Australian National University

Working Papers in
Trade and Development

From taxing to subsidizing farmers in China Post-1978

Kym Anderson

November 2017
Working Paper No. 2017/13

Arndt-Corden Department of Economics
Crawford School of Public Policy
ANU College of Asia and the Pacific

From Taxing to Subsidizing Farmers in China Post-1978

Kym Anderson

University of Adelaide, Australian National University, and CEPR
kym.anderson@adelaide.edu.au

November 2017

Author contact:
Kym Anderson
School of Economics
University of Adelaide
Adelaide SA 5005 Australia
Phone +61 8 8303 4712
kym.anderson@adelaide.edu.au

Thanks to Signe Nelgen for assistance with the price distortions data and to two referees for helpful comments. Forthcoming in a Special Issue of *China Agricultural Economic Review*, Vol. 10, 2018, celebrating the 40th anniversary of rural reforms and the opening of China's economy.

Abstract

This paper has three purposes: to document the pace and extent to which China's policy regime has transitioned over the past four decades from taxing to subsidizing its farmers relative to its producers of other tradable goods; to present projections of the world economy to 2030 that suggest China will continue to become more food import-dependent under current policies and productivity growth rates; and to explore alternative policy instruments for remaining food secure and ensuring that farmers are not losers from economic growth. The data used to estimate the extent of distortions to producer incentives come from freely available World Bank and OECD sources that allow direct comparisons of China's policy developments with those of more- and less-advanced economies. The estimates reveal that China has made the transition from negative to positive assistance to farmers far faster than the average developing country, and almost as fast as its Northeast Asian neighbours did in earlier decades at similar levels of real per capita incomes. That has helped to ensure China remained food self-sufficient during the first two decades of reform. However, food self-sufficiency is now declining and is projected to continue to do so over the next decade under current policies. Preventing food self-sufficiency from declining further by increasing agricultural protection is now unnecessary thanks to the information and communication technology revolution that enables the government to use conditional cash transfers to directly support the adjustment and well-being of poor farm households.

Keywords: Agricultural support policies; China's economic growth; Food security; Multiple exchange rates

JEL codes: F13, F14, Q17, Q18

Paper type – General review paper

From Taxing to Subsidizing Farmers in China Post-1978

When China began its economic reform program at the end of 1978, agriculture was among the highest priorities. A striking feature of the reform period is that China managed to stay within one percentage point of being 100% self-sufficient in food and agricultural products in each of the decades of the 1980s and 1990s, just as in the 1960s and 1970s – despite massive industrialization that caused the shares of agriculture in China's economy to plummet during 1980-2015, from above 40% to below 10% for GDP and exports, and from more than 70% to less than 30% for employment. Such a trade outcome is virtually unprecedented for a rapidly industrializing, relatively densely populated market economy.

Certainly institutional and technological innovations contributed greatly to China being able to maintain food self-sufficiency. The initial institutional innovation of gradually replacing collective farming with the household responsibility system, together with the provision of technological innovations, accounted for the majority of China's massive farm output growth during 1978-84 (Lin 1991, 1992). But price, trade and foreign exchange rate policy reforms also contributed. Farmers had been extremely heavily taxed up to the 1980s. Those disincentives were gradually removed as part of the policy reforms. That was sufficient to encourage farm production to keep pace with domestic consumption growth through to the turn of the century. Since then, however, import dependence has grown. China's self-sufficiency slipped to 98% in 2000-04, and its trade specialization index (net exports divided by exports plus imports of farm products) fell from +0.1 in both the 1980s and the 1990s to -0.3 during 2000-16 (Sandri et al. 2006, WTO 2017). This growing import dependence has prompted the Chinese government to increasingly assist its farmers during the past two decades.

The purpose of this paper is three-fold: to summarize the evidence on this policy transition in China, from taxing to subsidizing farmers and from subsidizing to taxing food consumers; to present projections of the world economy to 2030 that suggest China will continue to become more food import-dependent under current policies and productivity growth rates; and to make the case that it is no longer necessary to use price and trade policy

instruments to achieve the objectives of remaining food secure and ensuring that farmers are not losers from economic growth.

The paper begins by defining the indicators used to reveal the extent to which a sector is taxed or subsidized. It then reports annual estimates of those indicators from 1981 to 2015. Estimated consequences of continuing those distortions to 2030, or of raising them sufficiently to retain self-sufficiency on key foodstuffs, are then provided from recent GTAP model simulations. The final section summarizes the findings and suggests ways of achieving more cost-effectively the fundamental objectives of national food security and less rural-urban income inequality.

Indicators of national distortions to farmer incentives and consumer prices

A common indicator of government interventions in agricultural markets, used in a comprehensive World Bank project (Anderson 2009), is the Nominal Rate of Assistance (NRA). The NRA for each farm product is defined as the percentage by which government policies have directly raised gross returns to farmers above what they would be without the government's intervention (or lowered them, if NRA<0).[1] These individual product estimates can then be used to estimate a weighted average NRA for all products, using the value of production at undistorted prices as weights (unlike the Producer Support Estimate and Single Commodity Transfers computed by OECD (2017), which are expressed as a percentage of the distorted value of output).

Also computed for that World Bank project is a production-weighted average NRA for nonagricultural tradables, for comparison with that for agricultural tradables via the calculation of a percentage Relative Rate of Assistance (RRA), defined as RRA = $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$ where $NRAag^t$ and $NRAnonag^t$ are the percentage NRAs for the tradables parts of the agricultural and non-agricultural sectors, respectively.[2] Since the NRA cannot be less than -100% if producers are to earn anything, neither can the

[1] See Anderson et al. (2008). By comparing domestic with border prices, the NRA takes into account not only trade taxes-cum-subsidies but also non-tariff measures (NTMs) that alter prices. Of course some of those NTMs, including domestic regulations and standards, may be introduced to overcome externalities and thus may raise rather than lower national economic welfare (Beghin, Maertens and Swinnen 2015). In such cases the NRA is an imperfect indicator of welfare-reducing distortions, but these cases are expected to have only a very minor influence on the empirical trends reported below. On the basic theory of the national welfare cost of price-distorting policies, see Bhagwati (1971) and Corden (1995).

[2] Farmers are affected not just by prices of their own products but also by the incentives nonagricultural producers face. That is, it is *relative* prices and hence *relative* rates of government assistance that affect producer incentives. More than seventy years ago Lerner (1936) provided his Symmetry Theorem that proved that in a two-sector economy, an import tax has the same effect as an export tax.

RRA. And if both of those sectors are equally assisted, the RRA is zero. This measure is useful in that if it is below (above) zero, it provides an internationally comparable indication of the extent to which a country's sectoral policy regime has an anti- (pro-)agricultural bias.

In calculating the NRAs for each sector of the economy, the methodology outlined in Anderson et al. (2008) also includes the implicit trade tax distortions generated by dual exchange rates, drawing on the methodology of Dervis, de Melo and Robinson (1981). China adopted a duel exchange rate system in 1979, whereby earners of foreign exchange were required to convert a portion of it at the over-valued official exchange rate but were able to retain the rest for converting at a legal secondary market rate that was always more attractive to them than the official rate. This system created distortions analogous to an import tariff and an export tax at a rate that was higher, the smaller the retention ratio and the larger the gap between the two rates. The retention ratio was gradually raised over the 1980s and early 1990s which drew the two rates together. By 1994, the scheme was replaced by a single foreign exchange rate. Details of how this policy contributed to distortions to prices of tradables in China during 1981-1993 are available in Huang et al. (2009).

Empirical estimates of distortions to farmer incentives in China

Agricultural production and exports were in effect taxed very heavily in China prior to the 1980s, while domestic consumers of farm products were effectively subsidized (Huang et al. 2009, pp. 119-24). Past farm policies took numerous forms, including export restrictions and requirements to deliver part of the crop to the government at below-market prices (Sicular 1988, Shea 2010), all of which are reflected in estimated NRAs that are negative. For some import-competing industries, though, restrictions on imports meant they enjoyed positive NRAs. Examples include milk and sugar. The resulting NRAs are shown for key farm industries and for all of agriculture in Table 1. China's NRA for the sector as a whole averaged -40% in the 1980s, -6% in the 1990s, 8% in the first decade of this century, and above 15% in the current decade.

Agriculture was also discouraged indirectly last century, by manufacturing protection policies and exchange rate overvaluation. When taken together, it meant the price of farm relative to non-farm tradable products within China in the 1980s was only half what it was at the country's border. That is, the relative rate of assistance to agriculture (RRA) was around -50%. Indeed it had been as low as -61% in 1981-84 (Table 1). Thanks to policy reforms since then, the RRA gradually approached zero by the late 1990s. Effectively this meant a doubling

of the ratio of the price of farm to non-farm tradable products domestically relative to that ratio internationally. During those first two decades of reform, about one-sixth of the estimated RRA was due to the dual exchange rate system.

Other developing countries also reduced their disincentives toward agriculture over the past half century, but the pace of reform has been far faster for China than for the average developing country; and China transitioned to positive RRAs from the start of the new millennium whereas the average RRA for other developing countries as a group remains just below zero (Figure 1).

Another comparison of interest is with East Asia's other industrialized economies, which Anderson, Hayami and Others (1986) showed three decades ago to have also transitioned from negative to positive assistance to their farmers. Figure 2 shows China taxed its farmers far more than either South Korea or Taiwan at similar real income levels in earlier decades. It also reveals that, in contrast to the less-advanced developing countries included in Figure 1, their transition to protection was even more rapid than was China's.

Those policy changes in incentives had a major impact in terms of reducing the discouragement of farm production (and the encouragement of food consumption) and thus slowing the decline in agricultural self-sufficiency that otherwise would have occurred as industrialization proceeded in China. The reforms in the final two decades of the 20th century also added to national economic growth and welfare by reducing inter-sectoral resource misallocation; and they reduced the extent to which growth in real incomes of urban households outpaced those of farm households.

Of concern, though, is China's transition during the past two decades to subsidizing farmers relative to manufacturers. Indeed the nominal rate of assistance to Chinese farmers is now almost as high as that for farmers in OECD countries (Figure 3). Total support for agriculture in 2014-16 was 2.4%% of GDP in China, which is four times higher than in OECD countries (OECD 2017). China's RRA is converging on the declining RRAs of its more-industrialized neighbors in Northeast Asia. That is, China's farm and food policies are going in the opposite direction to those of OECD countries, where the willingness to tolerate the high costs of agricultural protection has waned over the past three decades.

This recent transition to positive RRAs in China is lowering the efficiency of resource use and thus national economic growth and welfare. This is for the opposite reason to the welfare loss from China's 20th century policies: instead of too few there are now too many resources being retained in the farm sector. True, this transition may have contributed to reducing the gap between farm and nonfarm household incomes, and to raising food self-

sufficiency, but it has done so at the expense of national food security through lowering real incomes and raising domestic food prices for consumers. In 2014-16 consumer food prices in China on average were 13% above those at the country's border, with grain consumer prices more than 40% above and milk and sugar prices more than 80% above what they would have been with open markets (Figure 4). This directly affects the food security of the country's poor because, on average for those living on less than $1.25 a day in China in recent years, 25% of their expenditure has been on food *net* of their earnings from food sales (Anderson, Ivanic and Martin 2014, Table 1). Moreover, there is a costly mis-allocation of the resources employed *within* the agricultural sector as well, because of the wide variation in NRAs between farm industries (see Table 1); and the main forms of support are tied to, rather than decoupled from, current farm production (Figure 5).

Today there are much more efficient and more equitable ways to boost domestic food production and to deal with poverty and farm/nonfarm income inequality *without* raising consumer prices of food. Before turning to those, however, it is instructive to reflect on prospects for China's food production, consumption and trade over the next decade under current or alternative price-distorting policy regimes.

Market prospects for China in 2030 under alternative farmer support policies

Projecting China's food markets can best be done with the help of a global, forward-looking economy-wide model. Anderson and Strutt (2014) employed the widely used and well-documented GTAP model of the global economy (Hertel 1997). Its 2007 baseline for the world economy was projected forward to provide two new baselines for 2030 by assuming initially the 2007 trade-related policies of each country do not change. The baseline projection assumes that real GDP growth in China is 6% per year during 2007-30. Real international prices of agricultural and food products are 9 percentage points more in 2030 than in 2007 in this baseline scenario, and so well below their peak levels in 2008-12.

In 2007 China accounted for 4% of both the world's exports and its imports of agricultural and food products, and was 97% self-sufficient in farm goods (excluding highly processed foods). By 2030, China's share of global imports of farm goods is projected in the baseline to be one-fifth with no change in policies, while its share of exports is projected to dwindle. As a result, China's agricultural self-sufficiency rate is projected to fall nine percentage points, again assuming its (and other countries') policies remain unchanged. The

projected decline in China's food self-sufficiency is spread across many products, as can be seen by comparing columns 1 and 2 in Table 2.

However, because of the projected increases in incomes and farm output in China over this period, real per capita consumption of agricultural and food products in China is projected to be 75% higher in 2030 than in 2007. This indicator is an index of the quantity purchased per person, valued at constant (2007) prices. It thus accounts for food diet upgrading away from staples to higher-priced foods as well as quantity responses to domestic consumer price changes. That is, China will be far better fed in 2030 than it was in 2007 – even if its rate of agricultural self-sufficiency were to fall from 97% to 88%.

Such a decline in food self-sufficiency may well be perceived as unacceptable politically, in which case it is worth considering alternative policy options. Tightening restrictions on imports is an obvious one, but it needs to be kept in mind that such market-distorting measures reduce national income and raise the price of food and hence the aggregate capacity for most citizens to access food.

An alternative set of options involve expanding public rural investments in areas where the marginal social rate of return is above the opportunity cost of funds. By contrast to price-distorting measures, these not only raise the level of national income in the short-run but also raise the long-run rate of economic growth and of food self-sufficiency. Moreover, in some cases they can simultaneously enhance the food security of both farm and nonfarm households. One such case is public agricultural R&D expenditure. While that has risen considerably in China in recent decades, it was still only four-fifths of the Asia-Pacific average in 2008 (Flaherty, Stads and Srinivasacharyulu 2013). Marginal returns from boosting such levels of public investment in most developing countries are extremely high (Rao, Hurley and Pardey 2017).

The evidence from Brazil is particularly compelling: during the 1980s and 1990s Brazil invested more than four times as intensely as China in public agricultural R&D as a percentage of national agricultural GDP. It is therefore not surprising that Brazil's outputs of both crop and livestock products have more than doubled since the early 1990s, and its food self-sufficiency has been boosted commensurately. By biasing that research toward labor-saving technologies, that investment also helped farmers adjust to rising rural wages – something that is becoming more pressing also in China as the supply of under-employed labor in rural areas shrinks (Zhang, Yang and Wang 2011). And insofar as such investments lower domestic consumer food prices, they would benefit not only farmers but also net buyers of those foods, thereby contributing to both the availability and access dimensions of

food security. This contrasts with food import restrictions, which raise domestic prices and thus benefit net sellers of food *but at the expense of net buyers of food*. More people would be harmed than helped by such a policy measure, now that more than half of China's workers are employed in urban areas and barely one-quarter still work on farms.

Anderson and Strutt (2014) modelled increases in total factor productivity in Chinese agriculture that would be required for the country to be at the same overall rate of agricultural self-sufficiency as in 2007, namely 97%.[3] To achieve that requires a 60% cumulative improvement in agricultural TFP over the period 2007 to 2030 (an extra 2% per year). This magnitude of productivity increase would slightly over-achieve self-sufficiency in cereals and fully achieve it for meat and milk products, with other sectors also seeing increased self-sufficiency rates (third column of Table 2). Since it generates 7% higher incomes on average, it would lead to higher volumes of various foods consumed by households in China. It would also reduce the relative importance of agricultural and food imports in China's total import bundle in 2030, from 13% of total imports in the baseline simulation to just 4% in the higher agricultural productivity growth scenario.

The alternative approach to achieving self-sufficiency of using a trade measure such as a food import restriction, which is the equivalent of a production subsidy plus a consumption tax, is sometimes chosen because it avoids the budgetary outlays that direct producer or consumer subsidies involve. In the interest of boosting farm incomes to reduce the urban-rural income gap, Japan and Korea have imposed import restrictions on meat and milk products in addition to staple foodgrains – but not on coarse grains and oilseed products required for animal feedstuffs. If China were to ban such imports so as to be self-sufficient in them by 2030, the resources that would move toward rice, wheat and livestock production would in turn cause a reduction in self-sufficiency in crops that provide inputs into animal feedstuffs, and also for other crops. According to Anderson and Strutt (2014), the tariff equivalents of such import restrictions would range from 114% for wheat to 255% for red meats. These are well above China's bound out-of-quota tariffs (compare the last two columns in Table 2) and so would be inconsistent with China's WTO legal commitments.

Moreover, such a policy response would impose a burden on households that are net buyers of those grain, meat and milk products, because domestic consumer prices for those products would increase along with the producer price hikes. The extent of the consequent

[3] In addition to agricultural R&D, investments in rural infrastructure and in basic rural education and health also would have the effect of raising farm productivity growth, as would a freeing up of factor markets. See, for example, Fan and Zhang (2004) and Rozelle et al. (2005).

reductions in the volume of various foods consumed by households in China would range from 3-6% for livestock products, 0-3% for grains, and 2-3% even for vegetable oils and horticultural products. The fall for the latter goods is despite no change in their import restrictions. It is due to the fall in real national income resulting from this policy (estimated to be 0.9% of China's GDP), as well as the rise in their prices due to productive resources being withdrawn from those industries to boost resources in the now-more-protected farm industries. Clearly, such a policy response to declining food self-sufficiency undermines national food security by reducing economic access to food for the vast majority of households.

Conclusion: more-efficient instruments for achieving key policy objectives

The reforms to market-distorting policies that China undertook in the 1980s and 1990s were truly transformational: by reducing to zero the discouragement of farm production, they contributed non-trivially to national economic growth and welfare, helped reduce the income gap between farm and nonfarm households, lowered hugely the extent of rural poverty, and helped to expand food production as domestic consumption grew, thereby maintaining food self-sufficiency.

However, the transition during the past two decades to increasingly assist farming, including by raising some food prices above levels at the country's border, is lowering national economic growth and welfare and reducing economic access to food for all but those farm households that are net sellers of the foods that are protected from import competition. The experiences of Japan and Korea strongly suggest this path will turn out to be very costly, and not very effective in closing the farm-nonfarm income gap. Moreover, more-advanced economies have found by bitter experience that reversing an agricultural protection growth path is very painful, which is all the more reason not to follow that policy path in the first place. Yet policy reversals have happened, and been sustained. For the OECD membership as a whole, their average rate of assistance to farmers is now less than half what it was a generation ago, and is nearly down to China's rising rate (Figure 3).

A reluctance to abandon the use of trade-restricting measures sometimes stems from concerns about the reliability of import suppliers. China has already begun to address this by contracting foreign farmers to supply Chinese markets with specific products. More such investments in land-abundant countries in Latin America, Africa, Australia and elsewhere can

further enhance the security of supplies at lower cost than by protecting Chinese farmers from import competition for such land- and water-intensive crops.

Fortunately for China, there are politically feasible alternative policy instruments to market-distorting policies. China has begun to re-instrument some agricultural supports, but most forms are still coupled to current farm production (Figure 5). More efficient and effective ways to improve national food security, reduce the gap between farm and nonfarm household incomes, and reduce extreme poverty are available though. Many past empirical studies have shown that further public investments in rural infrastructure, in agricultural research,[4] and in rural primary education and health would have high payoffs in China, as in numerous other developing countries.

Moreover, thanks to the information and communication technology (ICT) revolution, there are now cheaper and easier means than price supports to provide income supplements, as and when needed, to the poorest and hence most food-insecure households, whether they be urban or rural. Such payments were unaffordable in developing countries in the past because of the fiscal outlay involved and the high cost of administering small handouts. However, cash transfers can now be provided electronically as direct assistance to even remote households because the vast majority of them now or soon will have access to electronic banking (World Bank 2015). If such payments to rural households were made conditional on meeting basic health and education targets for their children, they could reduce the huge gap between childhood development in rural versus urban areas (see Li et al. 2017).

China is more capable than most developing countries in being able to effectively deliver social protection payments electronically to its rural households. Huang, Wang and Rozelle (2013) point out that already the government has set up a special account for each household in a local bank, into which a timely deposit can be made electronically to each account. This provides China a way to avoid going any further down the agricultural protection growth path and then having to reverse, the political cost of which would be larger the longer such programs are in place. Needless to say, such cash transfers would have an even more favourable national food security impact if combined with an increase in agricultural research investment and in infrastructure that lowered costs along the food value chains.

[4] As of 2014-16, only 1.8% of China's total support to agriculture was in the form of agricultural R&D expenditure, according to OECD (2017).

References

Anderson, K. (ed.) (2009), *Distortions to Agricultural Incentives: A Global Perspective, 1955–2007*, London: Palgrave Macmillan and Washington DC: World Bank.

Anderson, K., Y. Hayami and Others (1986), *The Political Economy of Agricultural Protection: East Asia in International Perspective*, Boston, London and Sydney: Allen and Unwin and Tianjin: People's Publishing House (expanded Chinese language edition translated by F. Cai, 1996).

Anderson, K., M. Ivanic and W. Martin (2014), 'Food Price Spikes, Price Insulation, and Poverty', Ch. 8 (pp. 311-39) in *The Economics of Food Price Volatility***,** edited by J.-P. Chavas, D. Hummels and B. Wright, Chicago and London: University of Chicago Press for NBER.

Anderson, K., M. Kurzweil, W. Martin, D. Sandri and E. Valenzuela (2008), 'Measuring Distortions to Agricultural Incentives, Revisited', *World Trade Review,* Vol. 7, No. 4, pp. 1-30.

Anderson, K. and S. Nelgen (2013), *Updated National and Global Estimates of Distortions to Agricultural Incentives, 1955 to 2011*, data at www.worldbank.org/agdistortions

Anderson, K. and A. Strutt (2014), 'Food Security Policy Options for China: Lessons from Other Countries', *Food Policy,* Vol. 49, No. 1, pp. 50-58.

Beghin, J.C., M. Maertens and J. Swinnen (2015), 'Nontariff Measures and Standards in Trade and Global Value Chains', *Annual Review of Resource Economics,* Vol. 7, pp. 10.1–10.26.

Bhagwati, J.N. (1971), 'The Generalized Theory of Distortions and Welfare', in *Trade, Balance of Payments and Growth*, edited by J.N. Bhagwati et al., Amsterdam: North-Holland.

Corden, W.M. (1997), *Trade Policy and Economic Welfare* (second edition), Oxford: Clarendon Press.

Dervis, K., J. de Melo and S. Robinson (1981), 'A General Equilibrium Analysis of Foreign Exchange Shortages in a Developing Country', *Economic Journal,* Vol. 91, pp. 891–906.

Fan, S. and X. Zhang (2004), 'Infrastructure and Regional Economic Development in Rural China', *China Economic Review,* Vol. 15, No. 2, pp. 203-214.

Flaherty, K., G.-J. Stads and A. Srinivasacharyulu (2013), 'Benchmarking Agricultural Research Indicators Across Asia–Pacific', Washington DC: International Food Policy Research Institute.

Hertel, T.W. (ed.) (1997), *Global Trade Analysis: Modeling and Applications*, Cambridge and New York: Cambridge University Press.

Huang, J., S. Rozelle, W. Martin and Y. Liu (2009), 'China', Ch. 3 (pp. 117-61) in *Distortions to Agricultural Incentives in Asia***,** edited by K. Anderson and W. Martin, Washington DC: World Bank.

Lerner, A. (1936), 'The Symmetry between Import and Export Taxes', *Economica,* Vol. 3, No. 1I, pp. 306–313.

Li, H., P. Loyalka, S. Rozelle and B. Wu *(*2017), **'**Human Capital and China's Future Growth**',** *Journal of Economic Perspectives*, Vol. 31, No. 1, pp. 1-26.

Lin, J.Y. (1991), 'The Household Responsibility System Reform and the Adoption of Hybrid Rice in China', *Journal of Development Economics,* Vol. 36, pp. 353-372.

Lin, J.Y. (1992), 'Rural Reforms and Agricultural Growth in China', *American Economic Review,* Vol. 82, No. 1, pp. 34-51.

OECD (2017), *Producer and Consumer Support Estimates* Database, www.oecd.org (annually for 1986–2012).

Rao, X., T.M. Hurley and P.G. Pardey (2017), 'Recalibrating the Reported Returns to Agricultural R&D: What if We All Heeded Griliches?', Department of Applied Economics, University of Minnesota, St. Paul, June.

Rozelle, S., Q. Li, L. Zhang and A. de Brauw (2005), 'Labor Market Emergence and Returns to Education in Rural China', *Review of Agricultural Economics,* Vol. 27, No. 3, pp. 418-424.

Sandri, D., E. Valenzuela and K. Anderson (2006), 'Compendium of National Economic and Trade Indicators by Region, 1960 to 2004', Agricultural Distortions Research Project Working Paper 01, World Bank, Washington DC, October. Posted at www.worldbank.org/agdistortions

Shea, E.Y.P. (2010), 'Understanding China's Grain Procurement Policy from a Perspective of Optimization', *China Economic Review,* Vol. 21, No. 4, pp. 639-649.

Sicular, T. (1988), 'Plan and Market in China's Agricultural Commerce', *Journal of Political Economy,* Vol. 96, No. 2, pp. 283-307.

World Bank (2015), *The Global Findex Database 2014,* Washington DC: World Bank, http://www.worldbank.org/en/programs/globalfindex.

WTO (2017), *International Trade Statistics*, Geneva: World Trade Organization, www.wto.org.

Zhang, X., J. Yang and S. Wang (2011), 'China Has Reached the Lewis Turning Point', *China Economic Review*, Vol. 22, No. 4, pp. 542-554.

Table 1: Nominal and relative rates of assistance (NRA and RRA) to agriculture,[a] by product, China, 1981 to 2016

(percent)

	1981-84	1985-89	1990-94	1995-99	2000-04	2005-09	2010-14	2015-16
Wheat	2	22	11	1	-14	39	33	67
Rice	-56	-34	-30	-13	9	-19	20	47
Maize	-35	-16	-25	-2	25	15	19	43
Soybean	1	1	5	-2	10	10	20	59
Sugar	44	45	12	20	22	23	39	117
Cotton	-34	-35	-26	5	15	64	59	104
Pig meat	-79	-49	-15	0	-2	5	14	11
Poultry meat	25	-27	-3	0	10	16	15	15
Beef and veal	na	na	4	0	-2	5	15	15
Milk	129	58	47	117	43	-5	33	82
NRA all agric.[b]	**-45**	**-36**	**-14**	**2**	**6**	**10**	**15**	**18**
NRA non-agric.	42	28	25	10	5	4	4	4
RRA	**-61**	**-50**	**-31**	**-8**	**1**	**6**	**11**	**13**

[a] The nominal rate of assistance (NRA) is defined as the percentage by which government policies have raised producer returns above what they would be without the government's direct intervention in that industry or sector (or the percentage by which government policies have directly lowered returns, if the NRA is less than zero). The relative rate of assistance (RRA) is defined as $100*[(100+NRAag^t)/(100+NRAnonag^t)-1]$, where $NRAag^t$ and $NRAnonag^t$ are the percentage nominal rates of assistance for the tradables parts of the agricultural and non-agricultural sectors, respectively. The NRAnonag after 2005 is assumed to be the same as in 2005. Almost one-third of the NRA, and one-sixth of the RRA, was due to foreign exchange rate distortions during 1981-1994 before the dual exchange rate system ended in 1994. See Anderson et al. (2008).

[b] Weighted average of NRAs for all agricultural industries (including ones not shown), using production valued at undistorted price as weights.

Source: Compiled from Anderson and Nelgen (2013), which draws on estimates for China reported in Huang et al. (2009) for 1981-94, and from Producer Single Commodity Transfers and aggregate Nominal Assistance Coefficients in OECD (2017) for 1995-2016.

Table 2: China's self-sufficiency in farm products without and with faster farm productivity growth and import bans on rice, wheat, meats and milk products, and agricultural tariff rates for China, 2030

(percent)

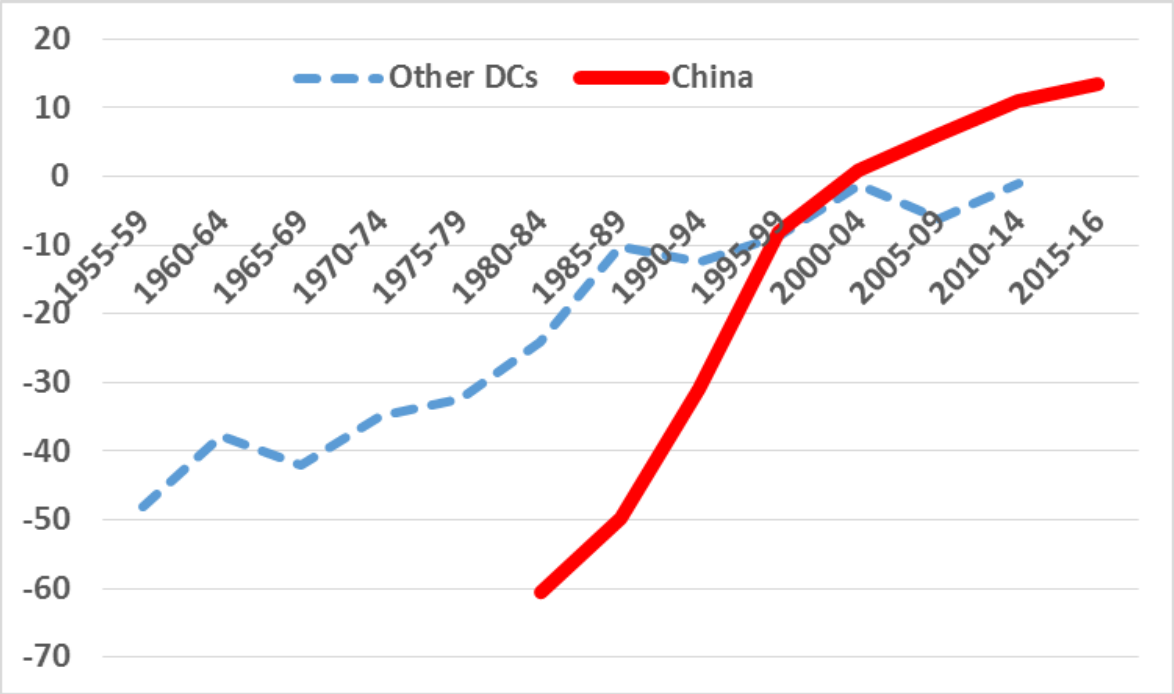
	2007, actual	**2030 projected baseline scenario**	**2030 plus 2% p.a. extra agricultural TFP growth**	**2030 plus selected China food import bans**	**2030 tariff rates, China, with no policy change**	**2030 tariff rates, China, with selected import bans**	***China's legally bound out-of-quota tariff at WTO***
***Rice**	101	95	103	100	2	196	*65*
***Wheat**	103	97	107	100	2	114	*65*
Coarse grains	105	98	103	98	2	2	*65*
Fruit & veg	102	96	102	95	7	8	*11*
Oilseeds	56	35	56	32	2	2	*3*
Vegetable oils	88	61	92	55	2	2	*3*
Sugar	96	79	98	74	0	0	*50*
Cotton	74	66	78	64	4	4	*40*
Other crops	132	45	123	40	8	8	*na*
***Beef & sheepmeat**	94	89	100	100	11	255	*12*
***Other meats**	101	37	99	100	8	164	*12*
***Dairy products**	97	75	101	100	8	159	*11*

* Indicates sectors subject to the import bans for achieving selected food self-sufficiency.

Source: Compiled from Anderson and Strutt (2014).

Figure 1: Relative rate of assistance to agriculture, China and other developing countries,[a] 1955 to 2016

(percent)



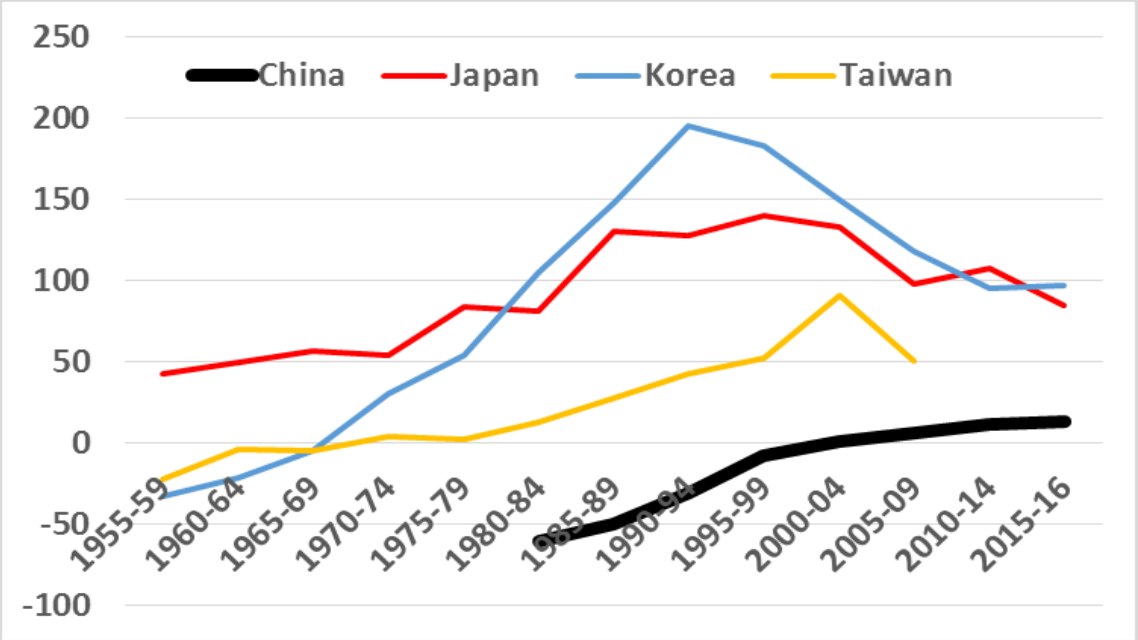
[a] Weighted average RRA for 38 developing countries not including China, Korea, Taiwan or the transition economies of Eastern Europe and the former Soviet Union. The gross values of national agricultural production valued at undistorted prices are used as weights (see Anderson et al. 2008). The first period of estimates for China is 1981-84, and the last period shown for Other Developing Countries is 2010-11.

Source: Author's compilation from Anderson and Nelgen (2013) for estimates to 2011, updated for China from OECD (2017).

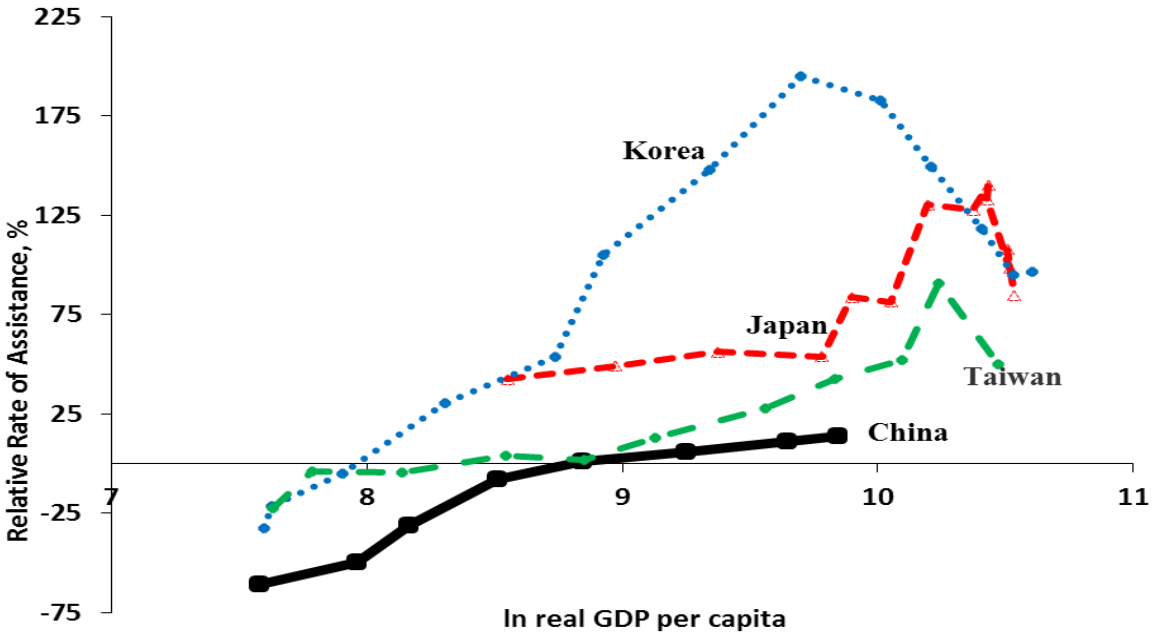
Figure 2: Relative rate of assistance to agriculture, China and other East Asian economies, 1955 to 2016

(percent)

(a) By 5-year periods



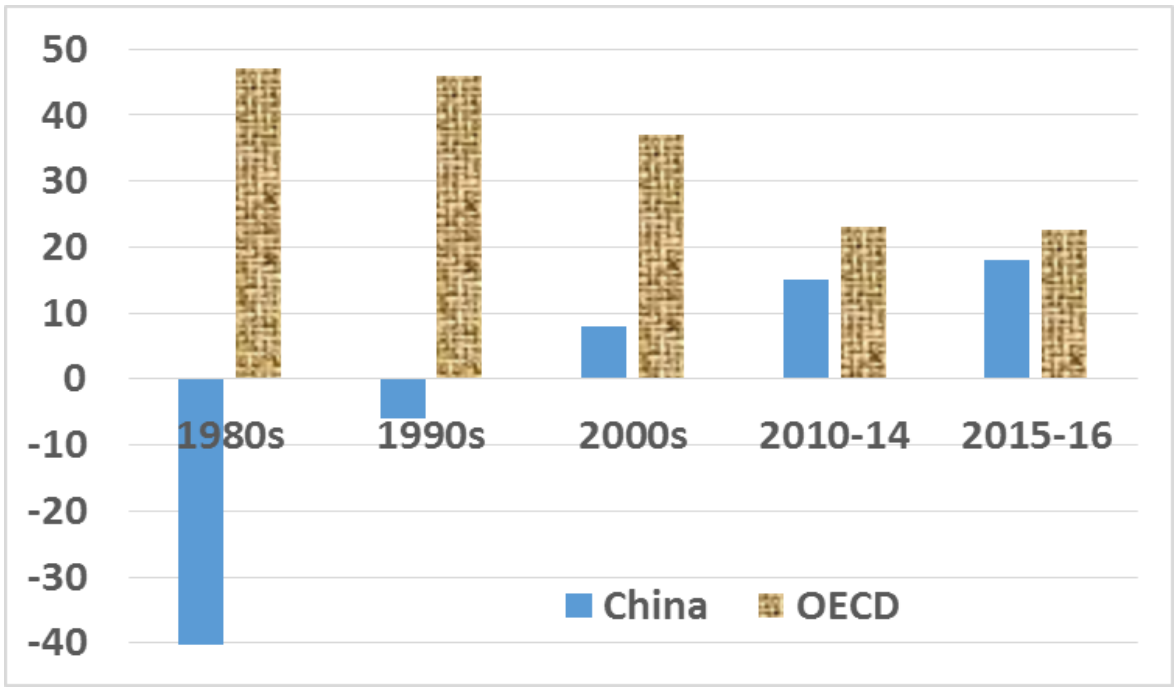
(b) By real per capita GDP[b]



[a] The NRA for agriculture is for China is 1981-84, and the last period shown for Taiwan is 2010-11.
[b] Real GDP per capita is shown on the horizontal axis in natural logs at 1990 International Geary-Khamis dollars, from www.ggdc.net/maddison/maddison-project/data.htm. These have been updated to 2016 by taking the latest PPP estimates in 2011 dollars from the World Bank's International Comparison Project (http://icp.worldbank.org) and splicing them to the Maddison series.
Source: Author's compilation from Anderson and Nelgen (2013), except agricultural NRA estimates for years 1995-2016 for China, Japan and Korea are from OECD (2017).

Figure 3: Nominal rate of assistance to agriculture, China and OECD countries, 1980s to 2016

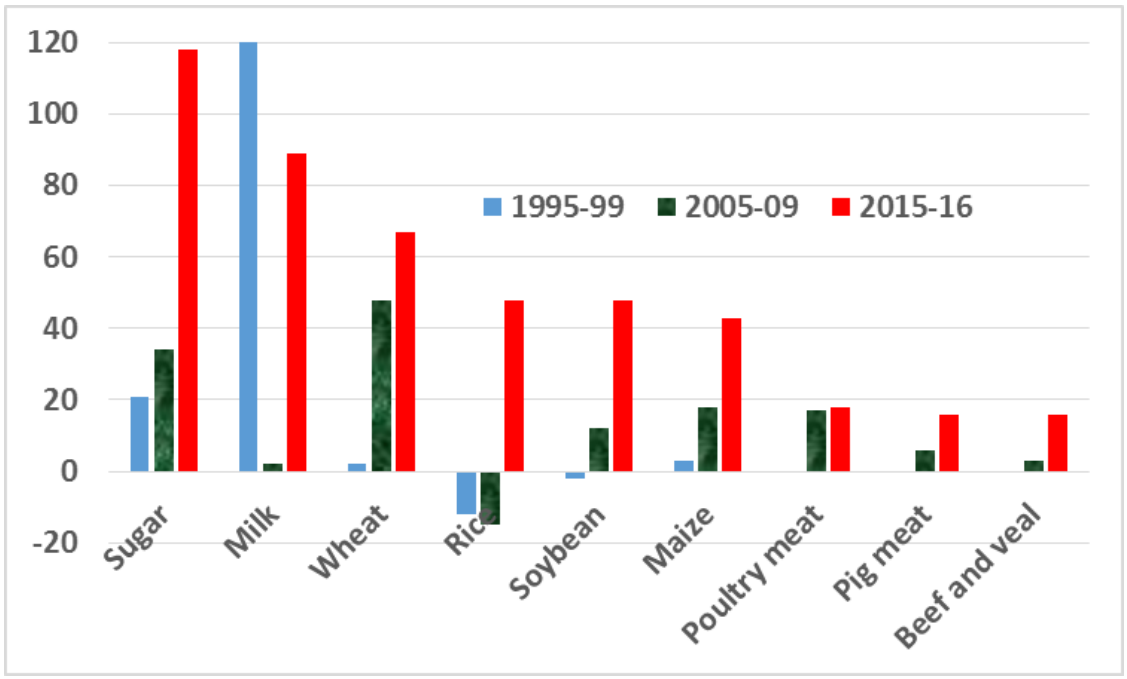
(percent)



Source: Compiled from Anderson and Nelgen (2013) for 1980 to 1994, and from aggregate Nominal Assistance Coefficients in OECD (2017) for 1995 to 2016.

Figure 4: Consumer tax equivalent for key food products, China, 1995 to 2016

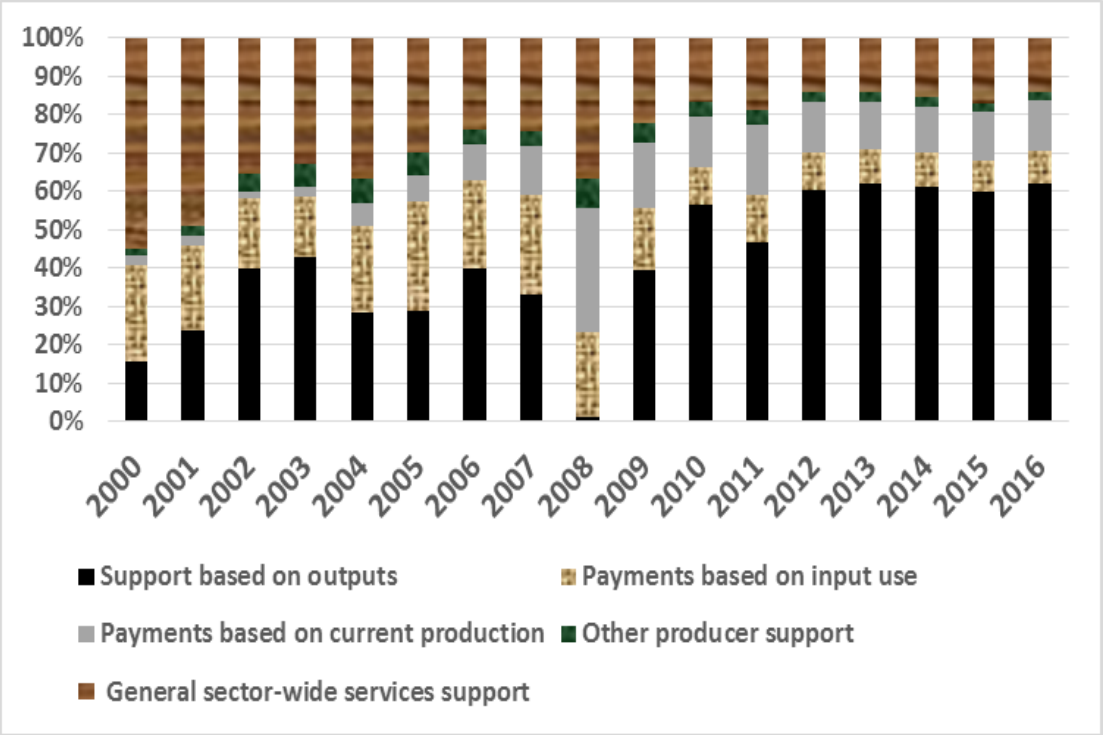
(percent)



Source: OECD (2017).

Figure 5: Shares of various measures in total government support to agriculture, China, 2000 to 2016

(percent)



Source: OECD (2017).

Working Papers in Trade and Development
List of Papers (as at 2017)

16/01 RAGHBENDRA JHA and SADIA AFRIN, 'Pattern and determinants of structural transformation in Africa'

16/02 SANTANU GUPTA and RAGHBENDRA JHA, 'Democracy and redistribution'

16/03 W. MAX CORDEN and SISIRA JAYASURIYA, 'The Japanese macroeconomic mystery'

16/04 PREMA-CHANDRA ATHUKORALA and C VEERAMANI, 'Internationalization of Indian enterprises: patterns, determinants and policy issues'

16/05 PREMA-CHANDRA ATHUKORALA, TALA TALGASWATTA and OMER MAJEED, 'Global production sharing: exploring Australia's competitive edge'

16/06 KYM ANDERSON, JOSEPH FRANCOIS, DOUGLAS NELSON and GLYN WITTWER, 'Intra-industry trade in a rapidly globalizing industry: the case of wine'

16/07 KYM ANDERSON, 'National and global price- and trade-distorting policies'

16/08 BUDY P RESOSUDARMO, ACRAM LATIPH, SARAN SARNTISART and ISRA SARNTISART, 'Development in Southeast Asia's lagging regions'

16/09 ARIUN-ERDENE BAYARJARGAL, 'Economic growth and income inequality: asymmetric response of top income shares to growth volatility'

16/10 CHRIS MURPHY, 'The effects on consumer welfare of a corporate tax cut'

16/11 ANIS CHOWDHURY, 'Financing poverty eradication'

16/12 PREMA-CHANDRA ATHUKORALA and JOHN RAVENHILL, 'China's evolving role in global production networks: the decoupling debate revisited'

16/13 SANTANU GUPTA and RAGHBENDRA JHA, 'Democracy, redistribution and optimal tax structures'

16/14 PAUL J BURKE and HEWEN YANG, 'The price and income elasticities of natural gas demand: International evidence'

16/15 IVAN GONZALEZ and BUDY P. RESOSUDARMO, 'A sectoral growth-income inequality nexus in Indonesia'

16/16 BLANE D. LEWIS, 'Local elections, political fragmentation, and service delivery in Indonesia'

16/17 IAN COXHEAD and RASHESH SHRESTHA, 'Globalization and school-work choices in an emerging economy: Vietnam'

16/18 KYM ANDERSON, 'Sectoral trends and shocks in Australia's economic growth'

16/19 SELWYN CORNISH and RAGHBENDRA JHA, 'Trevor Swan and Indian planning: The lessons of 1958/59'

16/20 MOHAMMAD ZULFAN TADJOEDDIN, ILMIAWAN AUWALIN and ANIS CHOWDHURY, 'Revitalizing Indonesia's manufacturing: the productivity conundrum'

17/01 PREMA-CHANDRA ATHUKORALA, 'Global productions sharing and local entrepreneurship in developing countries: Evidence from Penang export hub, Malaysia'

17/02 ROHAN BEST, 'Switching towards coal or renewable energy? The effects of financial capital on energy transitions'

17/03 PREMA-CHANDRA ATHUKORALA, 'Manufacturing Exports from Sri Lanka: Opportunities, Achievements and Policy Options'

17/04 MANOJ K PANDEY, VANI S KULKARNI and RAGHAV GAIHA, 'Aging, depression, and non-communicable diseases in South Africa'

17/05 SHUHEI NISHITATENO and MASATO SHIKATA, 'Has improved daycare accessibility increased Japan's maternal employment rate? Municipal evidence from 2000-2010'

17/06 RAMESH CHANDRA PAUDEL and SWARNIM WAGLE, 'Export performance and potential with regional partners: The case of a landlocked LDC, Nepal'

17/07 VINISH SHRESTHA and RASHESH SHRESTHA, 'Intergenerational effect of education reform program and maternal education on children's educational and labor outcomes: evidence from Nepal'

17/08 PREMA-CHANDRA ATHUKORALA, 'China's evolving role in global production networks: implications for Trump's trade war'

17/09 ARIEF ANSHORY YUSUF and ANDREW SUMNER, 'Multidimensional poverty in Indonesia: how inclusive has economic growth been?

17/10 PAUL J BURKE, TSENDSUREN BATSUURI, and MUHAMMAD HALLEY YUDHISTIRA, 'Easing the traffic: The effects of Indonesia's fuel subsidy reforms on toll-road travel'

17/11 ROHAN BEST and PAUL J BURKE, 'The importance of government effectiveness for transitions toward greater electrification in developing countries'

17/12 CHRIS MURPHY, 'Optimal fiscal equalisation and its application to Australia'

17/13 KYM ANDERSON, 'From taxing to subsidizing farmers in China Post-1978'