Discussion Paper Series

RIEB

Kobe University

DP2017-04

The Labour Productivity Gap between Agricultural and Non-agricultural Sectors and Poverty in Asia*

Katsushi S. IMAI
Raghav GAIHA
Fabrizio BRESCIANI

Revised May 2, 2018

Research Institute for Economics and Business Administration
Kobe University
2-1 Rokkodai, Nada, Kobe 657-8501 JAPAN

The Labour Productivity Gap between Agricultural and Non-agricultural Sectors and Poverty in Asia

Katsushi S. Imai *

Economics, School of Social Sciences, University of Manchester, UK & RIEB, Kobe University, Japan

Raghav Gaiha

Global Development Institute, University of Manchester, UK, & Department of Global Health and Population, Harvard School of Public Health, Boston, USA

Fabrizio Bresciani

Asia and the Pacific Division of International Fund for Agricultural Development (IFAD), Italy

Corresponding Author:

Department of Economics, School of Social Sciences,

University of Manchester,

Arthur Lewis Building, Oxford Road,

Manchester M13 9PL, UK

Email: Katsushi.Imai@manchester.ac.uk

Acknowledgements

This study is funded by Asia and the Pacific Division (APR), IFAD (International Fund for Agricultural Development). The opinions expressed in this publication are those of the authors and do not necessarily represent those of the International Fund for Agricultural Development (IFAD).

The Labour Productivity Gap between Agricultural and Non-agricultural Sectors and Poverty in Asia

Abstract

The objective of this paper is to examine how agricultural and non-agricultural labour productivities have grown over time and whether the growth pattern – proxied by the labour productivity gap in two sectors – affected poverty in low and middle income countries in Asia. We first examine whether the labour productivities in agricultural and non-agricultural sectors have converged or not using a five-year average panel dataset. We have found evidence that non-agricultural labour productivity and agricultural labour productivity did not converge as the former has grown faster and the gap has increased significantly over time. We then confirm that both agricultural and non-agricultural labour productivities have converged across countries and the convergence effect is stronger for the non-agricultural sector. We have also observed that, despite the relatively lower growth in agricultural labour productivity, the agricultural sector played an important role in promoting non-agricultural labour productivity and thus in non-agricultural growth. Finally, we have found some evidence that the labour productivity gap reduces rural and urban poverty as well as the national inequality.

Key words: labour productivity gap, agricultural labour productivity, poverty, inequality, Asia
JEL Classifications: C23, I32, J24, O13

I. Introduction

The objective of this paper is to examine (i) how labour productivities in agricultural and non-agricultural sectors in Asia have grown over time and (ii) whether the growth pattern – proxied by the labour productivity gap in two sectors – affected poverty and inequality in low and middle income countries in Asia. We focus on these countries because the interaction between agricultural and non-agricultural sectors has become increasingly important as the countries have experienced structural transformation. We will first investigate the convergence of labour productivity in agricultural and non-agricultural sectors with a focus on *both* inter-sector convergence *and* within-sector convergence across different countries over time.

The former, or the issue on inter-sector convergence or divergence, is closely associated with the literature which investigates allocations or misallocations of inputs into agricultural and non-agricultural sectors. For instance, using the micro-level data Gollin et al. (2013) found

that a large gap between the two sectors still persists, suggesting misallocation of labour at the macro level. However, the extent of the gap and how it has changed over time differs among different countries depending on their initial capital and labour endowments, the stage of economic development, and the nature of public policies. As the degree of misallocation of resources in dual economy settings explains variations in national income and productivity growth (Vollrath, 2009a), it is important to examine how the gap has changed over time.

To investigate the latter we draw upon the large empirical literature to test the convergence hypothesis in line with the neo-classical growth model, that is, whether poorer countries or regions grow faster than richer countries or region (e.g. Barror, 1991; Barro and Sala-i-Martin, 1992; Barro et al., 1991). For instance, Barro and Sala-i-Martin used the data on the personal income in the U.S. states and found clear evidence of convergence using the data for 48 states in 19840-1963. On the convergence across countries, while the earlier literature suggests that there was convergence across a wide range of countries (e.g. Barro, 1991 for 98 countries in 1960-1985) and the convergence is also achieved for the productivity growth (e.g. Baumol et al., 1994), it has been debated whether the convergence is achieved for a subset of the countries or for different specifications (Levine and Renelt, 1992; Quah, 1996;). The results partly depend on the extent to which the countries are integrated, for instance, through international trade (Ben-David, 1996). Given that East and South Asian countries are becoming more integrated, an interesting question is whether the productivity converges among Asian countries.

We will also investigate whether the gap is associated with poverty or inequality reduction in rural and urban areas. While the literature has focused on the poverty-reducing effect of agricultural sector income or productivity growth[1], little is known about whether the gap between agricultural and non-agricultural productivity influences poverty or inequality. A point of departure is that we treat the labour productivity gap by treating it as endogenous using the Fixed Effects Instrumental Variable (FE-IV) model where the cropping pattern is used as an instrument. Finally, we will discuss whether the labour productivity gap will dynamically affect the labour allocation between rural and non-rural sectors.

Our paper draws upon the following three strands of the literature. First, this is related to the literature on the empirical investigations of the gap between agricultural and non-agricultural productivities in the dual economy model – consisting of the traditional and modern sectors. A seminal work in this strand of the literature is Gollin et al. (2013) who used

[1] See Imai, Gaiha, and Bresciani (2016) for the evidence for Asia.

both the national accounts and household data to show that value added per worker is much higher in the non-agricultural sector than in agriculture in developing countries. They call this gap as "the agricultural productivity gap". As Gollin et al. (2013, p. 942) notes, the investigation of the agricultural productivity gap has been viewed as an important topic in the early literature on development economics as it can offer valuable insights into the analysis of economic growth and inequality of developing countries (e.g. Lewis, 1955; Kuznets, 1971). In recent years, the agricultural and non-agricultural sectors have become more integrated under the structural transformation within a country, while the agricultural (or non-agricultural) sector of one country has become more closely linked with the same sector of other countries under globalisation. Given the nature of the data Gollin et al. (2013) used, their analysis is essentially static. However, it is important to analyse the gap in a dynamic context. Drawing upon the panel data of Asian countries, the present study focuses on how agricultural and non-agricultural labour productivities have grown with their interactions taken into account. It also estimates the effect of the gap on poverty and inequality.

Second, our study is closely related to the large body of the literature on the role of agricultural sector in development, poverty and inequality (see Christiaensen et al. 2011). A point of departure of the recent literature (Christiaensen et al., 2011; Imai, Cheng and Gaiha, 2017) is that the role of agriculture is captured by dynamic interactions between agriculture and non-agricultural sectors. The present study extends these arguments and focuses on the effect of the labour productivity gap between the two sectors on poverty and inequality.

Third, the present study is also closely related to the literature on structural transformation (in particular rural transformation or agricultural transformation) and its effect on development and/or poverty in low and middle income countries in Asia and elsewhere (e.g. Reardon and Timmer, 2014; Dawe, 2015; Barrett et al., 2017). As the structural transformation implies a closer and more intricate relationship between agricultural and non-agricultural sectors, our empirical investigation of the gap between agricultural and non-agricultural productivity would provide a useful insight into the literature on structural transformation.

The rest of the paper is organised as follows. In the next section we will briefly summarise the theoretical foundations underlying our empirical investigation. In Section III we will examine the convergence of labour productivity in agricultural and non-agricultural sectors. Section IV estimates the effects of the labour productivity gap on poverty, inequality and the sectoral population share. The final section offers the concluding observations.

II. Theoretical Foundations

Our empirical investigation of the gap between agricultural and non-agricultural labour productivity is associated with a large body of theoretical literature on the dual economy model which originated from Arthur Lewis (Lewis, 1954) and was later developed by many authors (Dixit, 1973; Mundlak, 2000). More recently, Vollrath (2009b) constructs a dual economy model in which the productivity differences between the two sectors arise endogenously. In Vollrath's model, agricultural production is a constant returns to scale function of labour effort and land (Vollrath, 2009b, p.8). Total agricultural production is denoted as:

$$Y_t^A = A_t^A F(R,\ E_t^A) \qquad (1)$$

where Y_t^A is agricultural production, A_t^A is total factor productivity of agricultural sector, R is the total amount of land (or resources in general) in the agricultural sector, and E_t^A is the total labour effort, that is, $E_t^A = s_t a_t L_t$. F is a well-behaved function with constant returns to scale. Net income for a representative farmer in the agricultural sector is:

$$I_t^A = p_t^A A_t^A F(r_t, s_t) - \rho_t r_t \qquad (2)$$

where r_t is the land employed by the farmer, and ρ_t is the rental price of land, and p_t^A is the price of agricultural goods relative to manufacturing goods.

The manufacturing or non-agricultural sector is assumed to be perfectly competitive so that labour effort is paid its marginal product (ibid., p.9). The wage rate per unit of effort in the non-agricultural sector is specified as:

$$w_t^M = A_t^M w(a_t) \qquad (2)$$

where the wage rate depends on the productivity of non-agricultural sector, A_t^M, as well as on a well behaved function w of the number of people in agriculture ($w' > 0$ and $w'' > 0$) given the assumption that the non-agricultural sector is competitive, while the agricultural sector is not. These properties imply that that the non-agricultural wage increases as the number of people in the non-agricultural sector $(1 - a_t)$ decreases. Net income for non-agrithe cultural worker is:

$$I_t^M = w_t^M s(1 - s) \qquad (3)$$

Under these settings, Vollrath (2009b, p.11) showed that in equilibrium a dual economy exists where non-agricultural workers allocate more time to productive work than agricultural workers and the marginal product of a worker is higher in the non-agricultural/manufacturing workers. As a result GDP per capita can be increased by a transfer of labour from the agricultural sector to the non-agricultural sector. Vollrath's model (ibid., p.13) also implies that sustained increases in agricultural productivity will help industrialize the economy, but this will be accompanied by a growing disparity in productivity between sectors. On the contrary, increases in non-agricultural productivity will not only industrialise the economy but induce agricultural workers to work more efficiently. [2]

The above model would predict, in our empirical context, that the gap of labour productivity between the agricultural and non-agricultural sectors expands as the economy grows. As the gap of the labour productivity in the two sectors implies improvement of relative productivity of the non-agricultural sector, it is likely to reduce poverty. As we will discuss later, our empirical results are broadly consistent with Vollrath (2009b).

Vollrath' (2009b) model also implies that agricultural productivity and non-agricultural productivity interact in a complicated way. However, the model does not explicitly consider the interactions with outside the country. Assuming the concavity of production function in both sectors, we will empirically investigate whether the agricultural productivity will converge or not across Asian countries by taking account of the effect of the lagged non-agricultural productivity on agricultural productivity. The convergence of non-agricultural productivity will also be examined by incorporating the effect of the agricultural productivity on the non-agricultural productivity. This empirical model is oriented in the literature to test the convergence of economic growth (Barror, 1991; Barro and Sala-i-Martin, 1992; Barro et al., 1991).

Vollrath (2009b) predicts that in the long term the agricultural sector productivity growth will exacerbate the inefficiencies of a dual economy and produce slower overall growth than will modern sector productivity improvements and the dual-economy will disappear. This is consistent with the empirical observation about developed Asian countries, such as South Korea and Japan. While both countries improved the agricultural productivity in the late 20th century, the share of agricultural sector reduced as they industrialise and eventually achieve high productivity. In the meantime, the overall inequality of these countries remained relatively

[2] See Vollrath (2009b) for details of the model.

low and stable.[3] However, Vollrath (2009b) lacks two aspects. First, the effect of the persistence of dual economy on income distribution is not explicitly analysed. Second, focusing on the long-term effect, Vollrath's model may not fully capture the positive role of agriculture on economic growth and reduction of poverty and inequality, which is important in most of the middle or low income countries in Asia, such as India. For instance, Ravallion and Datt (1996) used 35 household surveys of India between 1951 and 1991 and have found that the growth of the primary sector (mainly agriculture) and the tertiary sector (mainly services) reduced national, rural and urban poverty significantly, while the secondary sector (mainly manufacturing) increased national poverty. They also showed that rural growth is more important for poverty reduction than urban growth. It is evident that a separate theoretical model is necessary to analyse the effect of dual-economy on income distribution and poverty.

On the relationship between the dual economy, growth and income distribution, some authors have (e.g., Robinson, 1976, Bourguignon, 1990, Fields, 1993, Bourguignon, and Morrisson, 1998). Bourguignon (1990) offers a theoretical ground for Kuznet's hypothesis in detail. The dual economy model is modelled in a general equilibrium framework by taking account of the *entire* distribution which generates Lorenz curve rather than summary measures. Bourguignon first derived a proposition that '(a) necessary and sufficient condition for growth to shift the Lorenz curve of the income distribution upward is that the share of the traditional sector in GDP increases with growth' (Bourguignon, 1990, p.219), that is, an increase of the share of the agricultural sector in the growth process tends to reduce inequality. However, as Bourguignon notes, it is unlikely for the agricultural sector share increases with growth. Bourguignon (1990) then derives the proposition that '(a) necessary condition for growth to be unambiguously egalitarian, despite a fall in the GDP-share of the traditional sector, is that capital-labour substitution be inelastic in the modern sector' (p.226), implying that 'observing a falling GDP share of the traditional sector, together with elastic capital-labour substitution in the modern sector, is sufficient to rule out unambiguously egalitarian growth in a dual economy' (p. 227). That is, the model predicts that the disparity between agricultural and non-agricultural sectors tends to increase inequality with elastic capital-labour substitution in the modern sector.

[3] The income Gini coefficient of Korea reduced from 0.34 in 1965 to 0.31 in 1993 (Choo, 1991) and that of Japan reduced from 0.29 in 1966 to 0.28 in 1998 (based on Family Income and Expenditure Survey, Moriguchi and Saez, 2008). Both countries experienced a decline in the share of agriculture in this period.

Bourguignon's model would motivate our empirical analysis of the relationship between the agricultural and non-agricultural labour productivity gap and inequality or poverty.

III. Convergence of labour productivity in agricultural and non-agricultural sectors

Drawing upon the theoretical discussion in the last section, this section will examine the relationship between agricultural labour productivity and non-agricultural labour productivity with a focus on (i) whether these two converge or diverge over time, (ii) whether agricultural labour productivity converges across different countries and (iii) whether non-agricultural labour productivity converges across different countries. In (ii) and (iii), the inter-sectoral effects are also taken into account in one case, that is, the effect of lagged non-agricultural agricultural productivity on agricultural labour productivity is considered, while in (iii) the effect of lagged agricultural productivity on non-agricultural labour productivity is taken into account. For simplicity, the labour productivity of agricultural (non-agricultural) sector is defined as value added in the agricultural (non-agricultural) sector divided by the number of workers in the agricultural (non-agricultural) sector.

Table 1 compares labour productivity in these sectors by country, by region, and for Asia as a whole. The comparison is also made for the entire period as well as before and after the year 2000. Table 1 reports labour productivity growth as well as labour productivity gap as defined by the gap between 'log of agricultural value added per worker in the non-agricultural sector' and 'log of value added in the non-agricultural sector'. Consistent with earlier literature (e.g. Martin and Mitra, 2001; Bernard and Jones, 1996), non-agricultural labour productivity is higher in all the cases (except Micronesia before 2000). Also, the labour productivity gap is higher after 2000 in all the cases (except Fiji). Our results strongly confirm the labour productivity *divergence* between the two sectors. That is, non-agricultural labour productivity was higher than agricultural labour productivity to start with, and then the gap has expanded over time.

(Table 1 to be inserted around here)

However, there is a great degree of heterogeneity in terms of the speed of divergence. For instance, in a few countries (e.g. Indonesia and Micronesia), the gap has only moderately increased, but in other countries (e.g. China, India, Bhutan), the gap dramatically increased after 2000. It is thus safe to conclude that there is no evidence for the labour productivity convergence between agricultural and non-agricultural sector. This is due to the fact that, while

agricultural labour productivity has grown substantially since 2000, non-agricultural labour productivity has grown even faster in many countries.

Figures 1 and 2 have confirmed these results graphically. Figure 1 plots the labour productivity in agricultural and non-agricultural sectors in South Asian countries over time. The productivity gap was initially small in many countries (i.e. in the 1960s to the 1970s), but it has expanded over the years. Figure 2 indicates that the pattern of the above results is broadly similar for East and Southeast Asia countries. If we aggregate these data, the divergence of labour productivity between the agricultural and non-agricultural sectors can be confirmed for entire Asia.

(Figures 1 and 2 to be inserted around here)

Next, we will examine whether agricultural labour productivity (or non-agricultural labour productivity) has converged across different countries based on the following simple static model (fixed-effects model) and dynamic panel model (System GMM). The idea is similar to Ghosh (2006) who examined the convergence of agricultural productivity among Indian states 1960-2001. He found that that there has been significant divergence in labour productivity, particularly after the early 1990s, while there has been no significant convergence or divergence in land productivity and per capita agricultural output. To take account of the business cycle, we have taken the five-year averages and estimate the same models as follows. We have redefined the time periods as t=1 for 1960-64, t=2 for 1965-69, ... , t=11 for 2010-14. A selection of the countries is guided by the availability of variables: 23-37 middle and low income countries have been chosen from Asia and the Pacific.

First, the static model or the fixed-effects model is specified as:

$$dlogAGLP_{it} = \beta_0 + \beta_1 logAGLP_{it-1} + \beta_2 T + X_{it} \cdot \beta_3 + \beta_4 dlog\ NAGLP_{it-1} + \mu_i + \varepsilon_{it} \quad (4)$$

where $dlogAGLP_{it}$ stands for the annual agricultural labour productivity growth at time *t* for the country *i*. $logAGLP_{it-1}$ is the level of agricultural productivity 1 period earlier in order to capture the convergence effect following the empirical literature to test Solow growth model. Our main hypothesis for convergence is to test whether β_1 is negative.

T is the linear time trend. X_{it} is a vector of control variables, such as log a of schooling years, log a of shara e of mining sector (in order to capture the country's resource dependency), the lagged level of inequality (based on the Gini coefficient). A selection of explanatory variables draws upon the recent literature which investigated the interactions between agricultural growth and non-agricultural growth (see Christiaensen et al., 2011 and Imai, Cheng, and Gaiha, 2017 for details). The average years of total schooling is based on Barro-Lee data (http://www.barrolee.com/) and has been commonly used in the empirical macroeconomics literature as it is a broad measure of the human capital stock of the country. It is assumed that as the country's educational attainment improves, agricultural or non-agricultural labour productivity improves. The share of mining sector captures the extent to which the country relies on natural resources and may undermine the sectoral labour productivity. The degree of inequality in various ways influences the sectoral labour productivity. For instance, if there exists a threshold (based on the nutritional requirement) below which workers cannot work efficiently in the labour market, a high level of inequality may undermine the agricultural or non-agricultural labour productivity. $dlog\ NAGLP_{it-1}$ is the lagged annual non-agricultural productivity growth to capture the transmission effect of the labour productivity growth in the non-agricultural sector. This draws upon Vollrath's (2009b) model which showed that non-agricultural labour productivity enhances agricultural labour productivity over time in the dual economy setting. μ_i is the country's unobservable fixed effect (e.g. cultural or institutional factors). ε_{it} is an error term. We estimate this model with and without control variables or the non-agricultural labour productivity growth term, while the results are robust to inclusion/exclusion of a few other explanatory variables.

As an extension, equation (1) has been estimated by using the dynamic panel model (System GMM) drawing upon the Blundell-Bond (1998) robust estimator.

$$dlogAGLP_{it} = \beta_0 + \beta_1 dlogAGLP_{it-1} + \beta_2 logAGLP_{it-1} + \beta_3 T + \beta_4 dlog\ NAGLP_{it-1} + \mu_i + \varepsilon_{it} \quad (5)$$

The lagged dependent variable captures the persistent effect of agricultural labour productivity growth. Control variables have been dropped as they are statistically insignificant.

Exactly the same models can be estimated for the non-agricultural labour productivity growth by static and dynamic panel models as in Equations (6) and (7). The same models have been applied to subsamples for South Asia and for East and Southeast Asia.

$$dlogNAGGLP_{it} = \beta_0 + \beta_1 logNAGLP_{it-5} + \beta_2 T + X_{it} \cdot \beta_3 + \beta_4 dlog\ AGLP_{it-1} + \mu_i + \varepsilon_{it} \quad (6)$$

$$dlogNAGLP_{it} = \beta_0 + \beta_1 dlogNAGLP_{it-1} + \beta_2 logNAGLP_{it-5} + \beta_3 T + \beta_4 dlog\ AGLP_{it-1} + \mu_i + \varepsilon_{it} \quad (7)$$

In Table 2 the above models are estimated by using the five-year average data. Here the presence of convergence effect can be tested by checking whether the lagged agricultural labour productivity (Agricultural VA per worker(t-1)) is negative and statistically significant in Cases 1-4, and whether lagged non-agricultural labour productivity (Non-Agricultural VA per worker(t-1)) is negative and statistically significant in Cases 5-8. The result on a positive effect of the agricultural productivity on the non-agricultural productivity (Cases 1-4) is important as this is consistent with the prediction of Vollrath's (2009b) model that there is a diffusion effect of the agricultural sector. This is important in terms of the literature on structural transformation in Asia (Reardon and Timmer, 2014) which suggests that the transformation of the agricultural sector (e.g. commercialisation and product diversification) is becoming closely linked to, for instance, changes in the dietary pattern, supply chain and retail revolution, and integrated labour, land and credit markets. Here the whole process of structural transformation implies a positive diffusion effect of the agricultural labour productivity on the non-agricultural labour productivity. However, contrary to Vollrath's prediction, a positive effect of the non-agricultural labour productivity on the agricultural labour productivity is not observed as many Asian countries were primarily dependent on the agricultural sector in our data period.

In Table 2 we confirm that the labour productivity converges in both agricultural and non-agricultural sectors and the convergence effect is significant in all the cases except Case 2. This implies 'a catching-up effect' where the countries with the relatively low agricultural labour productivity tend to catch up with those with the relatively high agricultural labour productivity. The catching up effect is also found for non-agricultural labour productivity.

We have also found that lagged non-agricultural labour productivity growth *deters* agricultural labour productivity growth (Cases 3 and 4). This is consistent with the theoretical model of Vollrath (2009b) that an improvement of non-agricultural productivity induces agricultural workers to work more efficiently. However, it should be noted that the result is reversed when we use the annual panel data where non-agricultural labour productivity is

lagged by 5 years. Here, lagged non-agricultural labour productivity growth is found to *promote* agricultural labour productivity growth as predicted by the theoretical model.[4]

On the other hand, we have found, based on the five-year average panel, lagged agricultural labour productivity growth *promotes* non-agricultural labour productivity growth (Cases 5, 7 and 8). It should be noted that in Case 8 the lagged agricultural productivity growth is treated as an endogenous variable. Other covariates are mostly statistically insignificant, but a large lagged inequality increases non-agricultural labour productivity growth in Case 7.

(Table 2 to be inserted around here)

We have estimated the same models using the five-year average data only for South Asia. A statistically significant convergence effect is found only in the case of the agricultural labour productivity growth. On the cross-sectoral effects, the lagged agricultural labour productivity growth is found to promote the non-agricultural labour productivity growth. For South Asia, a higher level of inequality tends to *reduce* the overall agricultural labour productivity growth with some lag. Given that inequality can dampen the productivity of the disadvantaged group of agricultural workers or poor smallholders, this is a plausible result.[5] When we replicate the same regressions for East and Southeast Asia, we find that convergence effects are generally found to be significant. On the cross-sectoral effect, lagged agricultural labour productivity growth positively affects non-agricultural labour productivity growth.[6]

IV. Effects of the labour productivity gap between agricultural and non-agricultural sectors on poverty, inequality and the sectoral population share

[4] The results based on the annual panel will be provided on request.

[5] It is noted that for South Asian countries the Gini coefficient is *positively* correlated with the agricultural commercialisation index based on the degree of the extent to which agricultural product is processed (Imai, Gaiha, and Bresciani, 2016) with the coefficient of correlation 0.067, while the correlation is *negative* for East and Southeast Asian countries (-0.400). This could explain the negative correlation between the inequality and the agricultural labour productivity for South Asia, though the causality will have to be examined carefully in the future study.

[6] The disaggregated results will be provided on request.

We have so far examined the pattern of (i) the convergence of labour productivity between agricultural and non-agricultural sectors and (ii) the convergence of agricultural or non-agricultural productivity across different countries. Overall, the agricultural labour productivity growth has promoted the non-agricultural productivity growth and the sectoral gap has widened, while the between-country disparity of the sectoral labour productivity has reduced. These findings are broadly consistent with the theoretical model of Vollrath (2009b).

An interesting empirical question is how this process will dynamically affect poverty and inequality as well as labour allocation across different sectors over time. As we discussed in Section II, the theoretical model implies that an increase of the sectoral gap tends to be generally less-egalitarian, or increase inequality when both sectors grow (Bourguignon, 1990). However, it is not straightforward to answer the question because of the difficulty in disentangling the complex causal links from the labour productivity gap between agricultural and non-agricultural sectors to poverty (or inequality or the sectoral population share). For instance, the increase in the labour productivity gap may imply 'the divergence', that is, the change towards the higher non-agricultural labour productivity (reflecting the technological development) and/or the lower or more stagnant agricultural productivity. On the other hand, the reduction in the gap may imply the change towards the convergence due to the stagnant non-agricultural labour productivity and/or the increase in the agricultural labour productivity. However, while the larger gap affects poverty or inequality, the higher poverty rates or inequality would also influence the gap. For instance, the poor people in rural areas cannot invest in a profitable investment in agriculture that would require a certain amount of investment in physical and human capital (e.g. machinery; high yielding crops), which will hinder the growth of labour productivity in the agricultural areas. There is a need for instrumenting the labour productivity gap because it may be endogenous.

We have tackled the endogeneity by instrumenting the labour productivity gap by (i) the lagged agricultural product diversity index (Imai et al., 2016) [7] and (ii) the lagged logarithm of

[7] This draws upon Remans et al. (2014) who used an index called 'Shannon Entropy diversity metric' to capture the production diversity at the country level using FAOSTAT and is defined as:

$H' = -\sum_{i=1}^{R} p_i \ln p_i$

where R is the number of agricultural products and p_i is the share of production for the item i, available from FAOSTAT. The production share, p_i, is defined in terms of the monetary value

the production share of the mining sector in GDP. The first instrument is used as a proxy for the agricultural transformation by Imai et al. (2016) and is supposed to affect the labour productivity gap by influencing mainly the agricultural labour productivity (ibid., 2016). However, the change of the production pattern itself cannot influence *directly* poverty or inequality. We cannot deny the possibility that the process of specialisation could increase poverty, for instance, as there may be less demand for manual labour, but we can reasonably assume that poverty can change through the change in the farm production or income (per worker). The second instrument could also reduce the labour productivity gap because the dependence on the mining sector could deter the overall effort for technological progress in the industrial sector, without directly affecting poverty. The reliance on the mining sector could affect poverty directly (e.g. the impoverishment of manual workers in the mining sector), but we assume that this does not have a direct impact on poverty in particular in rural areas. We assume that the productivity or income effect is larger than the direct effect on poverty, while we admit any limitations in using the second instrument.[8] We have applied the IV model in the panel framework using the fixed-effects IV model whereby the unobservable country effect is taken into account. Because we focus on the relatively longer-term effect, we use only the five-year average data.

In the first stage, we will estimate the determinants of the labour productivity gap between the two sectors.

$$Gap_{it-1} = \beta_0 + \beta_1 dlogAGLP_{it-1} + \beta_4 dlog\ NAGLP_{it-1} + \beta_3 S_{it-1} + \beta_4 Mining_{it-2} + \beta_5 Product\ Diversity_{it-2} + \mu_i + \varepsilon_{it} \quad (8)$$

Here *t* stands for the 5 year period as t=1 for 1960-64, t=2 for 1965-69, ... , t=11 for 2010-14. Gap_{it-1} is the first lag of normalised difference between non-agricultural value added per capita and agricultural value added per capita (PPP in US$ divided by 1000). $dlogAGLP_{it-1}$

at a local price for each product, i. If the country produces more agricultural products, including processed and unprocessed crops and the monetary values of products are more evenly divided among different items, the diversity index, H', takes a larger value. On the contrary, if the country produces a smaller number of agricultural products and the monetary value of one or two specific products is large, H' is smaller.

[8] These sets of instruments are the best candidates given the data availability.

is the lag of the first difference in log of agricultthe ural value added per capita, that is, the agricultural labour productivity growth during the preceding period. Likewise, $dlogNAGLP_{it-1}$ is the non-agricultural labour productivity growth during the preceding period. S_{it-1} is the lag of schooling years. μ_i is the unobservable country fixed effect and ε_{it} is an error term (independent and identically distributed).

Instruments for the labour productivity gap between agricultural and non-agricultural sectors are the second lag of the production share of the mining sector ($Mining_{it-2}$) and the second lag of agricultural product diversity index. These instruments, despite the limitations, are justified on the following grounds. Since the mining sector share is a variable closely associated with the (broadly predetermined) factor endowment of the country, it will have a direct effect on the country's labour allocations across different sectors, including the rural agricultural sector, the rural non-agricultural sector (non-mining or mining), the urban non-agricultural sector (non-mining or mining). Depending on the degree of dependence on mining resources, the allocation of labour across sectors and the worker's effort in each sector are influenced directly. It is surmised here that the effect of mining sector share first influences sectoral labour productivity, rather than poverty. While the mining sector share may influence poverty directly (e.g. through the impoverishment of mining workers), we assume that it mainly influences the relative sectoral productivity. The second instrument, the product diversity index affects the agricultural labour productivity directly as more diversified production implies the country's adoption of profitable and marketable agricultural products (e.g. vegetables, fruits, meat). The index also influences the non-agricultural labour productivity as the introduction of these products would influence the productivity of the food processing sector. However, it is unlikely for the product diversity index affects directly poverty or inequality. These instruments – despite the limitations – have been validated by specification tests.

In the second stage, poverty is estimated by the (instrumented) labour productivity gap as well as other determinants.

$$Poverty_{it} = \gamma_0 + \gamma_1 \widehat{Gap}_{it-1} + \gamma_2 dlogAGLP_{it-1} + \gamma_3 dlog\ NAGLP_{it-1} + \gamma_4 S_{it-1} + \theta_i + e_{it} \quad (9)$$

Equations (8) and (9) are estimated by the fixed-effects IV model. Poverty is defined in various ways, namely (i) the national poverty headcount or poverty gap based on the international poverty line at US$1.90 (extreme poverty) or US$3.10 (moderate poverty) based on

PPP(Purchasing Power Parity) in 2011 (based on the World Development Indicators in 2016); (ii) the rural poverty headcount, the poverty gap, or the poverty gap squared based on US$1.25 (extreme poverty) or US$2.00 (moderate poverty) based on PPP(Purchasing Power Parity) in 2005; and the urban poverty indices (same as (ii), based on the household data in rural areas).[9] In one case we have replaced poverty by the Gini coefficient evaluated either at the national level or sub-national level (that is, for rural or urban areas separately). Finally, given the data limitations, we have derived the population share of the rural sector, the non-agricultural sector, and the urban sector and used each share as a dependent variable in the second-stage regression (Imai, Gaiha, and Garbero, 2017). This aims to examine how the labour productivity gap will influence the labour allocation in the middle to long run. In all the cases the endogeneity of the labour productivity gap is instrumented.

First, we have estimated national poverty in the second stage (the upper panel of Table 3).[10] In the first stage one of the instruments, the agricultural product diversity in the preceding period will reduce the labour productivity gap. That is, if the structural transformation in the rural sector progresses and the agricultural production is more diversified, then the gap will be reduced presumably because the agricultural sector productivity will catch up with the non-agricultural productivity. However, the first lagged agricultural productivity growth rather *increases* the gap. This is counter-intuitive, but if the agricultural productivity growth promotes the non-agricultural growth without lag, the period with a faster agricultural productivity growth may match the period even with faster non-agricultural growth. The coefficient estimate of the non-agricultural labour productivity growth is negative, but not statistically significant.[11] Education tends to increase the gap.

[9] The difference in the definitions of poverty for the national and rural or urban aggregates reflects the data availability. Poverty estimates (ii) and (iii) have been provided by SKD, IFAD.

[10] A full set of the regression results will be provided on request. We provide only the second stage results in Table 3.

[11] The correlation between the labour productivity gap and the non-agricultural labour productivity growth is positive (with the coefficient of correlation 0.034). The coefficient of correlation between the gap and the agricultural labour productivity growth is 0.036. Not surprisingly, the correlation between the agricultural and non-agricultural sector growth terms is high (0.614). The highest variance inflation factor (VIF) of the first stage regression is 2.44,

(Table 3 to be inserted around here)

The question arising from the analysis in the last section is why the labour productivity gap has grown in some countries, and not in other countries. It is not easy to provide a definite answer, but our results imply that the agricultural transformation reduces the gap and that better human capital widens the gap.

In the second stage, we do not find any evidence that the gap influences poverty at the national level with the coefficient estimate negative (except the second column) and statistically insignificant (the upper panel of Table 3).[12] We find that schooling years is negative and statistically significant. F-statistic of excluded instruments is 16.34, above the threshold of 1 and Sargan over-identification test of all instruments is not significant (with P-value 0.331), validating the IV estimation.

Next, we examine whether the labour productivity gap has affected poverty. Because the sample reduces, the results in the first stage have changed slightly. For instance, the non-agricultural productivity growth is now negative and significant, while one of the instruments, the productivity-diversity index is now *positive* and significant. So with a smaller sample, the progress of the agricultural transformation tends to *increase* the labour productivity gap. The reason is not clear, but in this case, the agricultural transformation may have an instant impact on improving both agricultural and non-agricultural labour productivities, with the magnitude of the latter comparatively larger.

In the second stage, the increase of the labour productivity gap tends to reduce poverty in the rural regions regardless of the choice of poverty thresholds, for all different measures of poverty, i.e., headcount, poverty gap and poverty gap squared (except the third columns for extreme poverty gap squared) as shown in the upper panel of Table 3. That is, as the non-agricultural labour productivity grows faster than the agricultural labour productivity, rural poverty significantly reduces in every dimension, that is, the share of the poor, the depth of

below the threshold 10, which would justify the inclusion of the labour productivity growth in the two sectors at the same time.

[12] We have also estimated the second-stage regressions by the FE model without using IV. In this case, the sample size is larger, but we have found that the lagged labour productivity gap reduces significantly both extreme and moderate poverty, for both the headcount ratio and poverty gap.

rural poverty and the inequality among the rural poor. This result may not be consistent with a theoretical prediction by Bourguignon (1990) as the model suggests that the gap between agricultural and non-agricultural sectors tends to increase inequality with elastic capital-labour substitution assumed in the modern sector. However, Vollrath's (2009b) model implies that as the non-agricultural labour productivity increases, the efficiency of workers in the agricultural sector improves. If this helps the rural poor escape from poverty, we expect that non-agricultural labour productivity growth has an effect of reducing rural poverty. Here, the test of excluded instruments (F-statistic) is 9.55 (below the threshold of 10) partly because of the small sample size and so the results need to be interpreted with caution. Sargan statistic is not significant, justifying the use of IV.[13]

We have also estimated urban poverty in the second stage of IV-FE model. The results are shown in the lower panel of Table 3. We have found that the size of the poverty-reducing effect is much larger for urban poverty rather than for rural poverty. That is, as the gap between the non-agricultural and agricultural labour productivity expands, both urban poverty and rural poverty decrease, but urban poverty tends to decline at a much faster rate. However, the results will have to be interpreted with caution, particularly in the cases where the F statistic for excluded instruments in the first stage is low (columns 2 and 3).

Finally, we have estimated the effect of the lagged labour productivity gap on the Gini coefficient at the national, rural and urban levels. As the sample size differs, the result in the first columns cannot be compared with the results in the second and the third columns. However, after controlling for the endogeneity of the labour productivity gap, we have found evidence that the gap significantly reduces the national Gini coefficient (the lower panel of Table 3). In this case, the first-stage F-statistic is larger than 10. The result is robust if we do not instrument the labour productivity gap or if we use the smaller sample for which disaggregated inequality data are available.

Using the disaggregated data, we have also estimated the effects of the lagged labour productivity gap on the sectoral population share drawing upon Imai, Gaiha, and Garbero (2017). The results will have to be interpreted with caution specifically in the first and the second columns due to the small sample size where the specification tests for IV do not validate the specifications. However, we have found some evidence that the labour productivity gap reduces the share of rural people and increases the share of the rural non-agricultural sector. In

[13] The lagged labour productivity gap is no longer statistically significant in explaining rural poverty for the larger sample in the FE model without IV.

case we use a larger sample size, we have found that the lagged productivity gap increases the population share of the urban sector significantly. These results are broadly consistent with the theoretical model of Vollrath (2009b) where increases in non-agricultural productivity will help industrialise the economy and induce agricultural workers to work more efficiently, while the share of the agricultural sector reduces over time. If this process benefits much of the population in rural and urban areas, inequality is likely to decline over time. However, our result is not consistent with Bourguignon's (1990) model which implies that the gap between agricultural and non-agricultural sectors tends to increase inequality.

In sum, we have found that the increase in the lagged labour productivity gap which is treated as endogenous will reduce both urban and rural poverty as well as the national inequality. In particular, there is robust evidence confirming that the labour productivity gap reduces urban poverty evaluated at the poverty threshold at US$2.00.

IV. Concluding Observations

First, we have examined whether the labour productivities in agricultural and non-agricultural sectors have converged or not using the five-year average panel dataset. We have found robust evidence that non-agricultural labour productivity and agricultural labour productivity did not converge as the former has grown faster and the gap has increased significantly over time.

We have also observed in the case where all the Asian countries are included that (i) agricultural labour productivity has converged across countries; (ii) non-agricultural labour productivity has converged across countries; and (iii) the convergence effect is stronger for the non-agricultural sector. Agricultural labour productivity growth was found to promote non-agricultural productivity growth with some lag. That is, despite the lower growth in agricultural labour productivity, the agricultural sector played an important role in promoting non-agricultural labour productivity and thus in non-agricultural growth. As we use the five-year average panel data, we can identify the middle to long-run effect by controlling for the short-term fluctuations.

In the second part, we have examined whether the labour productivity gap between the agricultural and the non-agricultural sectors reduced poverty, inequality and the share of the sectoral population over time. While the result varies depending on the specifications, we have found some evidence that the labour productivity gap reduces both urban and rural poverty over time as well as the national inequality. The gap also is found to increase the share of the population in the urban sector.

Our results provide the following policy implications. While the improvement in the agricultural labour productivity would bring about improvement in the non-agricultural labour productivity, the latter (the non-agricultural labour productivity) has increased faster than the former (the agricultural labour productivity) over time, causing the gap between the two sectors. The widening gap was found to reduce poverty and inequality. These results are important in light of the literature on structural transformation in Asia (e.g. Reardon and Timmer 2014, Imai et al. 2016) which underscores the diffusion from the agricultural sector. Our results suggest that as the agricultural sector experiences structural changes, it plays a central role in improving non-agricultural labour productivity and reducing poverty and inequality of the country. So policymakers need to facilitate the process of structural transformation (e.g. commercialisation and product diversification of agriculture; revolutions in supply chain and retail networks, and integration of labour, land and credit markets) to improve agricultural labour productivity and reduce poverty and inequality of the country.

References

Barro, R.J. and Sala-i-Martin, X., (1992). Convergence. *Journal of political Economy*, 100(2), pp.223-251.

Barro, R.J., Sala-i-Martin, X., Blanchard, O.J. and Hall, R.E., (1991). Convergence across states and regions. *Brookings papers on economic activity*, 1, 107-182.

Barrett, C.B., Christiaensen, L., Sheahan, M. and Shimeles, A., (2017) On the structural transformation of rural Africa. Journal of African Economies, 26(suppl_1), pp.i11-i35.

Baumol, W. J., Nelson, R. R., and Wolff, E. N. (eds.) (1994) *Convergence of Productivity: Cross-National Studies and Historical Evidence*, Oxford University Press, New York.

Ben-David, D., (1996). Trade and convergence among countries. *Journal of international Economics*, 40(3-4), pp.279-298.

Bernard, A.B. and Jones, C.I., (1996). Comparing apples to oranges: productivity convergence and measurement across industries and countries. *The American Economic Review*, pp.1216-1238.

Blundell, R. and Bond, S., (1998). Initial conditions and moment restrictions in dynamic panel data models. *Journal of Econometrics*, 87(1), pp.115-143.

Bourguignon, F., (1990). Growth and inequality in the dual model of development: the role of demand factors. *The Review of Economic Studies*, 57(2), pp.215-228.

Bourguignon, F. and Morrisson, C., (1998). Inequality and development: the role of dualism. *Journal of Development Economics*, 57(2), pp.233-257.

Choo, Hakchung (1991), "A Comparison of Income Distribution in Japan, Korea and Taiwan," in *Making Economies More Efficient and More Equitable: Factors Determining Income Distribution*, eds. By Toshiyuki Mizoguchi, Kinokuniya Company and Oxford University Press.

Christiaensen, L., L. Demery, and J. Kuhl., (2011). The (Evolving) Role of Agriculture in Poverty Reduction: An Empirical Perspective. *Journal of Development Economics* 96 (2): 239–254.

Dawe, D. (2015) 'Agricultural transformation of middle-income Asian economies: diversification, farm size and mechanization', ESA Working Paper 15-04, Rome, FAO.

Dixit, A. K., (1973). 'Models of Dual Economies', in J. A. Mirrlees and N. H. Stern (eds), *Models of Economic Growth*, New York, Wiley, pp. 325–352.

Fields, G.S., (1993). Inequality in dual economy models. *The Economic Journal*, 103(420), pp.1228-1235.

Gollin, D., Lagakos, D. and Waugh, M.E. (2013). The agricultural productivity gap. *The Quarterly Journal of Economics*, 129(2), pp.939-993.

Ghosh, M., (2006). Regional convergence in Indian agriculture. *Indian Journal of Agricultural Economics*, 61(4), 610-629.

Imai, K. S., Cheng, W. and Gaiha, R. (2017). Dynamic and Long-term Linkages among Agricultural and Non-Agricultural Growth, Inequality and Poverty in Developing Countries, *International Review of Applied Economics*, 31(3), pp. 318-338

Imai, K. S., Gaiha, R., and Bresciani, F., (2016) 'Dynamics of Rural Transformation and Poverty in Rural Asia and the Pacific', RIEB Discussion Paper, DP2016-30, Kobe University.

Imai, K.S. Gaiha, R., Garbero, A., (2017) Poverty Reduction during the Rural-Urban Transformation: Rural Development is still more important than Urbanisation, *Journal of Policy Modeling*, 39 (6), pp. 963-982.

Kuznets, S. S., (1971) *Economic Growth of Nations: Total Output and Production Structure*, Cambridge, MA: Harvard University Press, 1971.

Lewis, W.A., (1955) *The Theory of Economic Growth*, Homewood, Illinois: Richard D. Irwin, Inc.

Moriguchi, C. and Saez, E., (2008) The evolution of income concentration in Japan, 1886–2005: evidence from income tax statistics. *The Review of Economics and Statistics*, 90(4), pp.713-734.

Johnston, B.F. and Mellor, J.W., (1961). The role of agriculture in economic development. *The American Economic Review*, 51(4), 566-593.

Levine, R. and Renelt, D., (1992). A sensitivity analysis of cross-country growth regressions. *The American economic review*, 82(4), 942-963.

Lewis, W. A. (1954). Economic Development with Unlimited Supplies of Labour, *The Manchester School*, 22(2), pp. 139–191.

Lewis, W.A., (1979) The dual economy revisited. *The Manchester School*, 47(3), pp.211-229.

Mundlak, Y. (2000). *Agriculture and Economic Growth*, Cambridge, MA, Harvard University Press.

Martin, W., and Mitra, D., (2001). Productivity Growth and Convergence in Agriculture versus Manufacturing *Economic Development and Cultural Change*, 49(2), pp. 403-422.

Quah, D.T., (1996). Empirics for economic growth and convergence. *European Economic Review*, 40(6), pp.1353-1375.

Reardon T and Timmer CP. (2014). Five Inter-Linked Transformations in the Asian Agrifood Economy: Food Security Implications. *Global Food Security* 3(2): 108-117.

Remans, R., Wood, S. A., Saha, N., Anderman, T. L, DeFries, R. S., (2014). Measuring nutritional diversity of national food supplies. *Global Food Security*, 3(3-4), pp.174–182.

Robinson, S., (1976). A note on the U hypothesis relating income inequality and economic development. *The American Economic Review*, 66(3), pp.437-440.

Vollrath, D., (2009a). How important are dual economy effects for aggregate productivity?. *Journal of Development Economics*, 88(2), pp.325-334.

Vollrath, D. (2009b). The dual economy in long-run development. *Journal of Economic Growth*, 14(4), p.287.

Table 1 Labour Productivity Growth of Agricultural and Non-agricultural sectors and Labour Productivity Gap (in level) in these sectors*

	Total			Before 2000			After 2000		
	Agricultural Labour Productivity *Growth*[*1]	Non-agricultural Labour Productivity *Growth*[*2]	Labour Productivity Gap (in Level)*[*3]	Agricultural Labour Productivity *Growth*[*1]	Non-agricultural Labour Productivity *Growth*[*2]	Labour Productivity Gap (in Level)*[*3]	Agricultural Labour Productivity *Growth*[*1]	Non-agricultural Labour Productivity *Growth*[*2]	Labour Productivity Gap (in Level)*[*3]
South Asia									
Bangladesh	0.33	2.4	**0.95**	-0.41	1.49	**0.82**	2.57	5.15	**1.39**
Bhutan	1.3	7.9	**0.66**	2.13	8.38	**0.29**	0.06	7.14	**1.28**
India	0.66	4.01	**0.81**	0.37	3.2	**0.59**	1.53	6.47	**1.52**
Nepal	0.5	2.62	**0.34**	0.002	2.78	**0.22**	1.79	2.29	**0.61**
Pakistan	1	3.29	**0.91**	0.93	3.33	**0.78**	1.25	3.15	**1.28**
Sri Lanka	1.29	3.76	**1.4**	1.03	3.36	**1.21**	2.04	4.97	**1.99**
Total	0.82	3.77	**0.88**	0.55	3.36	**0.71**	1.56	4.83	**1.34**
East and Southeast Asia; Pacific									
Cambodia	2.72	7.25	**0.52**	1.93	5.66	**0.13**	3.23	7.99	**0.74**
China	2.96	7.34	**0.74**	2.78	6.54	**0.31**	3.51	9.75	**2.06**
Fiji	0.86	3.63	**2.96**	0.34	3.99	**2.87**	-0.66	0.97	**1.82**

Indonesia	1.4	4.38	**1.34**	1.09	4.34	**1.15**	2.32	4.51	**1.91**
Lao PDR	1.98	5.5	**0.33**	1.97	3.6	**0.1**	1.99	7.68	**0.62**
Malaysia	0.62	4.47	**1.78**	0.22	4.95	**1.5**	1.52	3.41	**2.52**
Micronesia	0.12	-0.27	**1.09**	-14.2	-6.31	**1.01**	0.74	0.19	**1.09**
Philippines	0.35	1.74	**1.72**	0.07	1.2	**1.64**	1.22	3.34	**1.97**
Timor-Leste	-2.9	4.87	**1.08**	-	-	**-**	-2.9	4.87	**1.08**
Vietnam	2.19	5.85	**1.18**	1.7	5.7	**0.94**	2.7	6.02	**1.46**
Total	1.15	3.68	**1.06**	0.96	3.14	**0.9**	1.48	4.64	**1.34**
Asia Total	0.84	3.44	**1.07**	0.24	2.56	**0.9**	2.04	5.16	**1.42**

Notes: *1: Agricultural Labour Productivity Growth = DLog (Agricultural Value Added per worker)
*2: Non-agricultural Labour Productivity Growth = DLog (Non-agricultural Value Added per worker)
*3: Labour Productivity Gap= Log (Non-agricultural Value Added per worker) - Log (Agricultural Value Added per worker)

Table 2 Convergence of Labour Productivity in Agricultural and Non-agricultural sectors (Total Asia, Five-year average Data)

	Dep. Var. D.log Agricultural VA per worker				Dep. Var. D.log Non-Agricultural VA per worker			
The model	Fixed-effects	Fixed-effects	Fixed-effects	SGMM	Fixed-effects	Fixed-effects	Fixed-effects	SGMM
VARIABLES	Case 1	Case 2	Case 3	Case 4	Case 5	Case 6	Case 7	Case 8
D.log Agricultural VA per worker(t-1)				0.331**	0.318***		0.281*	0.340**
				(0.141)	(0.117)		(0.160)	(0.145)
D.log Non-Agricultural VA per worker(t-1)		-0.0401	-0.100**	-0.154**				0.0136
		(0.0555)	(0.0418)	(0.0779)				(0.0756)
Agricultural VA per worker(t-1)	-4.27e-06**	-3.56e-06	-2.91e-05*	-2.61e-06**				
	(1.91e-06)	(2.19e-06)	(1.45e-05)	(1.22e-06)				
Non-Agricultural VA per worker(t-1)					-0.000111***	-9.56e-05***	-0.000124***	-2.73e-05***
					(2.28e-05)	(1.77e-05)	(3.19e-05)	(7.75e-06)
Log Share of the mining sector			0.00377				0.0119	

			(0.0101)				(0.0202)	
Log Schooling Years			-0.0366				0.00883	
			(0.103)				(0.144)	
log of Inequality Index			0.00424				0.00850*	
			(0.00259)				(0.00430)	
T	0.0197**	0.0102**	0.0203	0.00956**	0.0200***	0.0268***	0.0188	0.00446
	(0.00732)	(0.00484)	(0.0118)	(0.00386)	(0.00655)	(0.00750)	(0.0196)	(0.00473)
Constant	-0.118	-0.0144	-0.138	-0.00652	0.208	0.123	-0.147	0.171
	(0.0625)	(0.0462)	(0.211)	(0.0377)	(0.0485)	(0.0450)	(0.200)	(0.0545)
Observations	177	155	102	155	185	222	123	184
R-squared	0.054	0.033	0.197		0.253	0.160	0.257	
Number of countries	37	37	23	37	37	38	23	37

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Table 3: Effects of the labour productivity gap between the agricultural and non-agricultural sectors on poverty and inequality (The second stage of the IV-FE model)

VARIABLES	poverty HC USD1.90	poverty Gap USD1.90	poverty HC USD3.10	poverty Gap USD3.10		rural poverty HC USD1.25	rural poverty gap USD1.25	rural poverty gap2 USD1.25	rural poverty HC USD2.00	rural poverty gap USD2.00	rural poverty gap2 USD2.00	
L.Gap_noagri_agri	**-0.224**	**0.0811**	**-0.0738**	**-0.394**		**-1.620****	**-1.633****	**-1.291**	**-1.117****	**-1.357****	**-1.465****	
	(0.481)	**(0.464)**	**(0.601)**	**(0.459)**		**(0.734)**	**(0.797)**	**(2.664)**	**(0.504)**	**(0.593)**	**(0.662)**	
LD.logagrivapc	-3.445	-3.894	-2.793	-3.063		-1.176	-1.537	2.961	-0.904	-1.008	-1.152	
	(2.940)	(2.857)	(3.207)	(2.942)		(1.736)	(2.086)	(2.841)	(1.109)	(1.422)	(1.660)	
LD.lognoagrivapc	0.553	0.395	0.154	0.373		0.159	0.360	-1.132	0.190	0.172	0.214	
	(2.366)	(2.309)	(2.615)	(2.358)		(1.073)	(1.313)	(1.172)	(0.679)	(0.886)	(1.040)	
L.logschooling	-1.660	-1.613	-1.746	-1.470		-0.776	-1.368	-8.573**	-0.174	-0.584	-0.932	
	(1.085)	(1.023)	(1.224)	(1.056)		(0.888)	(0.931)	(4.119)	(0.592)	(0.704)	(0.799)	
Observations	77	77	77	77		45	45	45	45	45	45	
R-squared	0.251	0.190	0.170	0.273		0.479	0.557	0.561	0.455	0.506	0.524	
Number of countries	11	11	11	11		12	12	12	12	12	12	

VARIABLES	urban poverty HC USD1.25	urban poverty gap USD1.25	urban poverty gap2 USD1.25	urban poverty HC USD2.00	urban poverty gap USD2.00	urban poverty gap2 USD2.00		national Gini	rural Gini	urban Gini	Rural Share	Rural non-agri share	Urban Share
L.Gap_noagri_agri	**-19.40**	**-3.317****	**-2.074**	**-1.864*****	**-2.058*****	**-6.854**		**-4.636*****	**0.136**	**-0.0115**	**-24.46****	**30.81*****	**5.032***
	(12.74)	**(1.583)**	**(1.891)**	**(0.488)**	**(0.716)**	**(4.967)**		**(1.174)**	**(0.147)**	**(0.0971)**	**(8.294)**	**(8.281)**	**(2.535)**
LD.logagrivapc	26.21*	-0.525	0.316	-0.188	-0.0250	8.909*		6.316	-0.281	-0.198	-12.42	5.940	-5.097
	(14.18)	(1.702)	(1.711)	(1.052)	(1.287)	(5.084)		(3.925)	(0.183)	(0.142)	(21.90)	(17.65)	(7.491)
LD.lognoagrivapc	-15.68**	-0.564	-0.749	-0.174	-0.450	-5.528**		-6.143**	0.0261	0.00750	5.547	-9.953	8.586*
	(5.859)	(1.064)	(1.114)	(0.658)	(0.769)	(2.070)		(2.766)	(0.106)	(0.0860)	(14.99)	(19.43)	(5.048)
L.logschooling	-11.65	0.261	-0.702	-0.135	-0.737	-5.265		8.673***	-0.0299	0.234*	46.34***	-39.37***	-8.656
	(13.97)	(1.631)	(2.090)	(0.618)	(1.113)	(7.249)		(2.851)	(0.177)	(0.137)	(8.679)	(8.875)	(7.405)
Observations	44	42	39	43	42	42		77	45	43	24	24	68
R-squared	0.271	0.542	0.428	0.689	0.689	0.256		0.063	-0.003	0.356	0.686	0.629	0.034
Number of countries	12	12	11	12	12	12		12	12	12	6	6	10

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Figure 1. The gap between non-agricultural labour productivity (agricultural value added per worker) and agricultural labour productivity (agricultural value added per worker) (South Asia, by country)

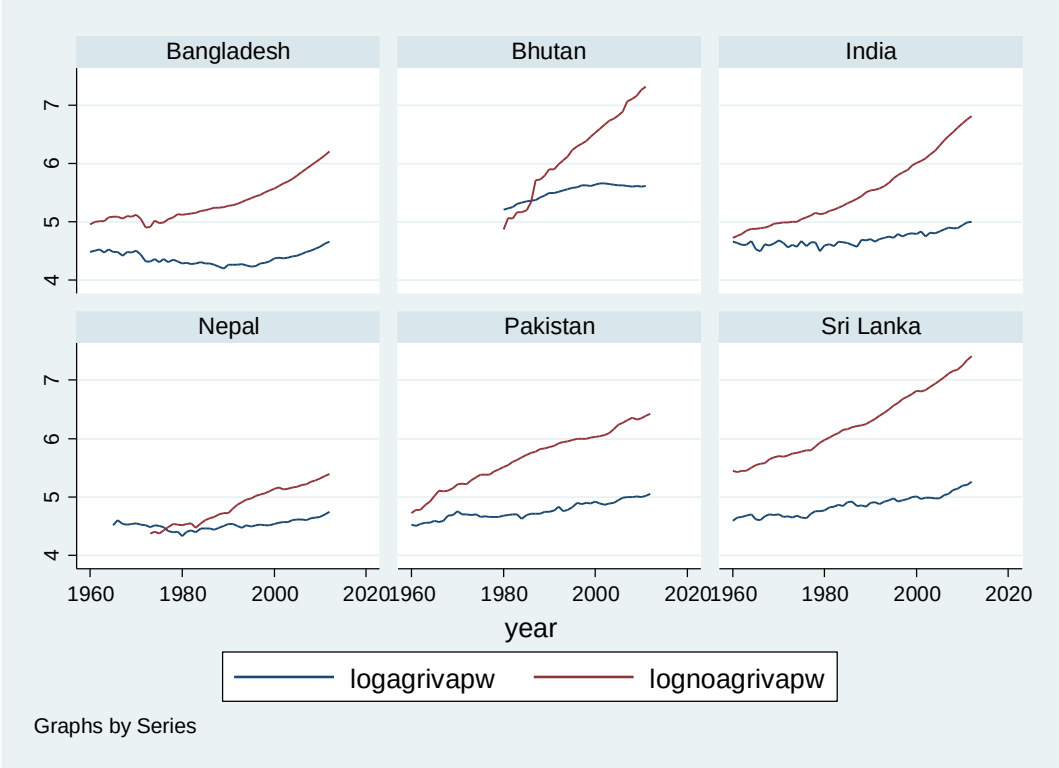

Figure 2 The gap between agricultural labour and non-agricultural labour productivity (East and Southeast Asia, by country)