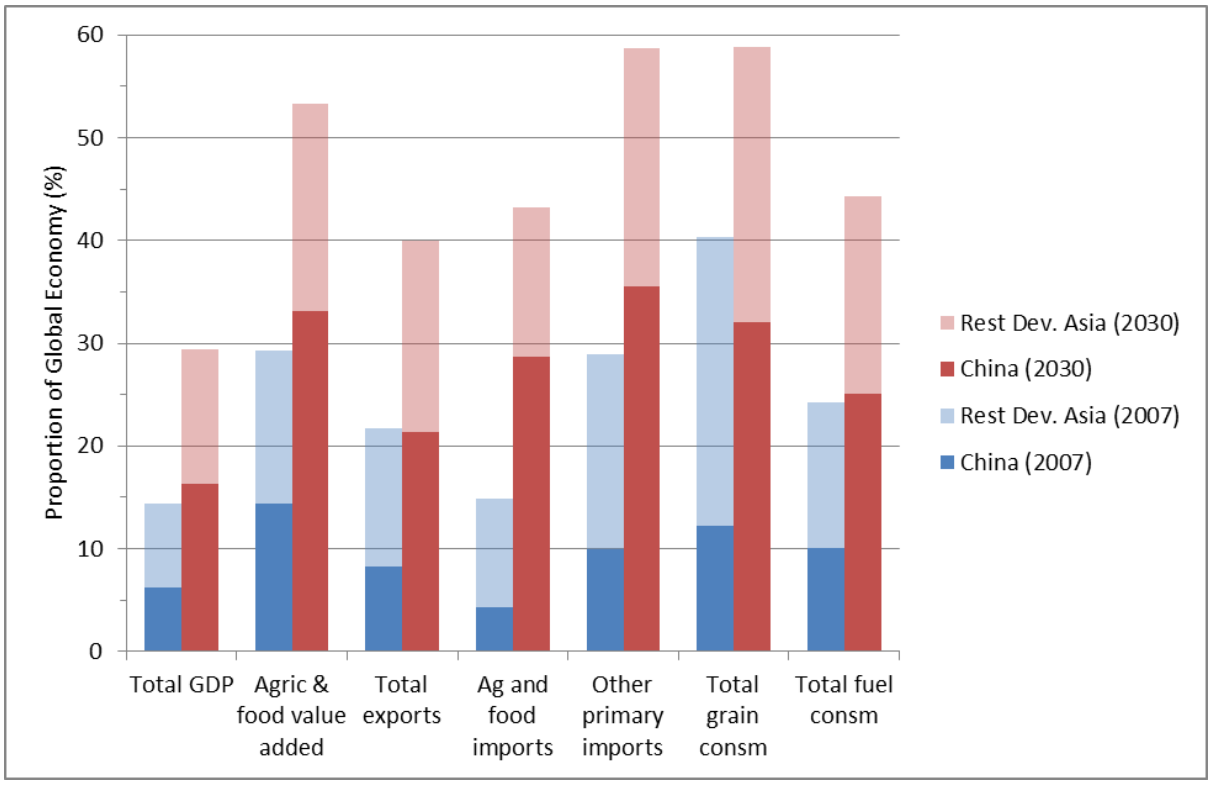



(b) manufacturing



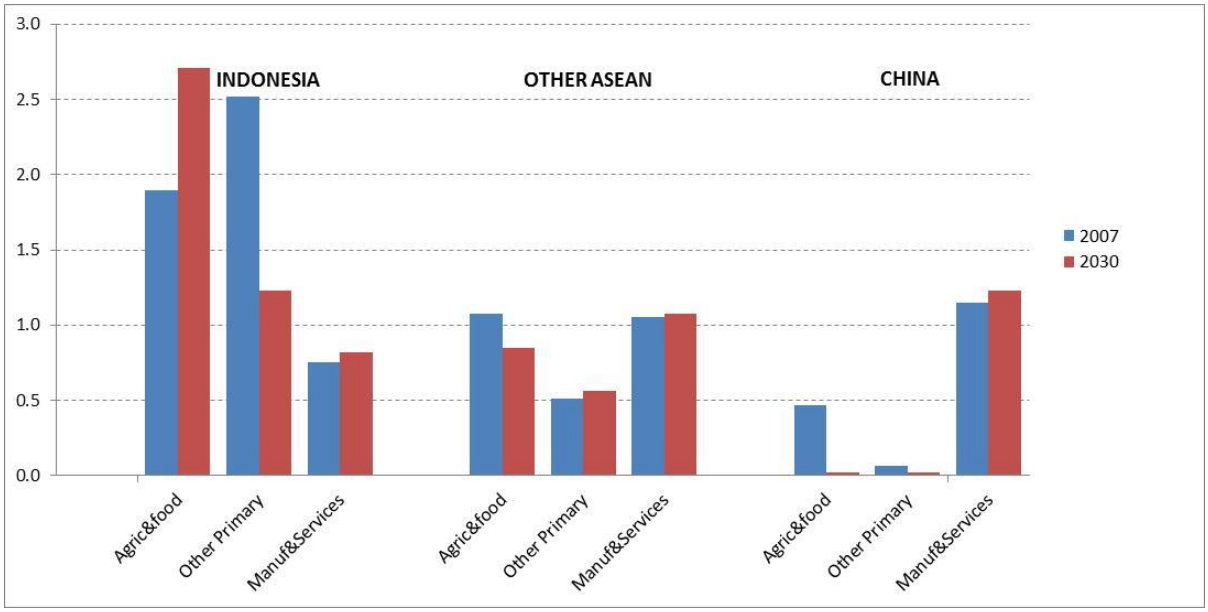

Source: Authors' compilation based on World Bank (2013a)

Figure 2: Shares of China and other Developing Asia in the global economy, 2007 and 2030 (%)




Source: Derived from the authors' GTAP Model results

Figure 3: 'Revealed' comparative advantage indexes, Indonesia, Other ASEAN and China, 2007 and 2030[a]

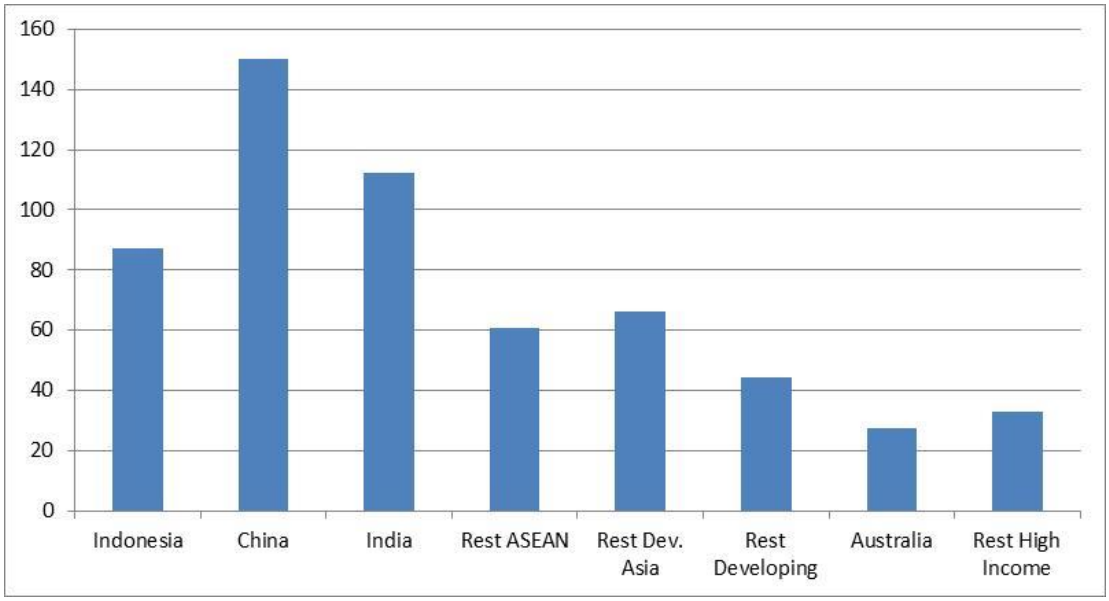



[a] The index of 'revealed' comparative advantage is the share of a product in an economy's exports divided by the share of that product in global exports, following Balassa (1965).

Source: Derived from the authors' GTAP Model results

Figure 4: Change in real per capita household consumption of food and agricultural products, 2007-2030

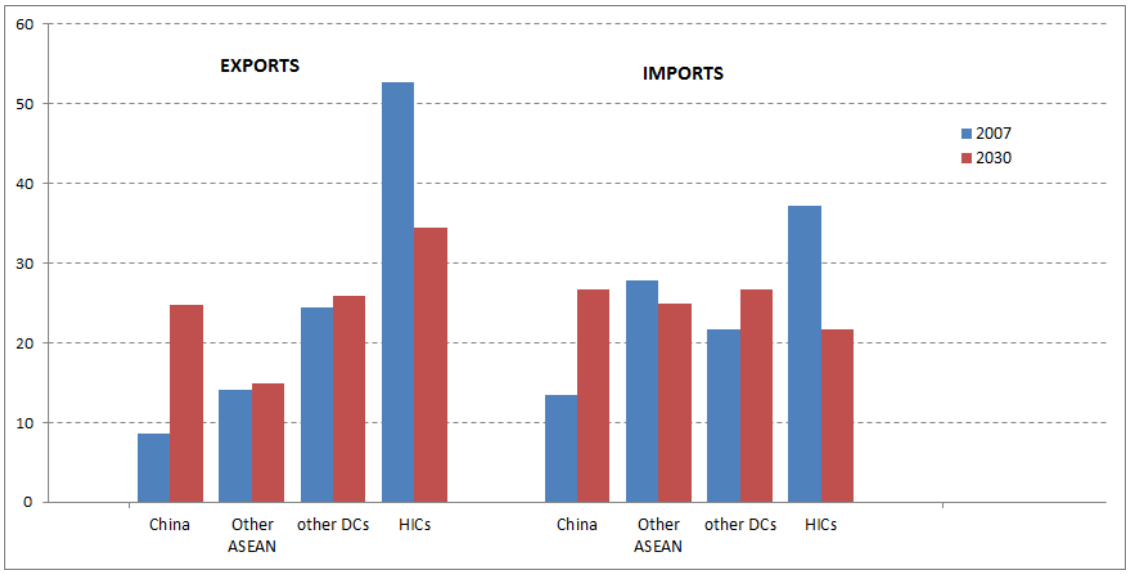
(% increase)




Source: Derived from the authors' GTAP Model results

Figure 5: Re-direction of Indonesia's external trade between 2007 and 2030

(% of all goods and services trade with different trading partners)




Source: Derived from the authors' GTAP Model results

Table 1: Relative natural resource endowments per worker,[a] 2007 and 2030

(world = 100)

a) 2007

| | Agricultural land | Fossil fuels (coal, oil, gas) | Other minerals | Forestry and fishing | All primary |
|---|---|---|---|---|---|
| Indonesia | 107 | 59 | 87 | 102 | 84 |
| China | 115 | 27 | 83 | 110 | 74 |
| India | 94 | 8 | 19 | 38 | 49 |
| Rest ASEAN | 89 | 48 | 28 | 158 | 72 |
| RDev Asia | 102 | 6 | 80 | 83 | 56 |
| Rdeveloping | 57 | 235 | 129 | 66 | 142 |
| Australia | 209 | 384 | 1836 | 244 | 347 |
| Other High Income | 130 | 157 | 144 | 158 | 144 |
| **World** | **100** | **100** | **100** | **100** | **100** |

b) 2030

| | Agricultural land | Fossil fuels (coal, oil, gas) | Other minerals | Forestry and fishing | All primary |
|---|---|---|---|---|---|
| Indonesia | 113 | 35 | 81 | 95 | 65 |
| China | 138 | 44 | 103 | 138 | 81 |
| India | 84 | 7 | 17 | 33 | 34 |
| Rest ASEAN | 89 | 58 | 27 | 148 | 71 |
| RDev Asia | 86 | 3 | 70 | 73 | 36 |
| Rdeveloping | 49 | 189 | 103 | 53 | 134 |
| Australia | 196 | 569 | 1894 | 252 | 488 |
| Other High Income | 162 | 183 | 184 | 202 | 176 |
| **World** | **100** | **100** | **100** | **100** | **100** |

[a] Based on real value of sector-specific endowments of natural resources per active worker relative to the world average, 2007 US dollar domestic prices. The workforce is assumed to grow between 2007 and 2030 by only 2% in China compared with 36% in Indonesia, 35% in other ASEAN countries, 47% in India, 44% in other developing Asia, and 59% in other developing country regions. Projected rates of growth in natural resource endowments are shown in Appendix Table A.

Source: Calculated from the GTAP database and authors' core projection to 2030, drawing on CEPII data for economically active population (Fouré, Benassy-Quéré and Fontagné 2012).

Table 2: Indexes of trade specialization in primary products (PPs),[a] Indonesia and other countries, 2005-09

| | **Ag. & food (light proc.)** | **Fossil fuels (coal, oil, gas)** | **Other minerals (+ NF metals)** | **Forestry & fishing products** | **ALL PRIMARY** |
|---|---|---|---|---|---|
| ***Net PP importers:*** | | | | | |
| Japan | -0.97 | -1.00 | -0.43 | -0.83 | -0.85 |
| South Korea | -0.89 | -0.99 | -0.50 | -0.61 | -0.85 |
| Taiwan | -0.72 | -0.94 | -0.50 | -0.19 | -0.81 |
| China | -0.44 | -0.84 | -0.66 | -0.65 | -0.69 |
| India | 0.22 | -0.99 | -0.37 | -0.68 | -0.54 |
| Pakistan | -0.29 | -1.00 | -0.33 | 0.07 | -0.52 |
| Thailand | 0.42 | -0.87 | -0.46 | 0.08 | -0.42 |
| Philippines | -0.28 | -0.85 | 0.07 | 0.52 | -0.33 |
| ***Net PP exporters:*** | | | | | |
| Malaysia | 0.27 | 0.51 | -0.39 | 0.69 | 0.27 |
| Vietnam | 0.20 | 0.98 | -0.61 | -0.27 | 0.38 |
| **Indonesia** | **0.26** | **0.55** | **0.60** | **0.84** | **0.49** |
| Brazil | 0.84 | -0.18 | 0.70 | -0.16 | 0.54 |
| Australia | 0.75 | 0.58 | 0.80 | 0.72 | 0.71 |
| Russia | -0.57 | 0.98 | 0.69 | 0.82 | 0.76 |
| Argentina | 0.94 | 0.66 | 0.34 | 0.11 | 0.84 |

[a] The trade specialization index for commodity group j for each region is defined as the 5-year average of $(X_j-M_j)/(X_j+M_j)$, where X and M are gross values of exports and imports

Source: Authors' calculations from the GTAP Version 8.1 trade time-series database

Table 3: Regional sectoral shares of global exports, 2007 and 2030 (%)

(a) 2007 Base

| | Agric. & Food | Other Primary | Manufactures | Services | Total |
|---|---|---|---|---|---|
| Indonesia | 0.10 | 0.22 | 0.50 | 0.05 | 0.87 |
| China | 0.24 | 0.05 | 7.43 | 0.56 | 8.27 |
| India | 0.11 | 0.07 | 0.87 | 0.45 | 1.50 |
| Rest ASEAN | 0.32 | 0.25 | 3.51 | 0.81 | 4.89 |
| Rest Dev. Asia | 0.09 | 0.04 | 4.69 | 1.31 | 6.14 |
| Rest Developing | 1.27 | 6.11 | 5.56 | 1.80 | 14.75 |
| Australia | 0.14 | 0.34 | 0.42 | 0.23 | 1.13 |
| Rest High Income | 3.85 | 2.74 | 42.86 | 13.00 | 62.44 |
| **HICs** | **4.00** | **3.08** | **43.27** | **13.22** | **63.58** |
| **Developing** | **2.13** | **6.75** | **22.56** | **4.98** | **36.42** |
| of which Asia | 0.86 | 0.63 | 17.00 | 3.18 | 21.68 |
| **World** | **6.13** | **9.83** | **65.84** | **18.21** | **100.00** |

(b) 2030 core

| | Agric. & Food | Other Primary | Manufactures | Services | Total |
|---|---|---|---|---|---|
| Indonesia | 0.29 | 0.23 | 0.95 | 0.09 | 1.56 |
| China | 0.03 | 0.06 | 19.22 | 2.01 | 21.33 |
| India | 0.05 | 0.23 | 2.53 | 1.13 | 3.95 |
| Rest ASEAN | 0.36 | 0.41 | 4.54 | 0.79 | 6.11 |
| Rest Dev. Asia | 0.14 | 0.09 | 5.42 | 1.34 | 6.98 |
| Rest Developing | 1.77 | 6.71 | 6.29 | 2.09 | 16.86 |
| Australia | 0.14 | 0.59 | 0.19 | 0.15 | 1.06 |
| Rest High Income | 4.14 | 3.65 | 24.20 | 10.17 | 42.15 |
| **HICs** | **4.27** | **4.24** | **24.39** | **10.31** | **43.21** |
| **Developing** | **2.64** | **7.73** | **38.95** | **7.46** | **56.79** |
| of which Asia | 0.87 | 1.02 | 32.66 | 5.37 | 39.93 |
| **World** | **6.91** | **11.97** | **63.34** | **17.77** | **100.00** |

Source: Derived from the authors' GTAP Model results

Table 4: Sectoral shares of national imports, 2007 and 2030 (%)

(a) 2007 Base

| | Agric. & Food | Other Primary | Manufactures | Services | Total |
|---|---|---|---|---|---|
| Indonesia | 9.5 | 6.5 | 68.5 | 15.5 | 100.0 |
| China | 4.3 | 15.6 | 69.9 | 10.2 | 100.0 |
| India | 3.0 | 30.6 | 49.0 | 17.4 | 100.0 |
| Rest ASEAN | 5.3 | 10.5 | 67.6 | 16.6 | 100.0 |
| Rest Dev. Asia | 5.8 | 15.5 | 62.2 | 16.5 | 100.0 |
| Rest Developing | 8.8 | 4.8 | 68.6 | 17.8 | 100.0 |
| Australia | 4.6 | 4.7 | 72.6 | 18.1 | 100.0 |
| Rest High Income | 6.3 | 9.8 | 65.5 | 18.4 | 100.0 |
| **HICs** | **6.3** | **9.7** | **65.6** | **18.4** | **100.0** |
| **Developing** | **6.5** | **11.4** | **66.4** | **15.7** | **100.0** |
| of which Asia | 5.0 | 15.6 | 64.9 | 14.4 | 100.0 |
| **World** | **6.4** | **10.2** | **65.9** | **17.6** | **100.0** |

(b) 2030 core

| | Agric. & Food | Other Primary | Manufactures | Services | Total |
|---|---|---|---|---|---|
| Indonesia | 9.2 | 12.0 | 63.7 | 15.2 | 100.0 |
| China | 13.7 | 30.0 | 49.6 | 6.7 | 100.0 |
| India | 6.1 | 36.9 | 41.3 | 15.7 | 100.0 |
| Rest ASEAN | 5.5 | 9.9 | 68.2 | 16.4 | 100.0 |
| Rest Dev. Asia | 6.2 | 13.6 | 62.8 | 17.4 | 100.0 |
| Rest Developing | 7.6 | 4.7 | 68.8 | 18.9 | 100.0 |
| Australia | 4.6 | 4.1 | 71.6 | 19.8 | 100.0 |
| Rest High Income | 5.5 | 8.5 | 66.6 | 19.4 | 100.0 |
| **HICs** | **5.5** | **8.4** | **66.7** | **19.4** | **100.0** |
| **Developing** | **9.0** | **17.3** | **59.5** | **14.2** | **100.0** |
| of which Asia | 9.7 | 23.2 | 55.2 | 12.0 | 100.0 |
| **World** | **7.1** | **12.6** | **63.3** | **16.9** | **100.0** |

Source: Derived from the authors' GTAP Model results

Table 5: Agricultural self-sufficiency ratio,[a] 2007, 2020 and 2030 (%)

| | 2007 | 2020 core | 2030 core |
|---|---|---|---|
| Indonesia | 104 | 110 | 121 |
| China | 97 | 92 | 87 |
| India | 102 | 98 | 96 |
| Rest ASEAN | 106 | 104 | 104 |
| Rest Dev. Asia | 89 | 87 | 88 |
| Rest Developing | 103 | 105 | 109 |
| Australia | 124 | 127 | 129 |
| Rest High Income | 99 | 103 | 110 |
| **HICs** | **100** | **104** | **111** |
| **Developing** | **100** | **98** | **96** |
| of which Asia | 98 | 94 | 91 |
| **World** | **100** | **100** | **100** |

[a] Agricultural self-sufficiency ratio excludes the highly processed other food sector

Source: Derived from the authors' GTAP Model results

Table 6: Share of Indonesia's exports going to China, 2007, 2020 core and alternative scenarios (%)

| | Agric. and food | Other primary | All products |
|---|---|---|---|
| **2007 baseline** | 10.9 | 10.0 | 8.7 |
| **2020 core baseline** | 31.8 | 19.8 | 16.0 |
| **Myanmar rice expansion** | 31.8 | 19.8 | 16.0 |
| **Indonesia export taxes** | 31.8 | 17.2 | 15.4 |
| **Indonesia Food Law (to achieve 99% self-sufficiency)** | 29.1 | 17.3 | 14.5 |

Source: Derived from the authors' GTAP Model results

Table 7: Indonesia's self-sufficiency in farm products, 2007, 2020 core, and 2020 after policy changes

| | 2007 baseline | 2020 core baseline | Myanmar rice expansion | Indonesia export taxes | Indonesia Food Law (to achieve 99% self-sufficiency) |
|---|---|---|---|---|---|
| **Rice** | 0.96 | 0.97 | 0.96 | 0.97 | 1.00 |
| **Coarse grains** | 0.97 | 0.98 | 0.98 | 0.98 | 1.00 |
| **Fruit & Veg** | 0.98 | 1.05 | 1.05 | 1.05 | 1.02 |
| **Oilseeds** | 0.94 | 0.92 | 0.92 | 0.92 | 1.00 |
| **Veg oils** | 1.95 | 2.53 | 2.53 | 2.52 | 2.13 |
| **Cattle & sheep** | 0.94 | 0.94 | 0.94 | 0.94 | 1.00 |
| **Sugar** | 0.64 | 0.65 | 0.65 | 0.65 | 1.00 |
| **Beef & mutton** | 0.92 | 0.91 | 0.92 | 0.91 | 1.00 |
| **Poultry meats** | 0.97 | 1.00 | 1.00 | 1.00 | 0.99 |
| **Dairy products** | 0.71 | 0.72 | 0.72 | 0.71 | 1.00 |
| **Highly processed food** | 1.06 | 1.05 | 1.05 | 1.05 | 1.03 |

Source: Derived from the authors' GTAP Model results

Table 8: Indonesian food and agricultural import shares and tariff rates, without and with the target of 99% self-sufficiency for products marked *, 2020 (%)

| | 2020[a] share of agric and food imports | 2020 tariff without new Indonesian Food Law | 2020 tariff with new Indonesian Food Law |
|---|---|---|---|
| ***Rice, processed** | 4 | 9 | 191 |
| **Wheat** | 12 | 2 | 2 |
| ***Coarse grains** | 1 | 3 | 607 |
| **Fruit & veg** | 4 | 4 | 4 |
| ***Oilseeds** | 12 | 5 | 187 |
| ***Vegetable oils** | 8 | 0 | 114 |
| ***Sugar** | 10 | 20 | 415 |
| **Cotton** | 13 | 0 | 0 |
| **Other crops** | 5 | 4 | 4 |
| ***Cattle & sheep** | 3 | 3 | 488 |
| ***Beef & mutton** | 2 | 5 | 124 |
| **Other meats** | 1 | 2 | 2 |
| ***Dairy products** | 9 | 4 | 126 |
| **Other processed foods** | 16 | 10 | 10 |
| **TOTAL** | **100** | | |

Note: [a] 2020 database including Indonesian agricultural export taxes.

Source: Derived from the authors' GTAP Model results

**Appendix Table A: Exogenous projected average annual GDP and endowment growth rates, 2007 to 2030** (% per year)

| | GDP growth | Population growth | Unskilled labour | Skilled labour | Capital | Oil reserves | Gas reserves | Coal reserves | Other mineral reserves | Agric land |
|---|---|---|---|---|---|---|---|---|---|---|
| Indonesia | 5.75 | 0.83 | 0.87 | 3.73 | 3.88 | -1.08 | 0.56 | 1.68 | 2.07 | 0.36 |
| China | 7.95 | 0.42 | -0.06 | 2.75 | 7.32 | -0.40 | 4.85 | 5.62 | 2.07 | -0.36 |
| India | 7.24 | 1.06 | 1.28 | 3.92 | 5.56 | 0.24 | 0.00 | 4.93 | 2.07 | -0.04 |
| Rest ASEAN | 4.27 | 1.01 | 0.11 | 3.40 | 4.42 | 3.28 | 2.43 | 7.27 | 2.07 | 0.10 |
| Rest Dev Asia | 3.87 | 1.23 | -0.03 | 2.51 | 4.07 | 0.40 | -0.84 | -0.51 | 2.07 | -0.40 |
| Rest Developing | 3.90 | 1.51 | 0.85 | 3.49 | 3.44 | 2.19 | 3.16 | 3.09 | 2.07 | 0.14 |
| Australia | 2.35 | 1.11 | 0.29 | 1.91 | 2.28 | 1.54 | 6.52 | 3.56 | 2.07 | -0.59 |
| Rest High-income | 1.63 | 0.26 | -0.56 | 1.40 | 1.32 | 2.55 | 0.19 | -0.89 | 2.07 | -0.29 |
| **HICs** | **1.64** | **0.27** | **-0.53** | **1.41** | **1.34** | **2.53** | **0.74** | **0.17** | **2.07** | **-0.29** |
| **Developing** | **5.56** | **1.08** | **0.48** | **3.21** | **4.96** | **2.02** | **2.87** | **4.95** | **2.07** | **-0.13** |
| of which Asia | 6.63 | 0.84 | 0.25 | 2.99 | 6.00 | 0.68 | 1.62 | 5.16 | 2.07 | -0.20 |
| **World** | **3.04** | **0.93** | **-0.18** | **1.85** | **2.87** | **2.18** | **1.99** | **3.30** | **2.07** | **-0.18** |

Source: Authors' assumptions (see text for details)

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