

Structural change and income inequality – Agricultural development and inter-sectoral dualism in the developing world, 1960-2010

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ABSTRACT

Structural change consists of the long-term changes in the sectoral composition of output and employment. We introduce a structural change perspective to the study of income inequality in 27 countries of the developing world for the period 1960-2010. The service sector has become the main employer, but the agricultural sector is central to the income distribution because poverty is mostly rural, and the labor surplus is high. We decompose

the sectoral composition of aggregate labor productivity at the country level, divide the countries into agrarian, dual (beginner, intermediate and advanced), and mature economies and use the inter-sectoral productivity gap to test the effect of structural change on income inequality. We confirm increases in agricultural productivity everywhere and find that the inter-sectoral gap is positively associated with income inequality. The effect is negligible in agrarian and advanced economies but powerful in dual beginner economies:

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Recibido: 1 de diciembre de 2015 / Modificado: 19 de enero de 2016 / Aceptado: 13 de febrero de 2016

Para citar este artículo

Andersson, M. P. y Palacio, A. (2015). Structural change and income inequality – Agricultural development and inter-sectoral dualism in the developing world, 1960-2010. *OASIS*, 23, 99-122.
DOI: <http://dx.doi.org/10.18601/16577558.n23.06>

an increase of 1% in the inter-sectoral gap increases income inequality by 0.5%. The effect peters out in dual intermediate economies and disappears completely in dual advanced economies. Finally, redistribution has been the key to compensating the losers in the income changes, particularly for those entering the non-agricultural economy.

Key words: Structural change, income inequality, labor surplus, dualism, redistribution.

Cambio estructural y desigualdad de ingresos. Desarrollo agrícola y dualismo intersectorial en el mundo en desarrollo, 1960-2010

RESUMEN

El cambio estructural consiste en los cambios de largo plazo en la composición de la producción y el empleo nacional. Bajo este enfoque, se examina la evolución de la desigualdad en el ingreso en 27 países de tres continentes del mundo en desarrollo para el periodo 1960-2010. El sector de servicios se ha convertido en el mayor empleador, pero el sector agrícola sigue siendo importante en la distribución del ingreso porque la pobreza predomina en el campo y la mano de obra es abundante. Se hace una descomposición sectorial de la productividad agregada de la mano de obra a nivel país; los países son clasificados en agrarios, duales (pricipiante, intermedio y avanzado)

y economías maduras; se usa la brecha de productividad intersectorial para medir el efecto de cambio estructural sobre la desigualdad del ingreso. Los resultados confirman aumentos de la productividad agrícola y una asociación entre la brecha de productividad intersectorial y la desigualdad del ingreso. El efecto es, sin embargo, marginal en economías agrarias y avanzadas, pero fuerte e importante en economías duales principiantes: un incremento del 1% en la brecha de productividad intersectorial aumenta la desigualdad medida por el coeficiente de Gini en 0,5%. El efecto se pierde en economías duales intermedias y desaparece completamente en economías duales avanzadas. Finalmente, la redistribución ha sido la llave para compensar a los perdedores en los cambios de la desigualdad, particularmente las personas que entran a la economía no agrícola.

Palabras clave: cambio estructural, desigualdad en el ingreso, superávit de mano de obra, dualismo, redistribución.

INTRODUCTION

The developing world has achieved robust growth in the last decade. On average, countries in Asia, Latin America and Africa have been growing faster than their counterparts in the developed world, and the prospects for catching up seem to have improved in many countries (Subramanian and Kessler, 2013). Global poverty has declined, with China at the forefront, and the Millennium Development Goals and their successors – the Sustainable Development Goals – appear to have sent the

right policy message to maintain the global efforts toward building more prosperous societies (Sachs, 2012). However, the recent growth period, with the exception of that in Latin America (Lustig *et al.*, 2013), is associated with rising income inequality. Most countries in Asia and Africa seem to be experiencing the growth–equality trade-off (Kanbur *et al.*, 2014; Thorbecke and Ouyang, 2016). For these reasons, the concern for inequality has reached policymakers, academics, journalists and citizens, making the case that rising inequality dampens the possibility for economic growth to be sustained and harms the political climate. Concerns have also been raised regarding the nature of the recent growth spell and the extent to which it has been inclusive and stimulated structural change or mostly rewarded a particular group or sector of the economy. In this context, this paper deploys a structural change perspective emphasizing the long-term changes in the sectoral composition of developing economies to examine the development of income inequality in developing countries categorized according to their degree of dualism. This is measured by the inter-sectoral gap, which is the difference in average labor productivity between agriculture and non-agriculture.

We regard productivity improvements in the agricultural sector as one of the most important triggers of structural change and the main determinant of dualism. We therefore ask how structural change affects income inequality during the transition into and out of dualism. There are strong theoretical and empirical reasons to focus on the role of the agricultural sector in the discussion of structural change

and income inequality. By agriculture we mean both farming and agro-business that processes and transports the output. The notion that the labor productivity in agriculture is lower than that in non-agriculture is on one hand a sign of weak structural change and on the other hand a sign of the potential for growth. In general, the agricultural labor productivity gap is estimated to be around a factor of 4 after considering the sector differences in the hours worked and human capital per worker, as well as other measures of sector income (Gollin *et al.*, 2013). Today the agricultural sector employs more than 1.3 billion people, 97% of whom are in developing countries (fao, 2014). Attempts to close the agricultural gap improve the chances of feeding the world's growing population, which is forecasted to reach 8 billion by 2025, and of improving the material well-being of entire societies.

Our contribution to the literature is to approach the current evolution of inequality from the perspective of structural change, with a particular focus on the role of agriculture in development. The neglect of agriculture and the dual nature of the developing economy in the discussion on the relationship between growth and income inequality continues to attract surprisingly little attention (Timmer, 1988, 2007; Bourguignon and Morrisson, 1998; Vollrath, 2009). One reason might be that the decline of the agricultural income share in the total GDP gives the impression of being automatic and unlikely to act as a stimulator of the economy at large. We argue, and show, that such assumptions are potentially misleading. We draw attention to the need to identify the broad patterns of similarities

and dissimilarities between countries across developing regions by relating measures of structural change to income inequality. We divide countries into agrarian, dual and economically mature groups, as suggested by Fei and Ranis (1966), to account for the different phases of development, and extend the typology for dual economies with a sub-division between beginner, intermediate and advanced.

We examine 27 countries of Africa, Asia and Latin America for the period 1960-2010: 11 in sub-Saharan Africa, 9 in Latin America and 7 in Asia. These countries covered 40% of the world's GDP and 58% of the world's population in 2014 (IMF, 2015). We find that the inter-sectoral gap is positively associated with income inequality. The effect is small in agrarian economies and powerful in dual beginner economies. Later on, the effect peters out in dual intermediate economies and disappears completely in dual advanced economies. We also observe that agricultural productivity in recent decades has accelerated and grown faster than that of manufacturing and traditional services everywhere. The traditional service sector has indeed become the main employer, a sign of structural change, but it provides a negative contribution to the overall productivity in the agrarian economies of Africa, in six out of the nine dual economies of Latin America, and in one out of six economies of Asia¹. It thus becomes clear that redistribution (i.e. transfers) has become an important tool to compensate for the changes in the income distribution coming from the rapid expansion

of the service sector during the transition. The general implication is that agriculture triggers structural changes in agrarian economies, but the transition out of dualism is rather difficult to sustain. More attention should be paid to the evolution of the inter-sectoral gap in conjunction with better targeting of redistribution to address income inequality during the transition into and out of dualism.

The developing world has experienced strong growth in recent decades. The overall per capita growth in Asia was 5.9% per year between 2000 and 2010 (UNCTAD, 2012; Kanbur *et al.*, 2014); the annual per capita growth in Latin America was 2.3% a year, which is almost twice the growth rate of the 1990s (Tsounta and Osueke, 2014). The annual per capita growth was 2.7% a year in Sub-Saharan Africa, which contained six out of the ten fastest-growing economies in the world between 2000 and 2010 (McKay, 2013). The rapid growth in the last decade has indeed reduced global poverty, but it has also generated income inequality in large parts of Asia and Africa. Surprisingly, the Gini coefficient in Latin America declined from 0.53 to 0.50 between 2000 and 2011 (Lustig *et al.*, 2013). In Asia, income inequality rose in twelve out of thirty countries with comparable data (Kanbur *et al.*, 2014), including China, India and Indonesia, and covered 82% of the region's population. The Gini coefficient in China rose from 0.35 in 1993 to 0.42 in 2010; the same statistic rose from 0.32 to 0.37 in India and from 0.29 to 0.38 in Indonesia.

¹ Bolivia, Costa Rica and Colombia (Latin America); Thailand (Asia).

The Gini coefficient in Africa also rose from 0.43 in 2000–2004 to 0.46 in 2006–2009 (Thorbecke and Ouyang, 2016).

The paper is organized as follows. Section 2 considers the relationship between structural change and income inequality in recent decades and presents the typology to distinguish the evolution of the transition out of dualism. Section 3 concerns the methods and the data. Section 4 presents the results and Section 5 the conclusions.

PREVIOUS LITERATURE: STRUCTURAL CHANGE AND INCOME INEQUALITY

Structural change consists of the long-term changes in the composition of output and employment in the economy, with implications for income distribution (Kuznets and Murphy, 1966; Timmer, 1988, 2007). One of the major structural changes in the second half of the twentieth century was the reallocation of agricultural labor in the developing world, particularly in Southeast Asia and Latin America (Ocampo *et al.*, 2009). In the last decade, the share of agricultural labor in Africa has also declined by almost 10%, and this is one of the main explanations for its recent spurt of growth (McMillan and Harttgen, 2014). However, the reallocation of labor to other sectors is not complete, and surplus labor remains the main feature of developing economies.

Technically, surplus labor is the failure to allocate labor and capital across economic sectors in an optimal way (Lewis, 1954; Kuznets, 1955; Fei and Ranis, 1966). The absence of structural change may be related to surplus

labor, with the agricultural sector as the main reservoir. The difference in value-added per worker between agriculture and non-agriculture is called the inter-sectoral gap and is one of the main features indicating that an economy can be labeled as dual. The productivity gap is estimated to be around a factor of 4 in contemporary developing economies after considering the sector differences in hours worked or human capital per worker (Gollin *et al.*, 2013).

The nature of dualism is usually neglected in the discussion of growth and income distribution (Bourguignon and Morrisson, 1998). The neglect comes partly from the fact that the agricultural GDP declines as the economy grows and will therefore become less important for sustained economy-wide growth over time. The agricultural sector remains the mainstay for the majority of the population in many developing countries and continues to be an important source of income. Agriculture is also closely related to poverty reduction and income inequality. The elasticity of poverty reduction with respect to growth is stronger when growth originates in the agricultural sector (Ravallion and Chen, 2007; de Janvry and Sadoulet, 2009). Productivity growth in the agricultural sector also leads to sectoral productivity convergence and thus helps to reduce inequality (Timmer, 1988).

As agricultural productivity rises and labor reallocates to other sectors of the economy, the income distribution might worsen in the initial stages. One reason is that the production function may vary by sector, and so may the intra-sectoral distribution of income, which is affected by the type of migrants in terms of fi-

nancial, human and social capital and the level of productivity of the absorbing sectors. However, assuming constant intra-sectoral distribution of both sectors, the fact that the average income in agriculture is lower than that in the non-agricultural sector implies that income distribution depends on the share of the total labor force in each of these sectors. When the two sectors have different sizes, reallocation from agriculture to non-agriculture will change the variance of the overall income distribution. The changes will continue until the reallocation exhausts itself and the agricultural sector has become a small sector in terms of value-added and employment, with the same level of productivity as the non-agricultural sector. In other words, the disappearance of dualism relates to equal productivity between sectors and the significance of dualism for income distribution diminishes. Although the process is difficult to estimate, the evolution of income inequality needs to be investigated empirically (Kuznets and Murphy, 1966).

It is true that the relationship between structural change and income distribution is neither uniform nor automatic. Economies are in possession of different endowments and they might differ in terms of size, location, history, development strategy, and in their interaction with the rest of the world. On the other hand, transnational factors can influence countries in similar ways and explain the changes in income distribution. For instance, capital has been the main beneficiary of trade globalization regardless of the type

of export² goods (Bourguignon, 2011). Furthermore, a few individuals may monopolize the high returns from capital relative to labor (Piketty, 2014). Another explanation relates to technological progress that is labor-saving (e.g. mechanization) or capital/land-using (e.g. irrigation, fertilizers and high-yielding varieties). Hence, as technological progress advances, labor productivity may increase faster than the real wage, partly because of the labor surplus associated with the dual structure of the economy (Kanbur *et al.*, 2014). However, there are also other domestic rigidities to account for such an outcome, such as land tenure insecurity (Proto 2007; Deininger *et al.*, 2012), institutional capabilities (Rodrik, 2014), inadequate infrastructure (Banerjee *et al.*, 2012), missing markets and so forth. It is beyond the scope of this study to investigate all these aspects in detail.

We aim to use a typology that fits the phases proposed by Kuznets regarding the evolution of income distribution over time. On this line, Fei and Ranis (1966) suggest that countries can be divided into three groups: agrarian, dual and economically mature. A country can be described as agrarian when agriculture is the dominating sector of the economy, industry is insipient and the productivity of service activities is low. In this group, the average income and inequality are expected to be low. However, data from contemporary developing countries indicate that although the average income is likely to be low, the variance of the total income dis-

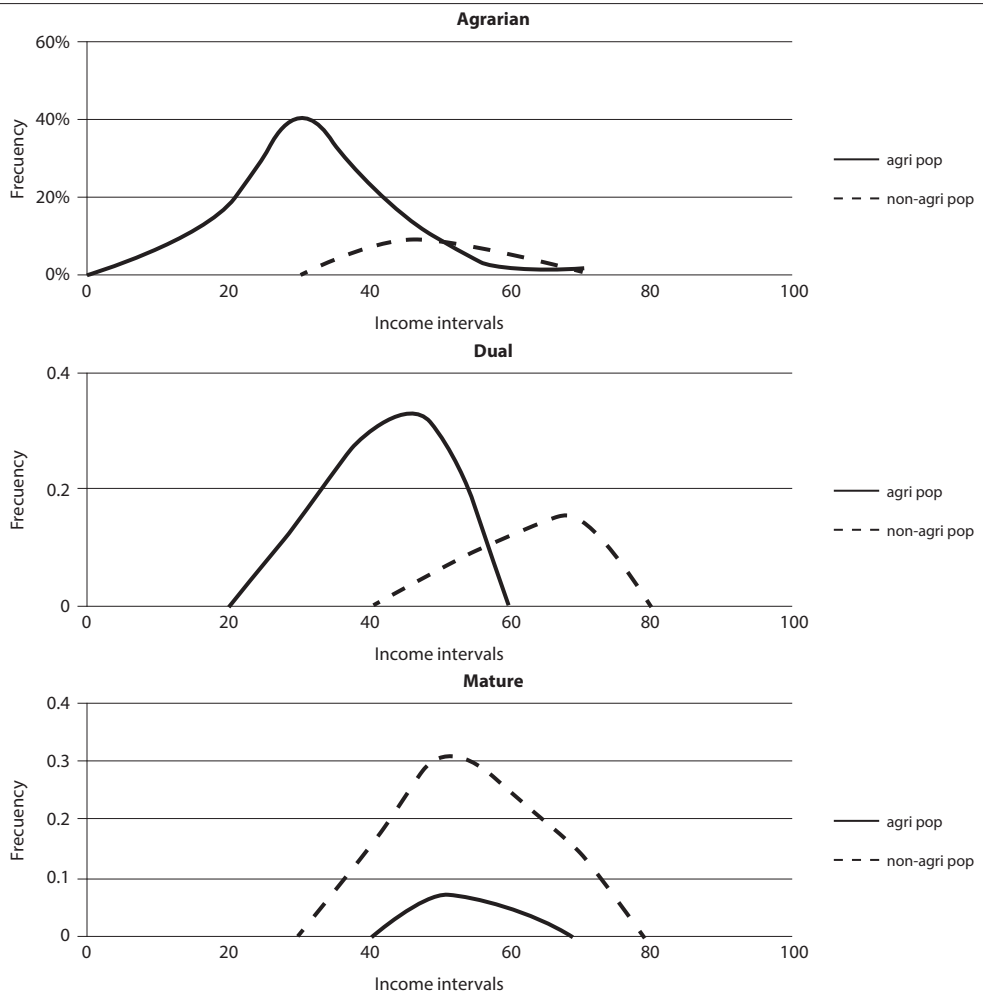
² Agricultural or mineral products or even labor-intensive manufactured goods.

tribution is not. One reason is that labor is mostly employed in agriculture and many of the laborers live in extreme poverty.

A country is dual when the non-agricultural sector and the agricultural sector have diverging levels of productivity and average income. Income inequality is expected to be rising or remain high. A reason may be that the labor productivity or average income between

the poor agricultural sector and the rich non-agricultural sector is diverging. Economies can remain dual for long periods of time, and shifting weights toward the high-productivity (but scarcely employed) end of the non-agricultural sector may keep inequality high.

Closing the gap between agriculture and non-agriculture is a powerful force in reducing inequality (Kuznets, 1955; Timmer, 1988



2007; Vollrath, 2009). Furthermore, it is a clear sign that a country is economically mature. The transition out of dualism into an industrial economy is complete, and the share of agriculture in value-added and employment is marginal but as productive as any other sector per unit of labor. The average income is similar across sectors, and the income inequality is low. Figure 1 below summarizes the theoretical insights into how income distribution is supposed to behave as agriculture declines.

As is usually the case, our approach using the Kuznets-Ranis and Fei typology is subject to limitations. First, the market structures (i.e. monopolies) may differ among sectors. Second, the absorbing sectors are not always likely to be high-productivity sectors, and perhaps these sectors are the “new agricultural sector” in terms of low productivity and surplus labor. Markets, prices and institutional capabilities are not studied directly either; therefore, making links to policy is less straightforward. Furthermore, uniform patterns reveal some associations but cannot determine causality.

METHODS AND DATA

We examine the relationship between structural change and income inequality in 27 countries of Africa, Asia and Latin America for the period 1960-2010: Argentina, Bolivia, Brazil, Botswana, Chile, China, Colombia, Costa Rica, Ethiopia, Ghana, Indonesia, India, Kenya, South Korea, Mexico, Mauritius,

Malawi, Malaysia, Nigeria, Peru, the Philippines, Senegal, Thailand, Tanzania, Venezuela, South Africa and Zambia. These countries accounted for 40% of the world's GDP and 58% of the world's population in 2014 (IMF, 2015). Our dependent variable is the most common measure of income inequality: the Gini coefficient. The Gini coefficient comes from version 5.0 of the Solt data set, which provides standard measures of net and market inequality for 153 countries for the period 1960-2010. The main independent variable is structural change, which is captured through the productivity gap between agriculture and non-agriculture, a suitable measure of convergence between sectors as proposed by Kuznets.

(1) Income inequality = constant + structural change + country dummies + time dummies + controls

To estimate the inter-sectoral productivity gap, Peter Timmer is one of the main proponents of using the inter-sectoral Gini (or “synthetic Gini”) for economic sectors. The estimator is based on the share of employment and total income in the hands of the agricultural population (Timmer, 19882007). Narrowing the inter-sectoral gap implies a decline in the share of the labor force in agriculture, which is an indicative sign of structural change.

(2) inter-sectoral gap³ = share of the labor force in agriculture - share of agricultural income

³ The inter-sectoral Gini = $(1 - p_{agri} * S_{agri}) - 2 * S_{agri} * (1 - p_{agri}) - (1 - p_{agri}) * (1 - S_{agri}) = p_{agri} - S_{agri}$, where p is the share of the labor force in agriculture and S is its share of income in relation to the overall economy.

When the two terms are of a similar size, the inter-sectoral gap indicates that the transition is complete. We use data from the Groningen Growth and Development Centre Data (GGDC) on sectoral value-added and employment⁴ for the period 1960-2010. We expect the relationship between the inter-sectoral productivity gap and income inequality to be positive. For instance, the Gini coefficient of China and India shows a clear upward trend in tandem with the inter-sectoral gap (see Figures 2 and 3 in the appendix).

We also divide the countries into five categories: agrarian, dual (beginner, intermediate and advanced) and economically mature. The agrarian economy according to our classification has over 60% of labor in agriculture, and the income share of agriculture is the largest among the sectors. Broadly speaking, the ratio between the income share of manufacturing and agriculture is below 1. A dual economy has between 15% and 60% of agricultural labor. The ratio between the income share of manufacturing and that of agriculture is above 1. However, many countries remain dual over the period and thus we suggest three additional categories: beginner, intermediate and advanced. Beginner if the inter-sectoral gap remains over 30%; intermediate for a gap between 10% and 30%; and

advanced below 10%. We use a histogram to define the thresholds in different periods⁵, and the ratios can be found in table A in the appendix. Mature economies have no or close to zero inter-sectoral gap. In table 1, we present the mean average of the Gini coefficient according to the typology.

TABLE 1. MEAN AVERAGE OF THE GINI COEFFICIENT, 1960-2010

	Mean	Std Dev.	Min.	Max.
Agrarian	46.8	8.5	30	66
Beginner	42.6	8.5	27	61
Intermediate	54.3	6.6	43	69
Advanced	47.2	4.1	39	54
Mature	39.4	4.9	28	48

Note. Authors' calculations using the Solt database

We also divide the period of study into three sub-periods that reflect alternative policy environments: the independent developmental period between 1960 and 1975, the global turmoil period between 1975 and 1995 and the commodity boom between 1995 and 2010. The latter is tested through a decomposition exercise to examine whether the agricultural sector is indeed outperforming the other sectors in the economy. Here we

⁴ We converted the constant value-added at 2005 dollar prices into PPP dollars. We also combined two of the original sectors (government services and community, social and personal services) into a single one, leaving the sample with nine sectors. The sectoral distribution and more details on the sources of the database are available in the website appendix.

⁵ The histogram for the whole period indicates 10% to be 6.7 and the median and the mean 27, with a standard deviation of 15. The histogram for the last period indicates 10% to be 4.6, the median 22 and the mean 21, with a standard deviation of 14.

follow the approach taken by McMillan and Harttgen (2014).

(3) labor productivity growth = sectoral productivity weighted by employment shares + productivity effect of labor reallocation across different sectors

Sectoral productivity growth (within) reflects technological change and rates of investment. Sectoral reallocation is the term most frequently used to capture structural change. However, we view structural change as the interplay of the two terms: without increases in sectoral productivity, reallocation might not contribute to growth as labor can end up in low-productivity non-agricultural sectors.

For the controls in equation (1), we put together a simple structural model of income inequality, which accounts for capital, labor and unearned income. (i) *Capital income* refers to the distribution and changes in value assets or wealth over time. They should be studied jointly with the income Gini because the distribution of wealth is the result of past income distributions and savings rates. We obtain the data for savings from the World Bank Indicators. (ii) *Labor income* is the reward for work. Assuming that labor productivity and wages are mutually connected, increases in labor productivity can raise the level of income inequality. Likewise, we add the impact of the service GDP to the Gini coefficient because the traditional or informal service sectors absorb most of the labor. (iii) *Unearned income* is the product of transfers, which are not in exchange for goods or services. Here governments can mitigate rising inequality

within countries through the imposition of progressive income taxes and the funding of social programs. Thus, we use the difference between market and net inequality to capture redistribution throughout the whole period. The period 1995–2010 is the most complete in terms of data availability for all countries, in particular African countries. Tables B and C in the appendix provide the descriptive statistics and data availability.

Strategy. We identify structural change by examining the reallocation of labor and the inter-sectoral productivity gap. We continue with a simple decomposition to estimate agricultural productivity growth relative to other non-agricultural sectors. Then we run a basic pooled OLS regression of income inequality on the inter-sectoral Gini. We add the country and time dummies to make up for fixed effects. Then we control for capital (savings), labor (relative labor productivity) and unearned income (redistribution). All the variables are logged except for capital (in %) and labor (ratio). We then run the full regression with the aim of estimating the effect of inter-sectoral inequality on income distribution among the beginner, intermediate and advanced dual economies. Finally, we also test geographical clusters to determine whether the inter-sectoral gap is part of the explanation for the changes in the income distribution in a particular developing region.

RESULTS

Labor reallocation is indeed a major structural change in the developing world. In table 2, we show that labor has moved out of agriculture

since the 1960s, with clear acceleration in the period between 1995 and 2010. The most dynamic changes can be seen in the richest countries in our sample, and it is apparent that the growth rate of labor reallocation speeds up as economies make the transition out of dualism (see the horizontal line from an agrarian to a dual economy in table 2).

TABLE 2. STRUCTURAL CHANGE: LABOR REALLOCATION

Countries	Agri. labor		Annual variation	
	1960	2010	1960-2010 (%)	1995-2010 (%)
Ethiopia	96	75	-0.5	-1.0
Tanzania	92	73	-0.4	-1.1
Zambia	63	73	0.3	-0.2
Malawi	84	65	-0.6	-0.6
Nigeria	78	61	-0.5	0.3
India	72	55	-0.5	-0.9
Senegal	73	51	-0.9	-1.4
Kenya	81	48	-1.2	-1.8
Ghana	61	42	-0.8	-1.9
Indonesia	66	38	-1.4	-1.4
Thailand	81	38	-1.5	-2.0
Botswana	87	38	-1.8	-0.2
China	65	37	-1.1	-2.3
Philippines	49	33	-1.0	-1,7
Peru	54	22	-1.8	-1.9
Colombia	51	19	-2.0	-1.9
Bolivia	70	18	-2.7	-5.1
Brazil	59	17	-2.5	-2.9
Costa Rica	51	15	-2.4	-2.8
South Africa	49	15	-2.3	-2.0

Countries	Agri. labor		Annual variation	
	1960	2010	1960-2010 (%)	1995-2010 (%)
Malaysia	46	14	-3.4	-1.7
Mexico	52	14	-2.5	-2.4
Venezuela, RB	33	9	-2.6	-2.9
Chile	30	9	-2.4	-2.5
Argentina	22	7	-2.3	-3.2
Mauritius	37	7	-4.0	-4.6
Korea, Rep.	62	7	-4.7	-3.5

Note. Authors' calculations with data from the Groningen Growth and Development Centre (GGDC).

Examining the inter-sectoral productivity gap in table 3 shows that most economies are indeed experiencing a faster structural change than the reallocation of labor suggests. Comparing the two estimates of structural change in general, it becomes clear that the inter-sectoral gap declines faster than labor reallocation, implying that agricultural productivity is also driven by its internal dynamics.

TABLE 3. STRUCTURAL CHANGE: THE INTER-SECTORAL PRODUCTIVITY GAP

Countries	Inter-sectoral GAP		Annual variation	
	1960	2010	1960-2010 (%)	1995-2010 (%)
Zambia	48	53	0.2	1.2
Tanzania	47	44	-0.1	-0.4
India	19	39	1.4	0.7
Malawi	44	35	-0.5	-1.1
Botswana	60	35	-1.2	-0.1
Senegal	44	34	-0.7	-1.3
Ethiopia	11	32	2.2	0.6

Countries	Inter-sectoral GAP		Annual variation	
	1960	2010	1960-2010 (%)	1995-2010 (%)
Thailand	47	28	-1.0	-2.4
China	11	27	1.9	-0.8
Indonesia	37	25	-1.0	-1.8
Kenya	41	24	-1.3	-2.6
Nigeria	6	23	2.6	-2.1
Philippines	29	22	-0.7	-1.6
Peru	44	16	-2.0	-2.5
Ghana	24	12	-1.4	-3.6
South Africa	44	12	-2.5	-2.3
Brazil	49	11	-3.0	-4.3
Mexico	44	11	-2.8	-2.9
Colombia	35	10	-2.4	-2.4
Costa Rica	37	6	-3.5	-4.3
Malaysia	19	6	-3.4	-0.9
Bolivia	50	6	-4.3	-9.3
Venezuela, RB	30	5	-3.5	-4.6
Chile	26	4	-3.7	-5.0
Korea, Rep.	41	3	-5.3	-4.2
Mauritius	24	2	-6.1	-6.4
Argentina	9	1	-4.4	-0.2

Note. Authors' calculations with data from the Groningen Growth and Development Centre (GGDC).

Opportunities within agriculture have become scarcer over time as agricultural productivity in the developing world has risen in recent decades (Fuglie et al., 2012). We observe that the agricultural sector has consistently

been a net contributor to the aggregate labor productivity in the period 1995-2010⁶ (figure 3 in the appendix). Furthermore, the productivity of agricultural labor has been growing faster than that of manufacturing and traditional services. One of the reasons for the resurgence in agricultural productivity may be related to the commodity boom that was fueled by the demand from China and other emerging markets. According to the IMF, the food commodity price index rose by 125% during the period 2000-2011. The boom lasted between 2004 and 2011 and was the longest ever, with an average duration of seven years compared with the three years of previous booms in the 1970s and the 1980s (Adler and Magud, 2013).

After finding empirical support for some sort of agricultural catch-up, we attempt to estimate whether improvements in the inter-sectoral gap lead to a lower level of income inequality. In table 4, the inter-sectoral gap has a positive association with the Gini coefficient in agrarian and dual economies. The beta coefficient, however, is negligible: an increase of 1% raises the Gini by less than 0.10%.

TABLE 4. EXPLAINING THE LOG OF THE GINI COEFFICIENT ACROSS COUNTRIES, 1960-2010

	Agrarian	Dual
Inter-sectoral gap	0.061	0.095***
Labor	0.029***	-0.00007
Capital	-0.0007	-0.0006
GDP services	-0.406***	0.357***

⁶ Venezuela changed the organization of production during the period and its productivity lies below zero in agriculture, manufacturing and services .

	Agrarian	Dual
Redistribution	0.042	-0.456***
Country + time	X	X
R squared	87%	85%
Number of obs.	210	547

Note: Statistical significance is indicated as * at the 10%, ** at the 5% and *** at the 1% level.

After disaggregating the dual economies, table 5 indicates that a 1% increase in the inter-sectoral gap raises the overall Gini by 0.47% among the beginners. It is clear then that the growth rate at which the inter-sectoral gap narrows (or increases) matters for income inequality. In contrast, the effect is less than 0.1% among the intermediate economies and disappears completely among the advanced economies.

TABLE 5. EXPLAINING THE LOG OF THE GINI COEFFICIENT AMONG DUAL COUNTRIES, 1960-2010

	Beginners	Interme- diate	Advanced
Inter-sectoral gap	0.477***	0.086***	0.003
Labor	-0.012***	-0.002	-0.002
Capital	-0.002	0.0005	-0.002***
GDP services	0.408**	0.433***	-0.563***
Redistribution	-2.098***	0.403**	-0.318
Country + time	X	X	X
R squared	85%	86%	87%
Number of obs.	137	261	149

Note: Statistical significance is indicated as * at the 10%, ** at the 5% and *** at the 1% level.

Apart from the role of agriculture in development, we have to determine whether other forces play any role in the behavior of income inequality. The service sector has indeed become the main employer, a clear sign of structural change, and can contribute to the overall productivity, albeit in different ways (Ravallion and Chen, 2007; McMillan and Rodrik, 2011; Ghani and ODonell, 2014). We find that the traditional service sector provided a negative contribution to the overall productivity in the agrarian economies of Africa, in three dual economies of Latin America (Bolivia, Colombia and Costa Rica) and in one in Asia (Thailand). India is the only economy among the agrarian group in which the traditional service sector made a positive contribution to the overall productivity growth, even though inequality rose from 0.32 to 0.37 Gini points. The rising inequality in India may be partly driven by the modern service sector (Mazundar, 2010).

Potentially, redistribution is an effective policy tool for controlling the growing effect of the service sector on income inequality during the beginning of dualism. A 1% increase in redistribution reduces income inequality by 2%. However, among the intermediate countries, where the changes in the income distribution occur and the effects of the inter-sectoral gap taper off, redistribution benefits the non-poor. The expansion of services may benefit the above-average-income non-agricultural population; therefore, income inequality remains high. The average Gini coefficient is the highest among the intermediate countries: 56.

Finally, in table 6, we check that the typology is useful for clustering such a hetero-

geneous group of countries at different stages of the inter-sectoral ladder. The inter-sectoral gap also has a positive relationship with the Gini, but the effect cancels out over the period. On average, an increase of 1% in the inter-sectoral Gini raises income inequality by 0.05% in Asia. The effect is 0.04% in Africa. In Latin America, the effect has the wrong, albeit statistically significant, direction. Taking out Argentina, which is the only country with no inter-sectoral gap, the effect is close to 0.03% but not significant at the 10% level. The implication is that the effect of the inter-sectoral gap on income distribution in the developing world is more a matter of structural characteristics than geographical location.

TABLE 6. EXPLAINING THE LOG OF THE GINI COEFFICIENT ACROSS REGIONS, 1960-2010

	Asia	LA	Africa
Inter-sectoral Gini	0.049**	-0.042***	0.038
Labor	0.060**	0.009***	0.011***
Capital	-0.003***	0.0006	-0.0005
GDP services	-0.126	0.267*	0.219*
Redistribution	-0.523**	-0.233	-0.083
Country + time	X	X	X
R squared	82%	81%	88%
Number of obs.	251	327	278

Note: Statistical significance is indicated as * at the 10%, ** at the 5% and *** at the 1% level.

CONCLUSIONS

We examine the changes in the economic structure of developing economies over time and try to identify the forces underlying

structural change that influence the evolution of income distribution, in particular income inequality. We use the change in the inter-sectoral productivity gap as the measure of structural change and estimate its effect on income inequality in the period 1960-2010, with a particular focus on the last decade, which coincides with the world commodity boom. We show that the inter-sectoral gap has a positive association with income inequality. A 1% increase in the inter-sectoral gap increases income inequality by 0.47%. In other words, a Gini of 50 declines to 47 in 10 years and 45 in 20 years.

Unlike the effects of labor reallocation on labor productivity, the inter-sectoral productivity gap captures another dimension of structural change by taking up the impact of the non-agricultural sector as labor reallocates to other sectors. The issue, however, is that agriculture may be the main source of growth during a period of high world prices, but the linkages with the non-agricultural sector may not have the time to consolidate. An unfortunate consequence may be that high world prices may slow labor reallocation in agrarian and dual economies, and when the spell of growth peters out, people remain trapped in a low-productivity sector.

Along this line, the nature of growth in most developing countries is characterized by the expansion of the service sector rather than a labor-intensive manufacturing sector. The service sector is heterogeneous in terms of sectoral productivity. While some subsectors with intensive highly skilled labor tend to raise income inequality, other subsectors with less skilled labor may reduce the overall

productivity during the transition. In the absence of strong manufacturing sector growth, redistribution might be the key to managing the unfortunate consequences of structural change in income distribution, but more attention is needed to target the beneficiaries during the transition. In general, redistribution in dual intermediate economies benefits the non-poor rather than the poor.

In sum, more attention should be paid to the evolution of the inter-sectoral gap in developing economies entering dualism and its effects on income inequality. The narrowing of the inter-sectoral gap is indeed progressing everywhere, but the nature and the speed of the change are important to consolidate the transition into and out of dualism. A successful transition also depends on how redistribution is implemented during a period of high prices and how it is maintained when the prices decline.

BIBLIOGRAPHY

- Adler, G. & Magud, N. E. (2013). Four decades of terms-of-trade booms: saving-investment patterns and a metric of income windfall. *IMF working paper* 13 (103).
- Alvaredo, F. & Gasparini, L. (2013). Recent trends in inequality and poverty in developing countries. *Handbook of Income Distribution*, 2, 697–805.
- Banerjee, A., Duflo, E. & Qian, N. (2012). *On the road: Access to transportation infrastructure and economic growth in China* (No. w17897). National Bureau of Economic Research.
- Bourguignon, F. (2011). A turning point in global inequality... and beyond. *Annual Bank Conference of Development Economics, Papers and Proceedings*.
- Bourguignon, F. & Morrisson, C. (1998). Inequality and development: the role of dualism. *Journal of Development Economics*, 57 (2), 233-257.
- Deininger, K., Jin, S., Xia, F. & Huang, J. (2014). Moving off the farm: land institutions to facilitate structural transformation and agricultural productivity growth in China. *World Bank Policy Research Working Paper Series*.
- De Janvry, A. & Sadoulet, E. (2009). Agricultural growth and poverty reduction: Additional evidence. *The World Bank Research Observer*, 25 (1), 1-20.
- da Costa Araújo, D. T. (2012). Structural Change for equality: An integrated approach to development. *Conyuntura internacional*, 9 (5), 61-66.
- FAO (2014). *The state of food and agriculture*. New York: Food & Agriculture Organization of the UN.
- Fei, J. C. & Ranis, G. (1966). Agrarianism, dualism and economic development. Underdevelopment to Developing Economies. In Adelman I. & Thorbecke, E. (eds.). *The theory and design of economic development*. Baltimore, MD: John Hopkins University Press.
- Fuglie, K. O., Wang, S. L. & Ball, V. E. (eds.) (2012). *Productivity growth in agriculture: an international perspective*. Washington, DC: CABI.
- Ghani, E. & O'Connell, S. D. (2014). Can service be a growth escalator in low-income countries? *World Bank Policy Research Working Paper* (6971).
- Gollin, D., Lagakos, D. & Waugh, M. E. (2013). *The agricultural productivity gap* (No. w19628). National Bureau of Economic Research.
- International Monetary Fund (2015). April 2015 World Economic Outlook Database.
- Kanbur, R. (2012). Does Kuznets still matter?. Policy-Making for Indian Planning: Essays on Contemporary Issues in Honor of Montek S. Ahluwalia, *Academic Foundation Press*, 1 (1), 5-128.

- Kanbur, R., Rhee, C. & Zhuang, J. (eds.) (2014). *Inequality in Asia and the Pacific: Trends, drivers, and policy implications*. New York: Routledge.
- Karabarbounis, L. & Neiman, B. (2014). The Global Decline of the Labor Share. *Quarterly Journal of Economics*, 129 (1), 61-103.
- Kuznets, S. (1955). Economic growth and income inequality. *The American Economic Review*, 45 (1), 1-28.
- Kuznets S. (1965). *Economic growth and structure: selected essays*. New York: W.W. Norton & Company
- Kuznets, S. & Murphy, J. T. (1966). *Modern economic growth: Rate, structure, and spread*. New Haven: Yale University Press.
- Lewis, W. A. (1954). Economic development with unlimited supplies of labour. *The manchester school*, 22 (2), 139-191.
- Lustig, N., Lopez-Calva, L. F. y Ortiz-Juarez, E. (2013). Declining inequality in Latin America in the 2000s: the cases of Argentina, Brazil, and Mexico. *World Development*, 44, 129-141.
- Mazundar, D. (2010). *Decreasing poverty and increasing inequality in India. Tackling Inequalities in Brazil, China, India and South Africa, 157-207*. Washington: OECD Publishing
- McKay, A. (2013). Growth and poverty reduction in Africa in the last two decades: Evidence from an AERC growth-poverty project and beyond. *Journal of African Economics*, 22 (suppl 1), i49-i76
- McMillan, M. S. & Harttgen, K. (2014). *What is driving the African Growth Miracle?* (No. w20077). National Bureau of Economic Research
- McMillan, M. S. y Rodrik, D. (2011). *Globalization, structural change and productivity growth* (No. w17143). National Bureau of Economic Research.
- Ocampo, J. A., Rada, C. & Taylor, L. (2009). *Growth and policy in developing countries: a structuralist approach*. NY: Columbia University Press.
- Piketty, T. (2014). *Capital in the 21st Century*. Cambridge: Harvard University Press.
- Proto, E. (2007). Land and the transition from a dual to a modern economy. *Journal of Development Economics*, 83 (1), 88-108.
- Ravallion, M. & Chen, S. (2007). China's (uneven) progress against poverty. *Journal of development economics*, 82 (1), 1-42.
- Rodrik, D. (2014). The past, present, and future of economic growth. *Challenge*, 57 (3), 5-39.
- Sachs, J. D. (2012). From millennium development goals to sustainable development goals. *The Lancet*, 379 (9832), 2206-2211.
- Subramanian, A. & Kessler, M. (2013). The hyperglobalization of trade and its future. *Peterson Institute for International Economics Working Paper*, 13-6.
- Thorbecke, E., & Duyang, S. (2016). Is Sub-Saharan Africa Finally Catching up? In: *Development Paths and Structural Transformation in the Escape from Poverty*. New York: Oxford University Press.
- Timmer, C. P. (1988). The agricultural transformation. *Handbook of development economics*, 1 (Part II), 276-331.
- Timmer, P. (2007). The structural transformation and the changing role of agriculture in economic development: empirics and implications. *Wendt Lecture*.
- Tsounta, E. y Osueke, A. (2014). What is Behind Latin America's Declining Income Inequality? *International Monetary Fund* (14/124).
- UNCTAD (2012). *Handbook of Statistics*. Geneva: Switzerland: United Nations.
- Vollrath, D. (2009). How important are dual economy effects for aggregate productivity? *Journal of development economics*, 88 (2), 325-334.

APPENDIX

FIGURE 1. INCOME DISTRIBUTION IN A TWO-SECTOR ECONOMY (ILLUSTRATIVE)

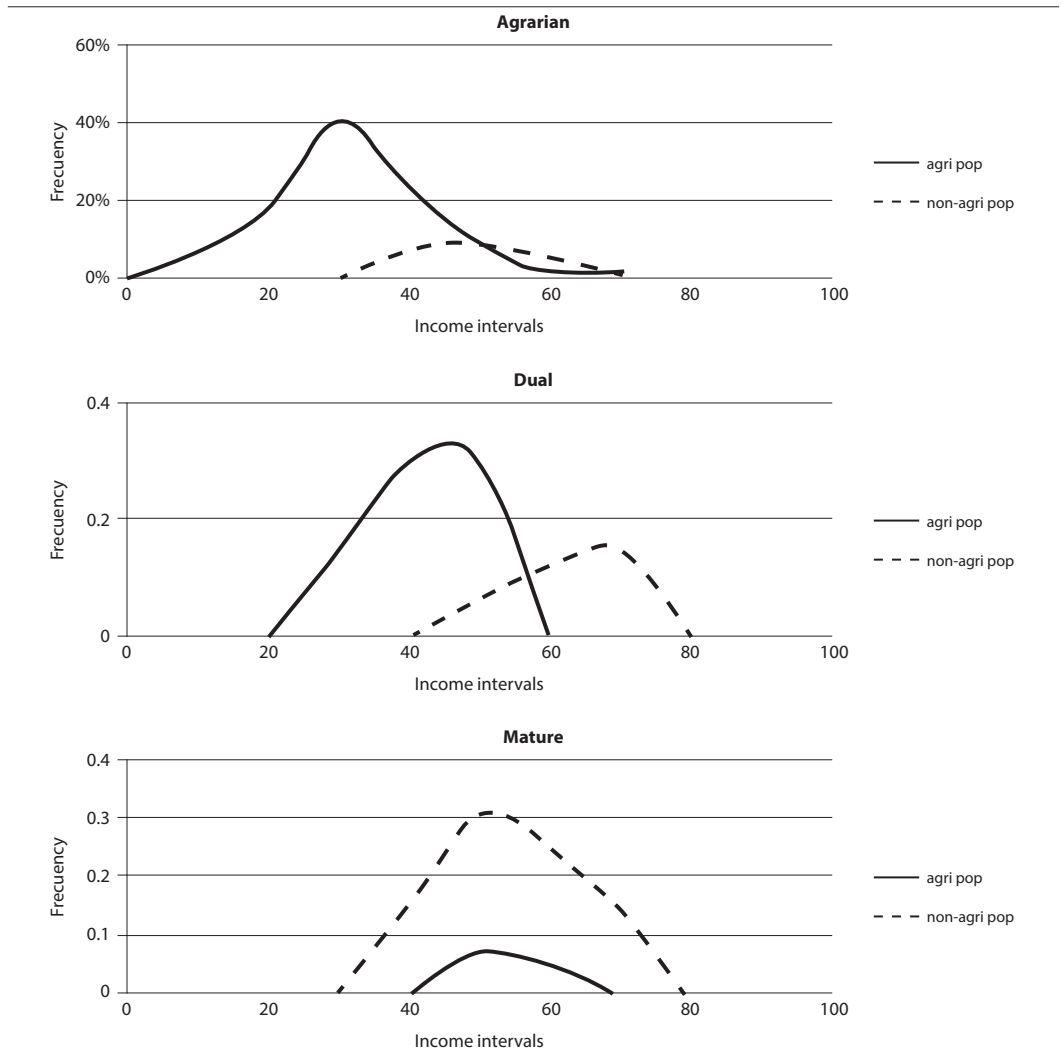
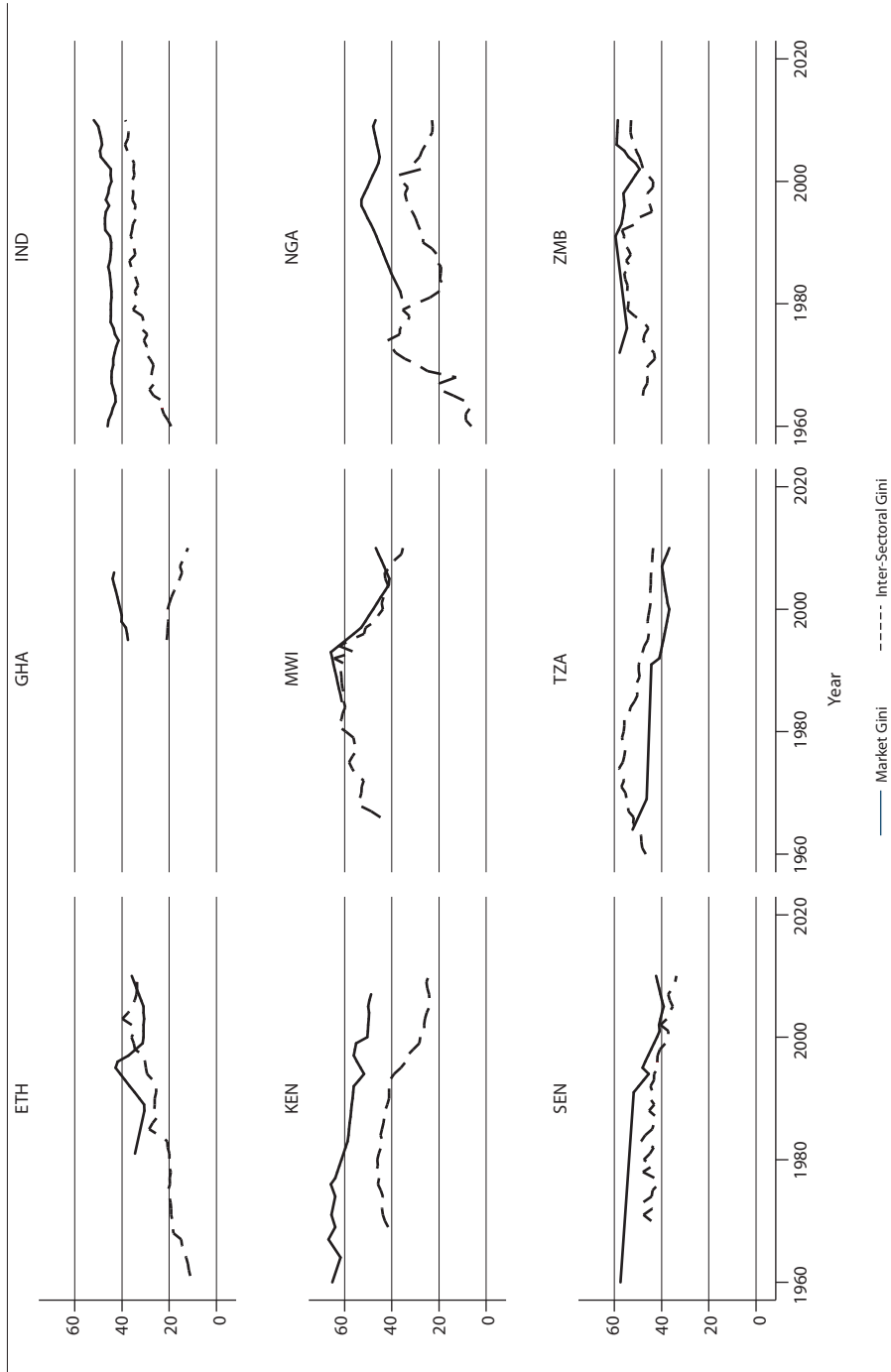


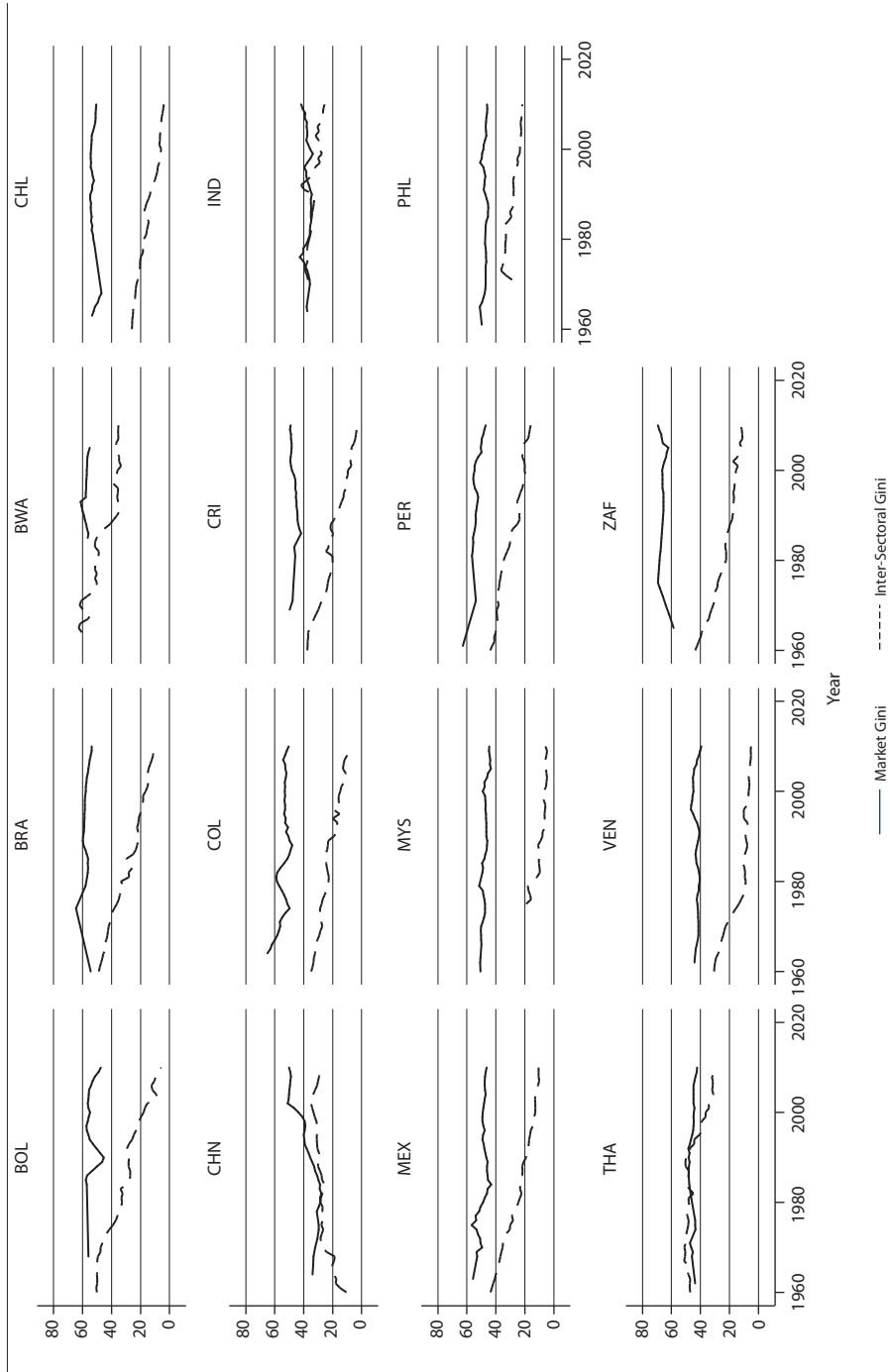
FIG. 2. AGRARIAN ECONOMIES



Graphs by Country

Note. Inter-Sectoral Gini = Inter-Sectoral Productivity Gap

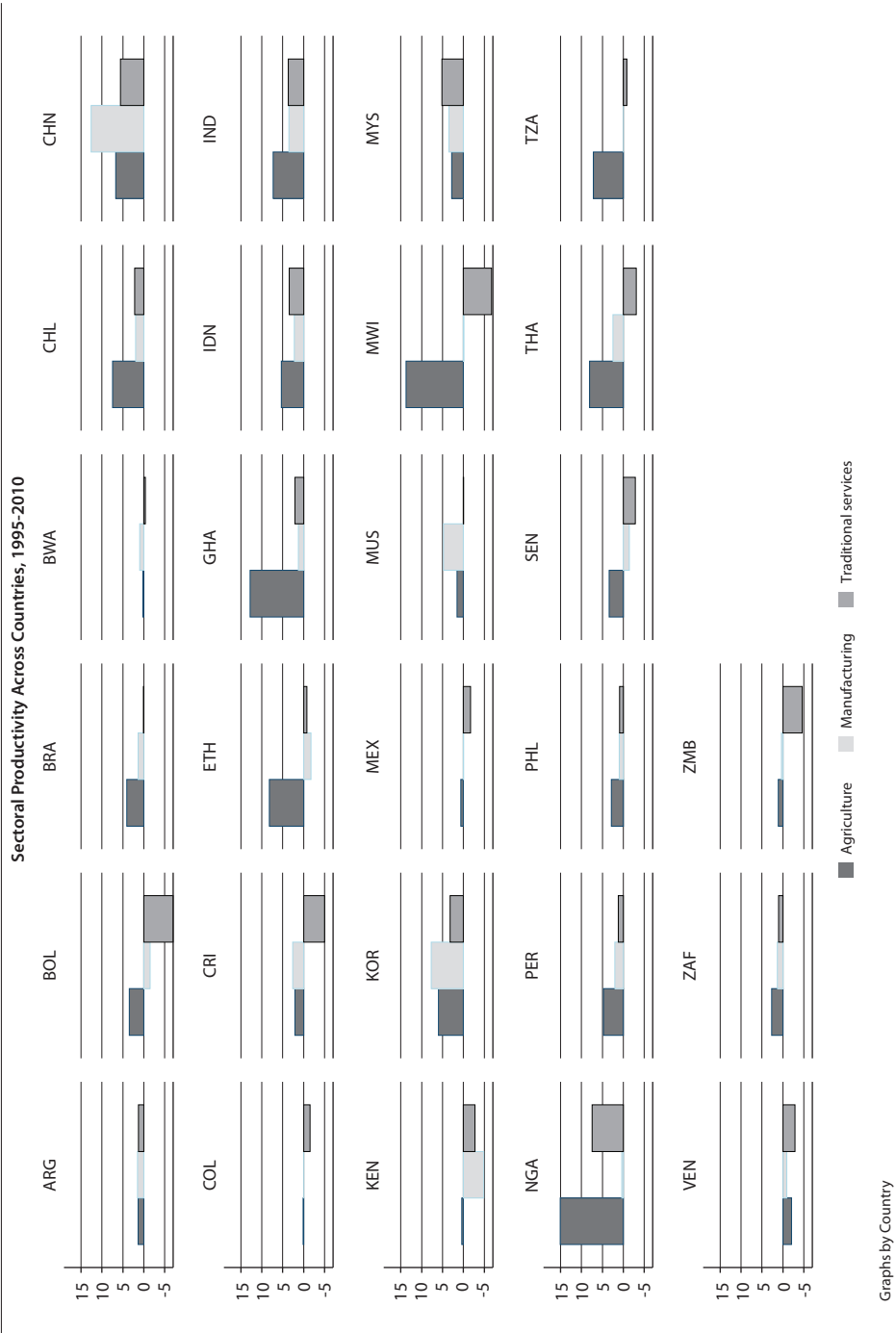
FIGURE 3. DUAL ECONOMIES



Graphs by Country

Note. Inter-Sectoral Gini = Inter-Sectoral Productivity Gap

FIGURE 4. CLOSING THE GAP: THE AGRICULTURAL RESURGENCE



Source: Authors' calculation with data from the Groningen Growth and Development Centre (GGDC)

TABLE A: COUNTRY DIVISION BY STAGE OF DEVELOPMENT USING THE AVERAGE FOR THE PERIOD 1995-2010

Countries	Type	(1) Agr. labor %	(2) Inter-sectoral gap	(3) Ratio agrarian	(3) Ratio dual	(3) Ratio mature
Ethiopia	Agrarian	83	34	0.10		
Malawi	Agrarian	78	44	0.29		
Tanzania	Agrarian	81	45	0.25		
Kenya	Agrarian	55	28	0.46		
Ghana	Agrarian	50	18	0.32		
Senegal	Agrarian	56	38	0.89		
Zambia	Agrarian	73	48	0.46		
Nigeria	Agrarian	62	29	0.10		
India	Agrarian	58	36	0.80		
Indonesia	Dual beginner	42	29		2.07	
China	Dual beginner	46	32		2.38	
Thailand	Dual beginner	45	34		3.06	
Bolivia	Dual	28	15		1.02	
Philippines	Dual	37	23		1.87	
Peru	Dual	27	20		2.19	
Colombia	Dual	23	14		1.78	
Brazil	Dual	21	15		3.00	
South Africa	Dual	17	14		10.05	
Mexico	Dual	16	13		5.34	
Botswana	Dual	38	36		2.69	
Costa Rica	Dual advanced	17	8		2.18	
Venezuela, RB	Dual advanced	11	7		4.36	
Malaysia	Dual advanced	15	6		3.02	
Chile	Dual advanced	11	6		3.95	
Argentina	Mature	8	0			3.04
Mauritius	Mature	10	3			3.65
Korea, Rep.	Mature	9	5			7.26

Note. Authors' calculations

TABLE B. DESCRIPTIVE STATISTICS

Agrarian economies, 1960-2010

Countries	ETH	MWI	TZA	KEN	GHA	SEN	ZMB	NGA	IND
Gini coefficient	34.2	53.4	39.8	57.1	39.4	44.2	55.4	46.3	45.4
	3.7	9.0	3.5	5.4	2.5	4.6	2.8	4.2	2.1
Inter-sectoral gap	24.8	52.6	50.1	37.5	19.7	42.0	49.8	25.7	32.3
	7.8	8.1	4.63	8.3	3.1	4.0	4.2	9.0	4.8
Rel. labor productivity	4.6	13.0	12.4	5.4	2.2	6.5	9.8	3.2	4.1
	0.7	5.2	4.1	1.8	0.27	0.9	2.2	1.2	0.9
Saving rate %	21.6	16.0	9.3	24.3	19.6	6.7	19.2	21.6	9.3
	8.1	3.2	7.0	5.1	3.9	3.1	18.7	8.1	7.0
Redistribution	0.05	0.05	0.05	0.09	0.05	0.08	0.05	0.05	-0.007
	0.01	0.01	0.02	0.05	0.004	0.03	0.01	0.008	0.006
GDP services %	25.9	51.5	41.6	48.2	38.1	55.0	38.3	16.3	37.9
	10.0	4.1	3.1	4.2	7.2	2.7	9.8	3.6	7.8

Dual economies, 1960-2010

Countries	IDN	CHN	THA	BOL	PHL	PER	COL
Gini coefficient	37.2	37.7	45.5	53.6	47.4	53.4	54.0
	2.0	7.9	1.7	3.6	1.3	3.0	3.6
Inter-sectoral gap	33.4	27.3	43.9	30.9	28.1	29.7	22.2
	4.2	5.2	7.1	13.8	4.6	8.5	7.2
Rel. labor productivity	5.0	3.7	8.2	5.5	4.2	8.0	3.9
	0.6	1.1	1.3	2.8	0.5	2.8	0.9
Saving rate %	26.9	12.9	26.9	13.4	19.6	26.5	15.7
	6.4	5.8	6.4	3.8	3.9	11.8	5.4
Redistribution	0.06	0.01	0.07	0.05	0.07	0.001	0.02
	0.009	0.03	0.01	0.02	0.01	0.01	0.007
GDP services %	0.33	30.9	46.7	51.1	43.6	59.6	51.0
	0.03	5.9	1.9	0.03	5.7	1.7	2.2

Countries	bra	SAF	MEX	BWA	CRI	VEN	MYS	CHL
Gini coefficient	57.4	66.2	48.9	57.6	46.6	42.6	47.6	52.7
	2.0	2.1	2.9	1.5	2.1	1.7	2.0	1.7
Inter-sectoral gap	28.3	23.2	23.9	45.0	19.5	13.0	8.8	15.0
	11.9	9.1	10.4	9.6	10.2	8.1	4.1	7.2
Rel. labor productivity	8.5	10.2	7.7	19.2	3.7	6.2	1.7	5.9
	3.6	3.7	2.3	5.6	1.5	5.0	0.2	2.9
Saving rate %	7.9	24.3	21.4	25.2	25.3	31.7	32.7	20.8
	3.7	5.1	6.3	9.7	10.3	6.5	8.8	5.7
Redistribution	0.13	0.11	0.01	0.06	0.08	0.06	0.08	0.05
	0.007	0.03	0.01	0.009	0.007	0.008	0.01	0.004
GDP services %	62.2	54.8	58.5	40.7	63.5	30.8	36.0	54.7
	1.9	6.5	1.0	9.7	2.1	6.5	6.9	1.6

Mature economies, 1995-2010

Countries	ARG	MUS	KOR
Gini coefficient	53.6	42.1	34.6
	3.6	1.4	2.5
Inter-sectoral gap	30.9	6.1	17.3
	13.8	4.8	12.2
Rel. labor productivity	5.5	1.6	3.4
	2.8	0.5	1.1
Saving rate %	13.4	18.8	18.7
	3.8	2.8	19.1
Redistribution	0.05	0.07	0.08
	0.02	0.01	0.01
GDP services %	51.1	56.6	59.3
	3.7	5.0	6.2

TABLE C. DATA AVAILABILITY

Sources	Solt Database		World Bank	Groningen Growth Development Centre Data	
	Countries	Market Gini	Redistribution	Savings	Rel. Labor Prod.
Argentina	1961–2013	1961–2010	1960–2010	1960–2010	1960–2010
Bolivia	1968–2012	1968–2010	1981–2010	1960–2010	1960–2010
Botswana	1985–2005	1985–2005	1964–2010	1985–2010	1985–2010
Brazil	1960–2012	60/74/79/81–2010	1960–2010	1960–2010	1960–2010
Chile	1963–2011	1963-68/79–2010	1960–2010	1960–2010	1960–2010
China	1964–2013	1964/66/68/70/72/74–2010	1960–2010	1960–2010	1960–2010
Colombia	1964–2012	1964–2010	1964–2010	1960–2010	1960–2010
Costa Rica	1969–2013	1969/71/74/81/83/86–2010	1960–2010	1960–2010	1960–2010
Ethiopia	1981–2010	1981/88–2010	1981–2010	1961–2010	1961–2010
Ghana	1987–2006	1987–2006	1960–2010	1960–2010	1960–2010
India	1960–2010	1960–2010	1990–2010	1960–2010	1960–2010
Indonesia	1964–2013	1964/70–2010	1960–2010	1971–2010	1971–2010
Kenya	1960–2007	1960/64/67/69/71/74/76–2007	1960–2010	1969–2010	1969–2010
Korea	1963–2013	1963–2010 (1995–2006)	1960–2010	1963–2010	1963–2010
Malawi	1985–2011	1985–2010	1960–2010	1966–2010	1966–2010
Malaysia	1960–2012	1960/62/66–2010	1960–2010	1975–2010	1975–2010
Mauritius	1972–2007	1980–2006	1960–2010	1970–2010	1970–2010
Mexico	1963–2012	1963/68–2010	1960–2010	1960–2010	1960–2010
Nigeria	1981–2011	1981–2010	1981–2010	1960–2010	1960–2010
Peru	1961–2012	1961/71/81–2010	1960–2010	1960–2010	1960–2010
Philippines	1961–2012	1965–2010	1966–2010	1971–2010	1971–2010
Senegal	1960–2011	1960/91–2010	1960–2010	1970–2010	1970–2010
South Africa	1965–2011	1965/68/70/72–2010	1960–2010	1960–2010	1960–2010
Tanzania	1964–2011	1964/69–2010	1990–2010	1960–2010	1960–2010
Thailand	1962–2011	1962/68–71/74–76/1981–2010	1960–2010	1960–2010	1960–2010
Venezuela	1962–2012	1962/65–2010	1990–2010	1960–2010	1960–2010
Zambia	1972–2010	1972/76/91–2010	1960–2010	1965–2010	1965–2010