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# The Revival of Agriculture and Inclusive Growth during the Commodity Boom in Latin America?

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## Abstract

Latin America has constituted a recent example of inclusive growth by reducing poverty and income inequality simultaneously during the latest commodity boom. Against the backdrop of non-inclusive and non-transformative nature of commodity booms, we ask whether growth of agriculture was able to speed up structural transformation, and, relatedly, if agricultural growth was inclusive. We examine 16 countries for the period 1994-2014 and find that the increase in agricultural productivity is associated with an increase in both non-agricultural employment during the boom. We also find that income per capita growth has been increasing also among the poor, even if the income elasticities are lower in rural than in urban areas. Focusing on the distribution of agricultural income in Brazil and Colombia between 2003 and 2013, we find that any improvement did go through income for the bottom and the intermediate deciles. Furthermore, formal employment was positively connected to the development of agricultural prices, income improvement of the bottom 40 per cent and the quality of manufacturing exports. In other words, the commodity boom, through agricultural growth, increased linkages across sectors. We conclude that the boom is associated with advances in structural change and moderate inclusive growth rather than mere redistribution.

**Keywords:** Agriculture, commodity boom, inclusive growth, Latin America, structural transformation

**JEL code:** O13;O54

## 1. Introduction

Booms and busts have been recurring events in the economic history of Latin America since the 19<sup>th</sup> century (Bulmer-Thomas, 2017). The consensus contends that these booms and busts have been driven by an excessive export concentration on natural resources, revealing a stunted process of structural transformation<sup>1</sup> and weak productivity growth (Bértola & Ocampo, 2013; Pagés, 2010). This condition is usually associated with the “resource curse”, i.e. the dependence on a few commodities<sup>2</sup>, making economies with abundance of natural resources missing out on sustained and inclusive long-term economic growth (Arezki, Pattillo, Quintyn, & Zhu, 2012; Auty, 2001; Badeeb, Lean, & Clark, 2017; Sachs & Warner, 2001). However, during the 2000s high international prices of primary commodities contributed to the best performance of the economies of Latin America since the 1970s (Nin-Pratt, Falconi, Ludena, & Martel, 2015). Real domestic income became at least 15 per cent higher than what it would have been without the boom (Adler & Magud, 2013). Furthermore, the region also cut poverty by half and saw a drop in income inequality (Messina & Silva, 2017; Rodríguez-Castelán, López-Calva, Lustig, & Valderrama, 2016).

Among the sub-categories of the natural resource sector, we focus on the contribution of agriculture in the development of these relatively favourable outcomes. We do this against the backdrop of the normally non-inclusive and non-transformative nature of commodity booms. The risk for resource abundant countries to be cursed by it, where societies are predestined to low long-term growth and marked inequality, is particularly high if natural capital is more unequally distributed than other types of capital. Compared to other types of natural resources, agricultural land is less unequally distributed but since commodity booms most often rewards the large land holders, one would expect inequality to increase in countries where land distribution is unequal. Not only has natural resource abundance in land in Latin America significantly contributed to elite capture and inequality (Engerman & Sokoloff, 1997), it has also been argued that it directly has delayed structural change and discouraged formation of labour skills (Leamer, Maul, Rodriguez, & Schott, 1999; Sinnott, Nash, & De la Torre, 2010).

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<sup>1</sup> By structural transformation we mean shifts in the output, trade and employment composition that leads to the growth in productive employment and higher average per capita income and changed income distribution.

<sup>2</sup> By commodities we mean minerals, oil and gas and agricultural goods like soybeans, rice and coffee.

In Latin America, gross agricultural output grew at 4 per cent per year during the 2000s and faster than the world average (WorldBank, 2019). The agricultural sector became the largest producer of commodities and food in the world (FAO, 2015), and exhibited higher increases in TFP, output and input per worker than in past decades (Nin-Pratt et al., 2015). Large and small countries experienced a substantial increase in investment in land and agriculture during the 2000s (Borras Jr, Franco, Isakson, Levidow, & Vervest, 2016; Byerlee, Falcon, & Naylor, 2016).

The relation between agricultural development and structural change is not straightforward. Agricultural commodities are more likely to keep the process of structural transformation moving ahead compared to non-agricultural commodities, partly because they are renewables, less capital intensive and more prone to create linkages outside agriculture (Canuto & Cavallari, 2012; Development, 2008). On the other hand, the wave of de-industrialization since the 1990s has led some to argue that, with the exception of East Asia, a comparative advantage in agriculture may halt the process of structural transformation in today's globalized world (Matsuyama, 1992; McMillan, Rodrik, & Verduzco-Gallo, 2014). Many even argued that Latin American countries has experienced the "re-primarization" of their economies and rightly noted the persistence of large productivity gaps within the economy and vis a vis the US economy (ECLAC, 2012; Rodrik, 2017). It is in this context that we ask the extent to which the growth of agricultural production in Latin American countries during the latest commodity boom stimulated the process of structural transformation and in particular the extent to which agricultural growth was inclusive.

The article is composed of four sections. The first section provides an overview of the changes in agricultural production in Latin America during the commodity boom. The second section presents a theoretical framework for explaining the role of agriculture in the improvement of the income distribution, with a focus in factor market changes during the recent commodity boom. The third section provides estimates of structural transformation and inclusive growth using 16 countries<sup>3</sup> over the period 2000-2015 and the agricultural distribution of income for the labour force of Brazil and Colombia. The last section presents the main conclusions.

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<sup>3</sup> See a description of the dataset included in the Appendix

## 2. The latest commodity boom, a different experience: the role of agriculture

The decline in poverty and income inequality in Latin America has been heralded as one of the major signs of social progress in the region. The main driver of the improvement has been argued to be the narrowing of the wage gap fuelled by the expansion of education, changes in the household demographics, targeting of conditional cash transfer, stable macroeconomic conditions and growing political voice during a period of leftist governments (Lustig, 2008; Messina & Silva, 2017). Although we acknowledge their importance, there are reasons to believe that these positive changes in growth and income distribution are also linked with other structural conditions such as the performance of the agricultural sector since the 1990s, and particularly during the boom, when Latin America became the largest producer of food and agricultural products in the world.

Gross agricultural output in Latin America grew to \$ 279 billion (2004-2006 prices) in 2013, with an average growth rate of 2.9 per cent per year since 1980 (FAO, 2018). The rate rebounded to 3.9 per cent during the commodity boom of 2003-2011, above the 2.3 per cent of the world average but still behind that of China's 5 per cent. In other words, new markets and trading partners, among emerging markets and relatively stable macroeconomic conditions<sup>4</sup> lie behind the nearly 40 per cent increase in agricultural output between 2003 and 2011, with grains, oilseeds, and livestock at the forefront (Borras Jr et al., 2016; Deininger & Byerlee, 2011). Although this rebound is in part the natural consequence of the growing role of Brazil in the global agricultural output, the region saw an increase in their share of global trade from around 8 per cent in the 1990s to 16 per cent in 2016 (FAO, 2018).

The global prices for non-agricultural and agricultural commodities went up in tandem and remained so for over 7 years, that is 4 years longer than previous booms (Adler & Magud, 2013; Baffes & Haniotis, 2010). Furthermore, the relative prices of agricultural commodities, which had been falling since the 1980s in line with the Singer-Prebisch hypothesis, reversed its downward trend (Erten & Ocampo, 2013) and those used as energy input (i.e. soybeans, corn, sugar) finally matched with those of oil prices after the Global Financial Crisis of 2008 (Nazlioglu, 2011; Nazlioglu, Erdem, & Soytaş, 2013). The region also embraced competition in the world markets and signed 73 of the 259 Free Trade Agreements (FTA's) notified to the

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<sup>4</sup> Average inflation in the region was one digit, excluding Venezuela. The appreciations of the currency were linked to the depreciation of the US dollar after the Great Recession.

World Trade Organization (WTO), with 29 of these agreements including Latin American partners, and the rest with other countries (Josling, Paggi, Wainio, & Yamazaki, 2015).

Table 1 shows the changes in the shares of export shares of natural resources in the region during the period. Agriculture still plays a central role in the export demand vis a vis fuels and minerals, with growing shares in at least 8 countries, including the three largest agricultural powerhouses of the region (Argentina, Brazil, and Mexico). The combination of changes in export demand and high international prices altered the demand for factor inputs. For instance, arable land and permanent crops expanded at an annual rate of 1.5 per cent and pastures (livestock) around 0.3 per cent between 2003 and 2013 (FAO, 2018). However, land prices experienced a rush, forcing new forms of association between landowners and producers in Argentina, Brazil, Colombia, Uruguay, among others, to cater the needs of the expanding global value chains in agricultural markets (Deininger & Byerlee, 2011, UNCTAD, 2015 #804, Borras Jr, 2016 #14).

The demand for agricultural labour during the period also experienced increases in wages (Valdes, Foster, Pérez, & Rivera, 2008), and a decrease in the share of agricultural employment during the decade (see table 2). The increase in employment followed suit between 2003 and 2011<sup>5</sup>, favouring groups that tend to drop out of the labour force such as prime aged low skilled individuals and older women (De La Torre, Ize, Beylis, & Lederman, 2015). Furthermore, agricultural wages followed the trend of wages in non-agricultural sectors, in particular construction and traditional services, where differences in human capital tend to matter less (Alvaredo & Gasparini, 2015; ECLAC, 2012).

The boom also brought a surge in government revenues (Tanzi, 2013). Other income derived from rents on natural resources was complemented with the increase in the tax pressure, in particular VAT and income taxes. This time, many countries in Latin America realized the importance of managing the effects of volatility in commodity prices through counter-cyclical fiscal policies, long term savings, social spending<sup>6</sup> and so forth (Adler & Magud, 2013). Farmers still benefitted from direct payments or input subsidies, but less support has been needed as market prices rose during the period. For instance, the producer support estimate (PSE), which

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<sup>5</sup> Average unemployment declined from 11 to 7 per cent during the period 2002-2013, the lowest level in decades (CEPAL, 2017).

<sup>6</sup> The region was able to expand further its social protection system from 2.6 per cent of GDP in the early 1990s to 3.2 per cent of GDP in the late 2000s (ECLAC, 2012).

indicates what proportion of the revenue comes from agricultural policies, decreased from 20 per cent in 2002 to 16.7 per cent in 2012 (Tangermann, 2014). There were, however, little changes in institutional arrangements and policies that influenced the allocation of tax revenues between investors, government and other stakeholders (Tanzi, 2013). In sum, the changes in the product composition of demand did alter the relative demand of land, labour and capital, but these ratios were not significantly affected by changes in fiscal policy.

The combination of available land and labour mobility in the midst of high international prices contributed to increases in investment levels up to 24 per cent of GDP, i.e. as high as during the import substitution period of 1970s (ECLAC, 2012). Most of these investments went into machinery and equipment, and land (Deininger & Byerlee). Between 2003 and 2011, around 70 per cent of these investments went to low or medium-low technology sectors such as food and beverages, textiles, footwear, paper, among others (ECLAC, 2012). These sectors are more likely to be labour intensive, and the returns on assets towards natural-resource based industries and food beverages were close to 8 per cent (ECLAC, 2012). That is in line with the returns for automotive, electronics and machinery, utilities and commerce, which were close to the average of 5 per cent during the decade. In sum, returns to capital on natural resource-based industries, excluding mining, converged with those of other economic sectors suggesting an increasing inter-sectoral integration.

### 3. How is agriculture able to speed up the structural transformation and promote inclusive growth

To approach this question, we adopt a structural transformation framework. By structural transformation we mean the changes in output, employment and trade., i.e. the ability to industrialize and diversify the economy with equity. In this line, inclusive growth, with its emphasis on long-term cross-sectoral growth, through the generation of productive activities and employment leading to income improvements for the majority of the labour force (Ianchovichina & Lundstrom, 2009), fits neatly within such a theoretical perspective (e.g. Kuznets 1966; 1973; Timmer, 1988).

Here we do not examine the process of structural transformation from the onset, but at the stage when the share of agriculture in total GDP is no longer dominant. The continuous pace

and nature of the relative decline of agriculture is still largely dependent on the dynamics of agriculture, and its interplay with the manufacturing and the service sector. A boom in international commodity prices can lead to higher income rents and investments in the natural resource sector (agriculture, fuels and minerals) and the non-tradable service sector and therefore crowd out the manufacturing sector. That is the so called Dutch disease. Theory suggests that the appreciation of the currency and higher labour costs are part of the explanation of the crowding out in the manufacturing sector as the boom sectors attract labour and capital. In this line, increases in agricultural productivity can therefore retard industrial growth as labour may remain in agriculture (Matsuyama, 1992, 2009)<sup>7</sup>.

Although a delayed exodus of agricultural labour may not be compatible with the perception of the secular decline of agriculture, it is conceivable that the resurgence of agriculture is a temporary phenomenon and therefore fully in line with structural transformation to the extent that agriculture is strongly contributing to the integration of the national labour market. Hence, depending on the nature of technological change in agriculture, developing economies with a comparative advantage in agriculture would release labour at different rates, and therefore experience different trajectories of catching up (Eberhardt & Vollrath, 2016a).

Releasing labour out of agriculture leads to a narrowing of the gap between agricultural GDP and employment, and therefore a strong signal that the agricultural sector is connected to the rest of the economy through labour and capital mobility, and therefore an equalizing income effect, or at least a convergence effect, on the overall income distribution. Agriculture is then no longer the base to set wages, but the economy at large. Yet, the process of convergence is mediated by the size of the income gap between agriculture and non-agriculture, their sectoral weights and the capital – labour ratio in the economy. Given that the GDP share of agriculture is shrinking and its productivity on the rise, reallocation of resources into commodities with higher value provide farmers with a better chance to improve productivity and income. In this line, the use of high yielding crops can influence the labour demand through two mechanisms: the reduction of the employment share of agriculture and the land expansion over areas previously used for other crops as during the commodity boom (see Bustos et al, 2016, for Brazil). Which

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<sup>7</sup> The model above assumes that technical change is by definition Hicks neutral. Alternatively, this case can be reinterpreted as an open economy with two sectors, agriculture and industry, producing different goods, with factor biased technological change, and the relative price between manufacturing and agricultural goods is determined exogenously in the world market (Bustos, Caprettini, & Ponticelli, 2016).

one dominates depends on the nature of the technology and therefore less so by weather and location characteristics<sup>8</sup>.

Labour saving technology may increase agricultural productivity per worker, reduce the labour intensity of production and therefore the employment share of agriculture. The distributional impact however depends on the factor mobility across sectors, i.e. wage rates and returns to capital. In other words, if the agricultural sector is not connected to other areas of the economy, the worsening of the income distribution is likely to come about through large differences in productivity. In contrast, land saving technology does not necessarily change agricultural productivity per worker, but may increase the labour intensity of production and therefore the employment share of agriculture. That increase may favour the income distribution. In the case of livestock, it appears that increases in arable land may shift the demand curve for labour to the right, other things being equal, indicating that labour is complementary to land, and therefore adding to the employment share of agriculture and an improvement of the income distribution in agriculture. Thus, a bias towards land saving will have an improvement in the income distribution. The interplay of both define the direction of structural transformation within and outside the sector, let alone distributional implications for the economy at large. However, all these changes are mediated by the relative importance of the type of farms and their size, and re-concentration of land and capital makes it more difficult to assess whether agricultural workers or self-employed farmers have experienced a rise in their real income during the boom.

In sum, increases in agricultural productivity largely depend on the nature of technological change. In other words, the technological changes in agriculture and how labour is absorbed in non-agricultural sectors determines the intensity of factors of production and whether the growth process is leading to a faster structural transformation. The linkages of agricultural growth with other sectors and the generation of productive employment together with social and economic policy tools that interconnects and diversify markets will have implications for whether income growth will be generalized and inclusive. In the following these theoretical considerations will be empirically investigated.

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<sup>8</sup> Studies indicate that the elasticity of agricultural output with respect to labour varies from 0.1-0.2 in temperate areas to 0.4-0.6 in tropical areas ((Eberhardt & Vollrath, 2016b)

#### 4. Measuring the effects of the revival of Latin American agriculture on employment growth and inequality

In order to shed light on the question whether the commodity boom in some countries contributed to structural change and inclusive growth, we examine the relationship between various drivers of agricultural production and formal employment in 16 countries of Latin America and the Caribbean for the period 1990–2015: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, El Salvador, Honduras, Mexico, Nicaragua, Panama, Paraguay, Peru, and Uruguay. These countries accounted for 95 per cent of Latin American value added in agriculture and 85 per cent of the population in 2015 (CEPAL, 2017). Brazil, Argentina and Mexico account for 70 per cent of production in the region, and Brazil is the third largest agricultural exporter in the world after the US and the EU (Nin-Pratt et al., 2015).

We classify these countries according to the content of their export baskets measured by the relative importance of major global crops in their agricultural output (see table 3). There were over 15 top commodity products, and we summarize the output to four main crops: (i) soybeans (cake soybeans, soybeans, oil soybean), (ii) fruits (grapes, apples, avocados) (iii) bananas and (iv) coffee. For instance, soybeans in Argentina had 45 per cent of its total export value in agriculture in the period 2000-3 and 65 per cent in the period 2012-2015; bananas in Ecuador saw the export value move from 65 to 56 per cent during the same periods. However, we also realized that some of these economies have been able to diversify their export baskets. Costa Rica is classified as a banana exporting economy even though the banana export value was cut by half during the period and replaced by pineapples exports to the US market. Broadly speaking, “soybean” countries include Argentina, Bolivia, Brazil, Paraguay and Uruguay; “fruits and vegetables” include Chile, Perú and Mexico; “coffee” includes Colombia, el Salvador, Honduras, and Nicaragua; “bananas” include Costa Rica, the Dominican Republic, Ecuador and Panama.

##### *4.1 Speeding up the structural transformation through agriculture*

We begin by exploring the changes in value added across sectors for the period 1999-2014. Given that the changes are slow in such a short period, we estimated a ratio of value added in the non-tradable service sector divided by the manufacturing sector, and another of value added in agriculture divided by manufacturing. We use year 2000 to index the series and compare it to the

real effective exchange rate in order to determine the extent of crowding out on manufacturing at the expense of the booming sectors. A ratio of 1 for the index means that both sectors have been growing at the same rate. Hence a ratio for the index above 1 means crowding out. In the same line, the real effective exchange rate above 1 means appreciation of the currency.

We observe that the ratio for the index has been above 1 for most countries, indicating that on average the value added of the service sector and agriculture grew faster than that of manufacturing during the period 1999-2014. In other words, the booming sectors did grow at the expense of the manufacturing sector. However, this is not say that the Dutch disease, or the resource curse, did embrace the region. In contrast to previous booms, stable macroeconomics and fiscal savings were treasured and a constant during the period, with some level of currency appreciation after the Great Financial Crisis of 2008.

In order to examine changes in employment, we use a panel regression and separate OLS estimates to check the correlates between the log differences in agricultural productivity per worker and non-agricultural (manufacturing and services) employment for the same period. Table 4 shows basic correlates that indicate a group of countries was able to increase their employment in industry, including manufacturing, and services in tandem with their agricultural productivity. The coefficient for industrial employment indicates that a 1 per cent increase in agricultural productivity has a 0.09 per cent increase in manufacturing employment and a 0.16 per cent in service employment. This is line with previous literature that stresses the role of traditional services in absorbing more labour than manufacturing, yet at the expense of overall productivity (Diao, McMillan, & Rodrik, 2017).

Disaggregating the results by countries, we see that all countries appear to be experiencing a process of structural transformation, some with positive employment growth in manufacturing and services simultaneously. A reallocation that goes through industry, in particular manufacturing, increases the chances to speed up the transformation and that inequality will decline because the sector usually pays higher wages than in agriculture or in traditional services (Helper, Krueger, & Wial, 2012; Rodrik, 2017). Here we observe that on average “soybean” countries have been able to raise their share of manufacturing employment. In Brazil, for instance, there is evidence that technical change in soybeans led to a contraction of labour demand in agriculture and therefore labour reallocated towards the manufacturing sector (Bustos, Caprettini, et al., 2016).

Furthermore, there are studies claiming that profits from the agricultural boom in soybeans were channelled to fund small and medium firms in non-agricultural regions (Bustos, Garber, & Ponticelli, 2016).

Whether we can generalize the direct evidence on Brazil to the other countries is not certain, but it is true that during the commodity boom all countries experienced a decrease in the labour share in agriculture and an increase in the share of private credit through the banking system (see figure 2). In other words, increases in the private credit through the banking system during the commodity boom supports the idea that profits from agriculture have been connected to the rest of the economy, and therefore one of the factors behind the growth of light manufacturing and service employment in the region.

The banana export economies also experienced an increase in the share of manufacturing employment, with the exception of the Dominican Republic. Land saving technologies and an increase in the labour demand in services during the boom period seems to be a plausible explanation for the decrease in the share of manufacturing employment in the island. In contrast, Costa Rica, Ecuador and Panama were able to reduce its commodity dependence on bananas, partly because of the free trade agreements with the US and the EU that enabled some diversification of exports (Josling et al., 2015). Some examples are electronics and machinery in Costa Rica, and textiles in Panama (The Atlas of economic complexity, 2019).

Among the “fruits and vegetables” countries, the increases in employment were seen in services, and not in manufacturing. Post-harvest opportunities such as packing and processing services<sup>9</sup>, which used to be carried out at the end destination, are provided at the source, or at the farm gate (Weinberger & Lumpkin, 2007). This change altered the approach to the development of workforce in this subsector, which employs mostly rural labour with low levels of education, and hinted at the need to improve their skills: among packing and cold storage, the packing worker may not need extra education, but the packing manager and quality assurance manager need to have at least university degree (Fernandez-Stark et al., 2011). For instance, the Chilean government provided tax breaks for the private sector in order to develop and implement training programs (the Chile – GAP)<sup>10</sup> to become more competitive and meet the rigorous standards required to export to the EU and the US. Peru was also able to embrace this change in the value

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<sup>9</sup> Washing, chopping, mixing, bagging, branding, coding, storing, refrigerating etc.

<sup>10</sup> See <https://www.globalgap.org/> .

chain faster than most in the region<sup>11</sup>, partly because it was able to diversify its export basket within vegetables and fruits and put together investment in training, sanitary and phytosanitary systems, favourable trade policies road and transport infrastructure (Meade, Baldwin, & Calvin, 2010). Likewise, it was able to diversify its exports based on ICT, which account for over 10% of total exports (The Atlas of economic complexity, 2019).

Finally, the picture is more mixed in terms of employment generation among the coffee countries. The decline in the share of agricultural labour continued in Colombia, Honduras and El Salvador, but not in Nicaragua. There it went up by 2 per cent between 2000 and 2015. Coffee, one of the most labour intensive crops, is still the major employer among the four countries. To shed light on this phenomena, we looked at the changes in employment within the agricultural sector in Colombia, the third largest coffee producer in the world.

Data from the Ministry of Agriculture and Development indicates that in absolute terms the people working in coffee has increased, but fallen in relative terms as other crops have been entering the sector (see table 5). In other words, traditional crops have been replaced by high value crops, which in turn also have experienced increases in area planted. On the other hand, Honduras, el Salvador and Nicaragua were able to diversify its export basket through textiles (The Atlas of economic complexity, 2019).

#### *4.2 Household survey and inclusiveness estimates*

Revisiting the debate about the recent decline in inequality in Latin America, a stylized fact that emerges is the low elasticity of the upper quintile during the period. The explanation why the top groups have seen their income share decline could be partially explained by the narrowing of the skill premium as proposed by recent studies (Lustig, Lopez-Calva, Ortiz-Juárez, & Monga, 2016; Messina & Silva, 2017). However, additional dynamics are at play related to the agricultural sector. We have for instance shown some basic correlates indicating that the process of structural transformation and broad based employment is ongoing in many countries of the region during the period. In order to test whether the gains of growth have included the rural population, in particular the rural poor, we estimate income elasticities of rural and urban labour by quintiles for the 16 countries before and after the 2008 Global Financial crisis (table 6).

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<sup>11</sup> The agricultural productivity in Peru was over 3 per cent and the highest in the region, even above that of Chile ((Nin-Pratt et al., 2015)

We use average income per capita in constant dollars of 2010 from the World Development Indicators and the per capita income distribution from the ECLAC database. Using data between 2000 and 2015, we observed that the bottom 20 in rural areas benefitted from economic growth more than the other quintiles. A 1 per cent increase in income per capita leads to 1.31 per cent increase in income per capita in the poorest quintile, and the pattern is biased in favour of the lower ends of the income distribution. The same pattern is evident for urban areas, but growth elasticities are in general higher in urban areas.

To understand the performance of the bottom and top deciles in more detail, we use household data<sup>12</sup> for Brazil and Colombia, and analyse the distribution of per capita income for the labour force in agriculture for the years 2003 and 2013. In the absence of land distribution and income from capital gains in the database, we focus only on the income generated in agriculture, and not of all income from agriculture of people engaged in agriculture or in the rural distribution. The absence of non-agricultural income leads to an underestimation of the total income for people who declare agriculture as the main source of income. We have employees, employers, self-employed and subsistence workers, among others. We exclude unpaid family workers. All these surveys collect annual information on demographic and socioeconomic characteristics of the population: income and expenditures, education, labour force, health, housing and other assets and demographic variables, among others. Survey weights are used to ensure the national representativeness. We use the income per capita from rural individuals in the agricultural sector to draw Lorenz curves and Gini ratios at both points in time (see figure 3). The income data has been deflated and 2008 is used as the base year for comparative purposes.

We find that the bottom 20 per cent did experienced changes that could be characterized as pro-poor in both countries. In Colombia, the bottom 20 per cent saw its income increase by over 8 percentage points while the top 20 per cent experienced a decrease by 4 percentage points (table 8). In Brazil, we see a less pronounced pattern on the extremes, but the intermediate deciles, between 3 and 8, appear to make up for that in both countries (table 9). The results go however in tandem with the increases in the wage share for Brazil during the period (Abeles, Amarante, & Vega, 2014). Both countries also experienced a decline in the Gini coefficient. However, while in Colombia the mean of labour income in agriculture as a proportion of the

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<sup>12</sup> The data sources in this study come from the Brazilian National Household Survey (PNDA) and the Colombian Survey of Life Quality (ECV) for years 2003 and 2013. The Brazilian Bureau of Statistics (IBGE) runs the PNAD every year. The Colombian National Department of Statistics (DANE) runs the ECV every year since 2010.

national mean declined by 2 per cent during the period, the mean of labour income in agriculture as a proportion of the national mean in Brazil rose almost 10 per cent. Furthermore, we find that the employees, not the self-employed, experienced the largest increase of income among the occupational groups in the sector (Valdes et al., 2008). In short, even though capital income is not included, we see an improvement in the real income of the agricultural labour force in both countries.

Returning to our main question on the effects of the revival of Latin American agriculture on structural change and broad-based inclusive growth, we explore the relative importance of various drivers of overall formal employment: the index of domestic producer prices for agricultural commodities from the FAO database, the quality indexes for manufacturing from the IMF database, the GDP share of tax, the Gini coefficient from the World Development Indicators, and the income distribution measured by increases in the bottom 40 per cent from the ECLAC database. All the variables are logged. The regression results are reported in table 7. The time series cover the period 1994-2014.

Domestic agricultural prices have a positive correlation with formal employment and indicate that domestic prices would induce both urban and rural employers to increase their demand for labour. Positive estimates for quality in manufacturing is consistent with the notion that the sector is growing with formal employment, and therefore contributing to structural change. In the same line, any improvement in the income distribution, either measured by the Gini or the bottom 40 per cent is associated with formal employment and hence inclusive growth. Finally, increasing taxation is not significant, which suggests that changes in the fiscal policy did not influence the performance of the economy. As a robustness check, we also use the service share in employment. Although causalities are uncertain, our results seem to suggest that agriculture has propelled economy-wide linkages and structural changes that have been relatively inclusive.

Our analysis is consistent with the idea that agriculture in most economies of Latin America has become connected to the rest of the economy through factor mobility, i.e., wages and return to capital in the agricultural sector are set at the national level rather than at the sectoral level. Even in the aftermath of the Great Recession of 2008/09 agricultural wages followed the trend of wages in non-agricultural sectors, in particular construction and traditional services (Alvaredo & Gasparini, 2015; ECLAC, 2012). Returns on agriculture-based industries

were also in line with the returns for automotive, electronics and machinery, utilities and commerce, during the boom (ECLAC, 2012). And the price volatility of agricultural crops has lessened as technology enabled multiple uses and therefore new markets and linkages between agriculture and manufacturing (Borras Jr et al., 2016; Byerlee et al., 2016). All these conditions are more likely to improve the prospects for rural output and employment and in turn speed up the structural transformation of the region.

## 5. Concluding remarks

The commodity boom in the 2000s supported high prices for fuels, minerals and agricultural goods for a relatively long period of time. Our main question here was to assess whether countries with a comparative advantage in agriculture were able to speed up their structural transformation and integrate broader social groups into social and economic life during this period. We focus on Latin America for many reasons. First, it is said that the region has a comparative advantage in agriculture vis a vis other regions, and agricultural productivity, as suggested by the structural transformation framework derived from Kuznets, is considered to be a main trigger of the process of structural transformation, and its subsequent distributional implications. Second, it was the only region of the world that grew in income per capita terms and experienced an improvement in its income distribution simultaneously during the boom.

Agriculture, in contrast to other natural resource based activities, is more likely to generate linkages and spillover effects, in particular through manufacturing and later on services, as documented in the early history of most advanced economies and the contemporary history of East Asia. However, a commodity boom also may entail the risk of experiencing the Dutch disease, i.e. crowding out the manufacturing sector and retard industrialization as the booming sectors attract or retain labour and capital. Taking a sample of 16 countries in the region, we observe that on average the value added of the service sector and agriculture grew faster than that of manufacturing during the period 1999-2014. In other words, the booming sectors did grow at the expense of the manufacturing sector.

However, this is not say that the Dutch disease, or the resource curse, did embrace the region. In contrast to previous booms, stable macroeconomics and fiscal savings were treasured and managed well during the period. Furthermore, the increase in agricultural productivity during the period increased in tandem with both manufacturing and service sector employment,

with agriculture supplying the labour. We see this happening even in economies with a comparative advantage in non-renewables, such as Bolivia, Chile, Ecuador, Peru, among others. The supply of labour was positively associated with increases in wages and the agricultural sector was no exception to this trend. Several reports show that agricultural wages were following the non-agricultural wages, a clear sign that the sector was connected to the rest of the economy and therefore could contribute to the improvement of the overall income distribution.

We also show that the bottom quintile in the income distribution did grow faster than the top quintile. Yet urban elasticities are greater than those in rural areas. In other words, although growth appears to be inclusive, the resource distribution is not optimal, which goes in line with the fact that there is still surplus labour in rural areas. Hence, the type of technology embedded in the agricultural sector, the main subsector of the rural economy, is important to understand the speed of labour reallocation. In this line, “soybeans” countries appear to be speeding up their transformation through faster release of agricultural labour and employment non-agricultural employment. The picture is however mixed for countries with a comparative advantage in other products. For instance, Nicaragua, a “coffee” country, increased their agricultural and manufacturing employment simultaneously during the period while Colombia, another “coffee” country, exactly the opposite.

The structural transformation framework highlights the contribution of the agricultural sector into the overall income distribution. As productivity increases, and labour is released, the average income within the sector should increase too and contribute positively to the overall income distribution. In this line, we examine the improvement in the real income of the agricultural labour force in two countries: Brazil and Colombia. Brazil is the agricultural powerhouse in the region, with 10 per cent of the population still in agriculture in 2015. Increases in agricultural productivity and non-agricultural employment rose together during the period. In terms of the distribution in agricultural income, the bottom quintile was relatively stable during the period while the top quintile lost ground to the intermediate deciles. In contrast, Colombia did not experience increases in non-agricultural employment but the improvement in its income distribution was more pronounced and favored the bottom quintiles over the intermediate and top quintiles. The implication is though that this improvement would probably not have been possible at all if agricultural wages were not connected to the rest of the economy. Furthermore, the

association between technology and factor mobility implies that they are complementary, otherwise the income distribution would most likely not have improved.

We conclude that the relative inclusiveness of the commodity boom in Latin America was supported by the recent revival of agriculture, partly driven by higher productivity and structural transformation within and outside the sector rather than mere good external conditions. However, good external conditions was the key incentive to support the decision to invest more in land and labour during the boom. On the other hand, given the connection between agriculture and the rest of the economy, profits from the boom were channelled, and manufacturing and services also could contribute to its transformation. In other words, contrary to much of the historical experiences of commodity booms our analysis suggests that labour benefited from the boom this time because labour markets are less segmented than they used to be and linkages between rural and urban activities have opened new job opportunities in the service and construction sectors. Hence the debate around the causes of the improvement in the income distribution should renew the interest on the relationship between reliance in agricultural commodity and long term economic development. Hence resource rich countries, including those dependant on non-agricultural commodities, that aspire to break the resource curse and improve the stability of their growth performance need to speed up the integration of the agricultural sector to the rest of the economy and deepen the effort to diversify its economy.

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**Table 1. Natural resource dependency in the export shares of Latin America**

	Agriculture			Fuels			Minerals			Totals		
	1995	2003	2013	1995	2003	2013	1995	2003	2013	1995	2003	2013
ARG	54,1	50,5	54,8	1,7	3,4	5,6	10,3	17,1	4,6	66,1	71	65
BOL	33,4	33,1	18,3	10,9	33,3	53,8	40,1	16,7	23,8	84,4	83,1	95,9
BRA	33,7	33,1	37,4	0,9	5,2	7,4	11,3	9,1	18,1	45,9	47,4	62,9
CHL	37,2	36,7	27,1	0,2	2,7	0,9	49,5	42,3	59	86,9	81,7	87
COL	36,2	22,9	11,4	27,2	37,2	66,8	6,8	6,2	3,1	70,2	66,3	81,3
CRI	61,5	30,4	22,3	0,4	0,3	0,1	1,2	0,7	1	63,1	31,4	23,4
DOM	16,4	14,8	22,6	0	0,1	3,3	2,2	1,8	16,1	18,6	16,7	42
ECU	54,8	46,3	34,5	35,1	43,2	56,5	2,5	0,4	2,7	92,4	89,9	93,7
SLV	45,3	19,3	22,8	0,2	1,7	1,9	1,9	1,6	2	47,4	22,6	26,7
HND	55,7	32,4	42,3	0,2	0,1	3,9	0,7	3,5	7,8	56,6	36	54
MEX	9	6	6,6	10,3	11,2	12,8	3,1	1,3	4,6	22,4	18,5	24
NIC	74,6	56,5	42,7	0,6	0,7	0,5	2,8	4,4	10,4	78	61,6	53,6
PAN	33,5	32,3	15,8	3	8,1	21,9	1,9	2	4,7	38,4	42,4	42,4
PRY	80,3	82,2	74,4	2,7	6,8	15,4	0,3	0,4	1,4	83,3	89,4	91,2
PER	31,3	22,3	17,1	4,9	7,4	13	50,2	53,7	58,1	86,4	83,4	88,2
URY	59,1	63,7	74,9	1	1,6	0,5	0,9	1,5	1,6	61	66,8	77
CUB	76,8	46	30,6	0,3	1,1	9,4	15,5	35	19,7	92,6	82,1	59,7
GUA	61,3	43	50,1	1,6	6,1	4	0,4	0,4	5,8	63,3	49,5	59,9
VEN	3,2	1,7	0,3	73,6	78,9	91,4	7,5	5,5	1	84,3	86,1	92,7

Source: UNCTAD, 2017.

**Table 2. Share of agricultural employment as % total labour force**

	1991	2000	2008	2011	2015	Var 2000/15
ARG	0,343	0,673	1,195	0,636	0,262	-61%
BOL	41,076	38,939	31,204	29,785	27,848	-28%
BRA	22,434	20,01	17,294	15,434	10,242	-49%
CHL	19,092	14,44	11,719	10,261	9,378	-35%
COL	24,166	22,381	18,268	17,811	16,006	-28%
CRI	16,978	15,778	12,392	10,905	12,307	-22%
DOM	20,53	15,602	12,681	12,04	9,715	-38%
ECU	31,727	29,941	27,955	27,906	26,192	-13%
SLV	28,161	21,613	18,688	21,594	18,111	-16%
HND	38,047	36,057	34,267	35,303	28,722	-20%
MEX	25,936	17,405	13,736	13,688	13,431	-23%
NIC	31,273	30,833	28,156	30,867	31,315	2%
PAN	27,302	16,97	17,902	16,549	14,673	-14%
PRY	36,001	34,061	25,296	25,517	19,702	-42%
PER	37,066	34,713	28,923	28,277	28,262	-19%
URY	12,508	11,367	10,58	9,793	8,824	-22%
AVG	25,79	22,54	19,39	19,14	17,18	-24%

Source: World Development Indicators, 2018.

**Table 3. Commodities (%) within the 20 top agricultural value exports**

	2000-2003	2012-2015
ARG	cake soybeans (25), wheat (14), maize (12)	cake soybeans (35), soybeans (16), oil soybean (14), maize (11)
BOL	cake soybeans (37), oil soybeans (19), soybeans (12)	Soybeans (40), oil soybeans (20), brazil nuts (15)
BRA	Soybeans (19), cake soybeans (14), coffee (13), orange juice (9)	Soybeans (31), meat (9), cake soybeans (9) sugar raw (9)
CHL	Wine (25), grapes (22), crude materials (9)	Wine (22), grapes (16), fruit prep (8)
COL	Coffee (39), crude materials (21), bananas (16)	Coffee (40), crude materials (21), bananas (12)
CRI	Bananas (39), coffee (19), pineapples (9)	Bananas (23), pineapples (23), food prep (14), coffee (9)
DOM	Cigars (46), sugar raw (13)	Cigars (37), bananas (17), cocoa (11), plantains (10)
ECU	Bananas (65), crude materials (13)	Bananas (50), crude materials (15), cocoa (13)
SLV	Coffee (59), sugar raw (8)	sugar raw (20), coffee (17), beverage (13), pastry (10)
HND	Coffee (62), bananas (21)	Coffee (48), bananas (15), oil palm (9)
MEX	beer of barley (17), coffee (13), tomatoes (9)	beer of barley (16), tomatoes (11), avocados (10)
NIC	Coffee (47), meat (13)	Meat (25), coffee (23), cigars (9)
PAN	Bananas (52), cigars (13)	Bananas (39), alcoholic beverages (13), oil soybeans (9)
PRY	Soybeans (45), cotton (12), cake soybeans (12), meat (9)	Soybeans (31), meat (22), cake soybeans (18), maize (9)
PER	Coffee (40), vegetals preserved (16), asparagus (10)	Grapes (17), coffee (15), asparagus (11), vegetables (9)
URY	Meat (35), rice (18)	Meat (32), soybeans (27), rice (9)

Source: FAO website, 2019.

**Table 4. Estimating the effect of agricultural labour productivity on sectoral employment between 2000 and 2015**

Panel regression model of Sectoral Employment	Changes in Industry	Changes in Services
log difference of agricultural value per worker	0.09**	0.16**
Observations	166	166
R-squared	1%	1%
Number of countries	16	16

	Industry	Services
Argentina (soybeans)	+	-
Bolivia (soybeans)	+	+
Brazil (soybeans)	+	+
Chile (grapes, apples)	-	+
Colombia (coffee)	-	-
Costa Rica (bananas)	+	+
Dominican Republic (bananas)	-	+
Ecuador (bananas)	+	+
El Salvador (coffee)	+	+
Honduras (coffee)	-	-
Mexico (avocados)	-	-
Nicaragua (coffee)	+	-
Panama (bananas)	+	-
Paraguay (soybeans)	+	-
Perú (grapes)	-	+
Uruguay (soybeans)	-	+

Source: Data taken from the World Development Indicators, 2019.

Note: Changes in dependent variables are calculated over the years 2000 and 2015, controlling for income per capita.

**Table 5. Direct employment by crops in the Colombian agricultural sector**

Products	1991	Share	2000	Share	2012	Share
Maize and rice	241943	11%	195966	9,3%	201983	8,3%
Vegetables, other	75260	3%	85536	4,1%	93422	3,8%
Potato	91023	4%	68624	3,3%	80388	3,3%
Cotton	108886	5%	19822	0,9%	17891	0,7%
Coffee	818931	37%	748752	35,5%	807225	33,1%
Panela and sugar cane	268823	12%	324933	15,4%	307812	12,6%
Fruit, other	58068	3%	129602	6,1%	200537	8,2%
Plantain	169534	8%	184724	8,8%	194195	8,0%
Flowers	60420	3%	75524	3,6%	140521	5,8%
Palm oil	18630	1%	25855	1,2%	74351	3,0%
Other temporary crops	87916	4%	44678	2,1%	48412	2,0%
Other permanent crops	207765	9%	204309	9,7%	274239	11,2%
	2207199	100%	2108326	100%	2440977	100%

Source: Ministry of Agriculture and Rural Development, 2014 (Colombia).

**Table 6. Income elasticity between average income and income by quintile in LAC between 2000 and 2015**

Quintiles	q1	q2	q3	q4	q5
Rural	1.31	1.10	1.01	1.01	0.93
Observations	147	147	147	147	147
R-squared	87%	95%	97%	98%	96%
Number of countries	15	15	15	15	15
Urban	1.46	1.32	1.26	1.13	0.72
Observations	165	165	165	165	165
R-squared	86%	94%	95%	98%	96%
Number of countries	15	15	15	15	15

Source: Data taken from the ECLAC, 2018.

Note: Log-log regression with fixed effects. Argentina is absent from the results because it is fully urbanized and therefore no available data on the rural distribution of income.

*Table 7. Panel regression estimates for formal employment (logged variables)*

Model	Formal employment
Variables	
Domestic producer prices	0.027**
Income Bottom 40	0.08**
Quality index in manufacturing	0.34**
Taxation	0.05
Time dummy (year 2002)	0.01
Observations	185
R-squared	7%
Number of countries	16

Note: Author's estimates

**Table 8. Personal income distribution for labour in the agricultural sector, Colombia**

Decile	2003		2013	
	%income	%cum	%income	%cum
1	1.63		1.99	
2	2.83	4.46	3.31	5.3
3	3.7	8.16	4.18	9.48
4	4.48	12.64	5.12	14.6
5	5.45	18.09	6.11	20.71
6	6.68	24.77	7.2	27.91
7	8.13	32.9	8.58	36.49
8	10.39	43.29	10.54	47.03
9	14.91	58.2	14.31	61.34
10	41.8	100	38.66	100
Avg. income as % national	53.9		51.9	
Gini	50.9		46.6	

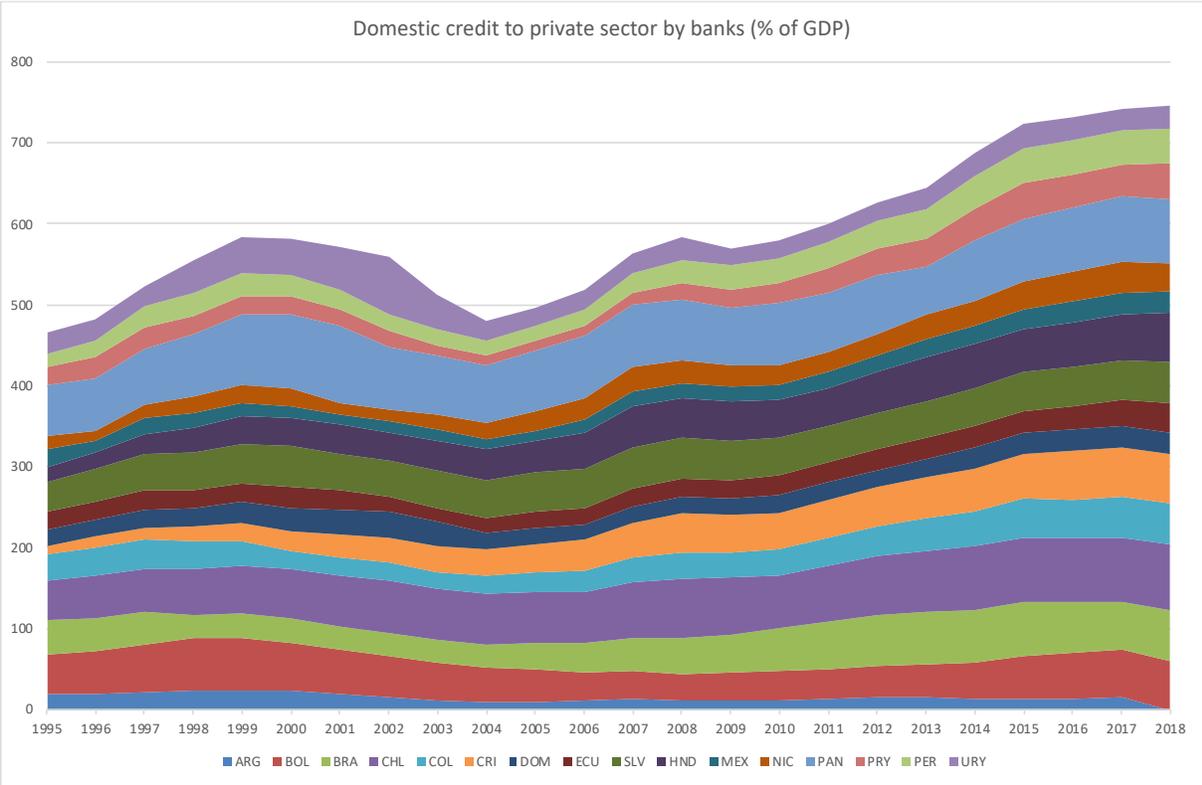
Note: Author's estimates on Life Quality Household Survey data (*Encuesta de Calidad de Vida*) from Colombia.

**Table 9. Personal income distribution for labour in the agricultural sector, Brazil**

Decile	2003		2008		2013	
	% income	% cum	% income	% cum	% income	% cum
1	1.02		1.01		0.89	
2	2.19	3.21	2.28	3.29	2.13	3.02
3	3.14	6.35	3.29	6.58	3.19	6.21
4	4.05	10.4	4.32	10.9	4.29	10.5
5	5.3	15.7	5.6	16.5	5.6	16.1
6	6.6	22.3	7,0	23.5	7.1	23.2
7	8.6	30.9	9,0	32.5	9.3	32.5
8	13.3	44.2	11.6	44.1	11.7	44.2
9	13.4	57.6	15.2	59.3	15.6	59.8
10	42.4	100	40.7	100	40.2	100
Mean income as % of mean national income	55.6		59.8		65.9	
Gini	53.7		51.9		51.7	

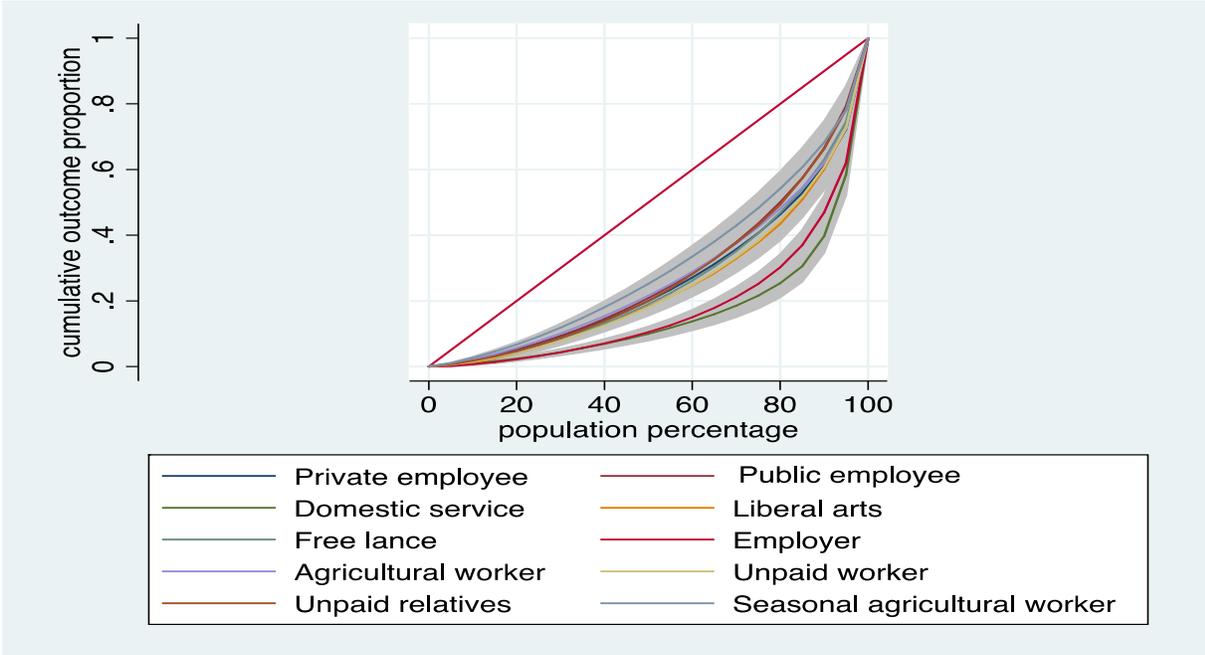
Source: Author's estimates based on PNDA from Brazil.

**Figure 1. Private credit through the banking system**



Source: World Development Indicators, 2019.

**Figure 2. Personal distribution of agricultural, Colombia year 2013**



Source: Author’s estimates using household surveys (ECV, 2013).