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RESEARCH ARTICLE



The agricultural productivity gap: A global vision

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ABSTRACT

Productivity in agriculture tends to grow slower than in other sectors. This is a stylized fact that has resulted in a persistent productivity gap, generalized over time and across countries. This paper explores the evolution of this gap from an international perspective, identifying patterns in both developed and developing countries. Empirical regularities are discussed in the light of a literature review on the causes of the gap and its socio-economic effects. Reflections on the nature of the productivity gap often merge with considerations on its social implications and on the policies that should be implemented to deal with it. We refer to this wider political economy issue as the ‘farm problem’, and argue that it has not been given a satisfactory solution, neither in rich nor in developing countries. Although in some industrialized countries the discharging of the countryside has acted as a major source of convergence, there has not been a general reduction in the productivity gap between agriculture and the rest of the economy worldwide, nor are there compelling reasons to assume that this will happen in the future.

KEYWORDS



Farm problem; structural change; agricultural policies; agricultural gap

JEL CODES

N50; O13; Q18; J43

1. Introduction

Modern economic growth over the last century-and-a-half has been accompanied by a set of regularities or stylized facts. One of these, as we shall argue, has been a tendency for productivity in agriculture to grow more slowly than in other sectors of the economy. The agricultural productivity gap continues to be a widespread reality in both developed and developing countries, although there have been a few episodes of convergence that are worth studying. Reflections on the nature of the agricultural productivity gap are probably as old as the gap itself, and are often indistinguishable from the considerations on its socio-economic implications and on the policies implemented to deal with it. We will try to differentiate between (1) the debate on the causes of the gap and (2) the much broader political-economy discussion of the policy responses and their economic repercussions. This is not an easy task, since there is a strong historiographical view that sees agrarian protectionism as one of the main causes of the gap (and not the other way around). This paper argues that the agricultural productivity gap has much

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deeper roots than agricultural protectionism, yet we acknowledge that protectionism has not only failed to narrow the gap, but possibly even widened it. We will argue that protectionism has been the completely uniform response to the political tensions associated to the productivity gap and, given that there is little reason to assume that the gap will narrow in the future, we will also argue that prospects for major breakthroughs in multi-lateral negotiations on agricultural trade liberalization are poor.

The paper is structured as follows. The next section provides an overview of the main views on the role of agriculture in modern economic growth. This will serve to frame the later discussion within a wide historical perspective and will also help to better articulate our conclusions. Section 3 separately discusses the main views on the nature of the agricultural gap and the core contributions on the derived ‘farm problem’. Section 4 provides a descriptive analysis on the evolution of the gap over the last decades based on data from FAO (2018) and United Nations (2018), discusses the strengths and weaknesses of the main indicators for measuring relative productivity in agriculture and identifies different paths of agricultural development. The article ends with a set of conclusions regarding the nature of the gap and its implications for both developed and developing countries, as well as for future international agricultural trade policy negotiations.

2. Agriculture in development theory

Although there has been a sort of ‘renaissance’ in the attention devoted to agriculture in the twenty-first century (Pingali 2010),¹ systematic thoughts on the role of the rural sector in the process of economic growth are as old as Quesnay (1694–1774) and Ricardo (1772–1823). A vast amount of intellectual effort has been put into understanding the nature of the structural transformation process, resulting in a wide number of theoretical and empirical works, different schools of thought, and varied policy prescriptions. According to Andersson and Till (2018), all major historical views on the role of agriculture in economic development may be roughly classified in two groups. On the one hand, the so-called ‘agro-sceptics’ have systematically argued that agriculture has been unable to stimulate sustained productivity increases in the past and is unlikely to serve as an engine of growth in the future. On the other hand, the ‘agro-proponents’ have consistently claimed that agricultural development was crucial for long-term growth and industrialization in the past, and in a similar way it should play an essential role both for aggregate and pro-poor growth in days to come. Of course, scholars from both groups draw on very different arguments, datasets, and methodological approaches to support their views.

Within the ‘agro-sceptics’ approach, one significant view has been that of agriculture as a ‘fifth wheel’ in the process of economic development (Andersson and Till 2018). Proponents from this strand have argued that agriculture, by itself, does not have the ability to stimulate sustained aggregate growth but, if neglected, may impede the whole development process. This was one of the key ideas behind *dual* models such as those proposed

¹After two decades of absence from World Bank reports and studies, agriculture returned to the agenda of international organizations with the publication of the *Agriculture for Development Report* (World Bank 2008). Although agriculture was regarded as a way out of poverty in developing countries and ‘small farmers’ were devoted special attention, it has been argued that the report fails to escape the logics and expectations of modernization theory (Murray Li 2009; Oya 2009; Veltmeyer 2009).

by Boeke (1953) and, most significantly, Lewis (1954). Agriculture was conceived as a means to provide food, labour, savings, and markets to the urban sector, but was not envisioned as a driver of economic growth. This view was also shared by the most significant proponents of Latin American Structuralism and Dependency Theory advocates. Drawing on the seminal work carried out by Prebisch (1950) and Singer (1950), the key idea was that there would be a long-term decline in the terms of trade of primary-commodity exporters due to the low income and price elasticities of demand for farm products. Hence, if long-term adverse effects of agricultural production were to be avoided, resources – labour and capital – should be reallocated to the industrial sector as rapidly as possible (Baran 1952). The emphasis on industrialization was shared by development economists such as W. Rostow, who nevertheless considered agricultural productivity increases as a precondition for the ‘take-off’ (Rostow 1962). The ideology of ‘modernization’ (Latham 2000) saw the agricultural sector as subsidiary and indeed inspired economic policy in developing countries over the second half of the twentieth century. In fact, it has been said that ‘the ideology of development focused on industrialization to the point of obsession’ (Friedmann 1992, 373). Although authors such as Rostow also pointed out that agriculture might play an important role in the development process – for instance, it could help earning foreign exchange and could lead to expansion of the domestic markets for manufactured goods – the aim of fostering industrialization most commonly implied anti-agricultural-biased policies. This was the case in most developing countries during the 1960s and 1970s (Krueger, Schiff, and Valdés 1988; Anderson, Rausser, and Swinnen 2013), where the strategy of pursuing industrialization via low food prices and low wages for urban workers failed to give agricultural investment enough priority and sometimes revealed itself as dangerous in terms of ensuring adequate food supplies to their population (De Janvry 1981; Bovard 1998; González-Esteban 2018).

On the other hand, there is a group of scholars and social organizations that have consistently highlighted the potential of the agricultural sector as an engine of growth. These are the so-called ‘agro-proponents’ (Andersson and Till 2018). Among this group, is the strand of development economists who first analysed the process of structural transformation and focused on agriculture’s contribution of labour, capital, commodities, and market expansion to this process (Clark 1940; Kuznets 1961). Soon other scholars focused on the potential of the agricultural sector to create forward and backward linkages to the industrial and service sectors, via commodity, factor, and financial flows (Johnston and Mellor 1961; Nicholls 1964; Timmer 1992; Delgado, Hopkins, and Vallerie Kelly 1994). This idea has subsequently been highlighted in empirical works such as Kay (2002). In a similar fashion, Adelman (1984) introduced the concept of ‘agricultural demand-led industrialization’ (ADLI). According to this author, the ADLI strategy consists of ‘building a domestic mass-consumption market by improving the productivity of agriculture and letting farmers share in the fruits of the improved productivity’ (Adelman 1984, 944). Importantly, while this approach calls for a shift in the sectoral emphasis for public investment towards agriculture, it does not advocate for a change in commercial incentives in favour of import substitution. The traditional idea of pro-agricultural strategies being associated with self-sufficiency and closed-economy ideologies is also proved inaccurate by export-led growth proponents, who have consistently pointed out that increased effective demand for trade may enable the use of surplus resources

(land, family labour ...) in countries where the land frontier is not closed (Myint 1958). Moreover, the realization that high agricultural exports per capita have been commonly associated with strong economic growth have led some scholars to argue that agricultural specialization may have been ‘the goose that laid the golden-eggs’ in some developing countries (Thorp 1998, 116; Martín-Retortillo et al. 2018). This optimism in relation to the agricultural sector is somehow shared by the Chicago School Rationality and ‘Anti-distortion’ proponents. Drawing on Schultz’s neoclassical perspective, they argue that peasants are as rational as any other economic agent and, if the proper incentives are provided, agriculture can be as efficient as any other sector (Bauer and Yamey 1959; Schultz 1964, 1978; Ruttan and Hayami 1984). Confronting the idea of agriculture as a passive sector dominated by inertia and traditionalism, these authors advocate for major investments in public goods to improve farmers’ access to technology and claim that anti-agricultural biased policies in developing countries should be removed (Johnson 1973; Krueger, Schiff, and Valdés 1988; Anderson, Rausser, and Swinnen 2013). Finally, since the foundation of *La Vía Campesina* in 1994, and from a totally different perspective, proponents of the ‘food sovereignty’ movement have developed a pro-agricultural discourse that praises the principles of agro-ecology and confers great importance to the non-economic functions of agriculture: the social and environmental functions (De Schutter and Vanloqueren 2011; González-Esteban 2014). It has often been argued that, when small farmers have the right incentives, they apply more sustainable practices and obtain higher productivity levels than large-scale farmers (Lipton 2005; Kay 2006; Hazell et al. 2007). Since small farmers also generate more employment per production unit and often play an important role in reducing rural poverty and food insecurity in developing countries, many authors have proposed inward-looking and sustainable agriculture as a long-term strategy for small holders in the global era (Pretty 2002; Rosset 2005; Altieri 2008).

It is important to note that the general distinction between ‘agro-sceptics’ and ‘agro-proponents’ is based on a great simplification of the ideas put forward by each of the above-mentioned scholars. For instance, Clark (1940), Kuznets (1961) and many others are considered ‘agro-proponents’ because they emphasized the importance of agriculture as a source of demand, capital and labour to foster the process of structural transformation. However, as we shall see, this is not to imply that they saw agriculture as having the same potential for expansion as manufacturing. Similarly, Prebisch is considered as an ‘agro-sceptic’ because he emphasized the role of industry for economic growth. However, he also claimed that agricultural modernization was an essential condition for the development of industry to raise living standards, and pointed out that primary exports should not be sacrificed in favour of industrial development (Prebisch 1986). The line between ‘agro-sceptics’ and ‘agro-proponents’ is thinner than could be expected.

3. The agricultural productivity gap and the ‘farm problem’

As discussed before, many efforts have been devoted to the task of analysing the contribution of the agricultural sector to the process of economic growth. Yet, it was the very same process of growth experienced by industrialized countries throughout the nineteenth and twentieth centuries that led to huge transformations within the agricultural sector itself and motivated the apparition of new problems and political economy

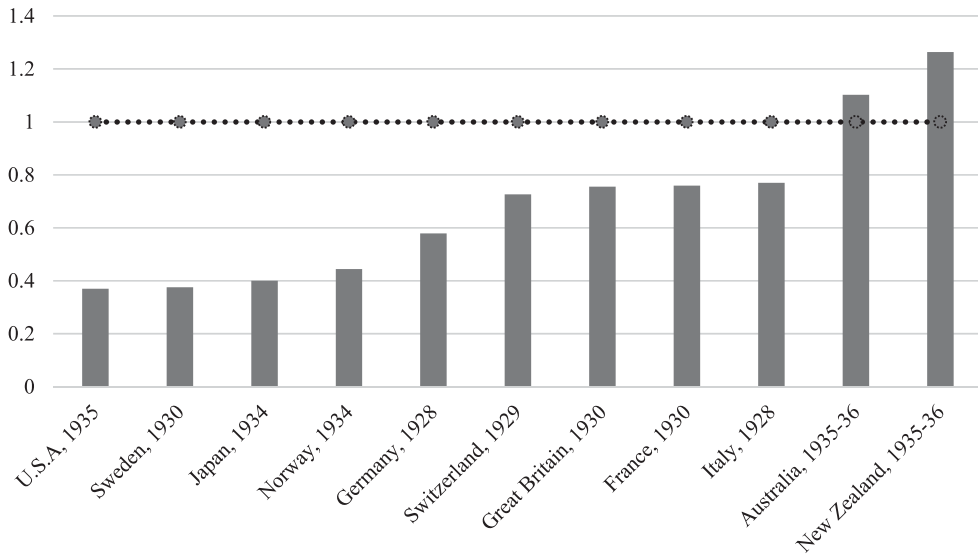


Figure 1. Productivity ratio between the primary sector and the economy as a whole. Measured in purchasing power of average incomes per head (international units), as expressed in Clark (1940). Source: author's elaboration from Clark (1940).

issues (or considerably aggravated existing ones). This was the case of the agricultural productivity gap and the so-called 'farm problem'.

3.1. The 'root problem': the agricultural productivity gap

In his 1940 work *The Conditions of Economic Progress*, Colin Clark echoes the words written by Sir William Petty in 1691: 'there is much more to be gained by Manufacture than Husbandry' (Clark 1940, 176). Clark refers to Petty's statement as 'Petty's Law', and considers it a 'brilliant and entirely correct generalization made from the scanty facts at his disposal in 1691' (Clark 1940, 177). Clark's judgement of Petty's law was based on his own empirical analysis, which clearly showed the existence of a generalized productivity gap between agriculture and other sectors. This is best seen in Figure 1, which shows the ratio between the income produced per head in agriculture and that of the whole economy.²

Clark's analysis goes back to the mid-nineteenth century for a group of countries. As may be seen in Figure 2, the agricultural gap was a growing reality in most industrialized countries over the studied period.

Of course, large differences can be observed in the size and evolution of the gap depending on the country. Clark attempted to explain these differences by appealing to the evolution of the terms of trade, the rhythm of technological change, and the transfer of workers from agriculture to industry. These are the variables that have captured the attention of scholars interested in understanding the gap since the mid-twentieth

²According to Clark (1940), data was obtained by taking the figures of average income per head in primary production (measured in the currency of each country) and comparing them with the general average income per head. Clark (1940) also points out that this 'can only act as a measure of the relative productivity of these industries in different countries so far as the terms of exchange between their products are the same in each country' (Clark 1940, 342).

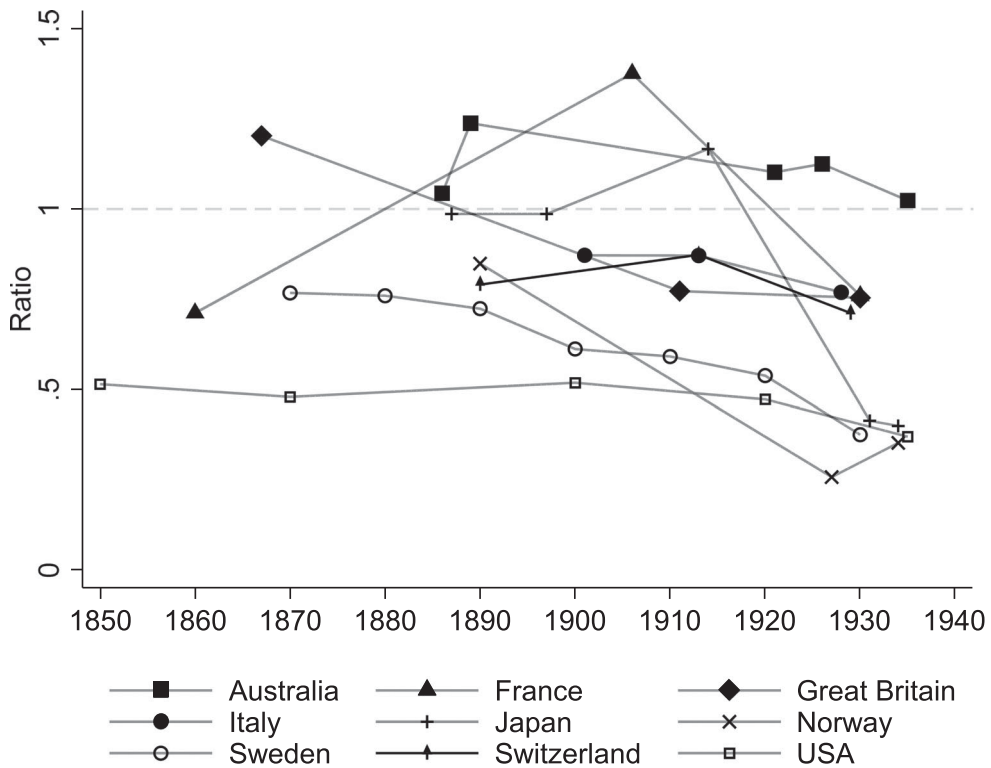


Figure 2. The agricultural gap in Clark (1940): LCU per person engaged in agriculture / average LCU per person (excluding rents). [LCU = Local currency]. Source: author's elaboration from Clark (1940).

century. As we shall see, the productivity gap has continued to be a widespread reality to this day (although there has been great heterogeneity in the trajectories followed by different countries). This led to the development of different explanations for the persistence of the gap.

The quasi-permanent nature of the gap was already intuited by Clark, who stated that there was 'clear evidence that the world economic equilibrium' had not yet been obtained, and indeed that the world was 'still within a very long distance of obtaining it' (Clark 1940, 342). However, it was probably Latin American structuralists like Prebisch (1950) who first suggested that there was no reason to believe that the so-called 'equilibrium' would ever be achieved. With regard to technology, Clark stated that 'the basic difference between primary and secondary types of production has always been, it is supposed, that the former is subject to conditions of diminishing return and the latter to conditions of increasing return' (Clark 1940, 340). In the early 1950s, CEPAL economists developed the concept of *structural heterogeneity* to suggest that productivity asymmetries between sectors were the natural result of the fact that in some sectors innovation is faster than in others, and that firms have different capacities to innovate and absorb technology (Sturm and Nohlen 1982). The *structural heterogeneity* was defined as a situation in which there are wide differences in labour productivity levels between and within sectors of the economy, and that these differences are sufficiently marked to clearly

segment the labour market and the productive system into different layers in which technological and wage conditions are strongly asymmetrical (Cimoli and Porcile 2013, 3). A similar argument regarding technological change may be found in more recent works such as Koning (2002). Koning emphasizes that the development of large industrial capitalism (over the last third of the nineteenth century) was made possible by the new industrial technologies, which enabled significant economies of scale to be achieved. The fact that economies of scale were much more limited in agriculture conditioned the development of the sector, favouring the consolidation of a productive structure based on *family farms* that squeezed profits and rents.³ A related argument on the role of technology may be found in Freeman and Louca (2011), who argue that industry and services, not agriculture, have been the leading sectors for the most disruptive innovations in the last century.

The issue of lower technological development in the agricultural sector is inextricably linked to the issue of prices. Prebisch's (1986) argument was based on the premise that, if the prices of agricultural and industrial products were to respond exclusively to the relative evolution of productivity in both sectors, the lower productivity growth in the agricultural sector should translate into an evolution of the terms of trade favourable to agricultural products. However, facts contradicted this idea. As we shall see, the second half of the twentieth century saw a general deterioration in the terms of trade for agricultural products (Timmer and Akkus 2008). Prebisch (1950) and Singer (1950) offered two complementary explanations for the deterioration of the terms of exchange for primary products. Inspired by the so-called Engel's Law – 'the poorer a family, the greater the part of total expenditures must be spent on food' (Engel 1957)⁴ – Prebisch's idea was that primary products had a very low income elasticity of demand. Singer's point was that, due to the greater bargaining power of industrial workers vis-à-vis agricultural workers, the efficiency gains derived from technical progress would translate in industry into higher income for the producer, and not into lower prices (Ocampo and Parra 2003). These arguments have been complemented more recently by others that emphasize the importance of the structure of the production chain. Koning (2017) argues that the broad wave of mergers that occurred in the agro-food sector from the 1960s onwards meant that many farmers were faced with only a handful of large suppliers and buyers. In contrast to what happened in other sectors, these companies did not buy up their suppliers or start their own primary production; given the high risk and low profits of farming, agro-food enterprises frequently used its position to impose their terms on farmers (including prices). Hence, as Patel (2007) and food regime scholars such as McMichael (2009) have pointed out, the monoposonistic structure of the agro-food chain may have contributed to the deterioration of farm prices.⁵

³Koning (2002) argued that the rise in wages that accompanied the development of large industrial capitalism in the last decades of the nineteenth century *squeezed* agricultural profits and rents. While large farms could not defend themselves against the profit squeeze, family farms were 'prepared to sacrifice income and sweat to preserve their holdings' (Koning 2002, 26). Thus, family farms consolidated themselves as the most widespread production unit and large farms declined. It should be noted, however, that the evolution of farm structures has differed between countries depending on factors such the availability of cheap migrant labour (Koning 2017). Moreover, the overall rise of self-employed farmers should not be confounded with a growing autonomy of agricultural producers: the post-war decades were characterized by a growing dependence of family farms on government agencies and agro-industry (Koning 2017). In fact, the modernization of holdings of self-employed farmers (the so-called 'rationalization' of farms) came to involve 'the displacement of small full-time farmers who lacked the resources for continuing to run on the technical treadmill' (Koning 2017, 127).

⁴The English translation comes from Perthel (1975).

⁵See also Magnan (2012) and Bernstein (2016).

Finally, other studies have looked for the determinants of the agricultural productivity gap in variables other than technology and prices. A particularly relevant idea refers to the importance of underemployment in the agricultural sector. It has been argued that many people remain attached – underemployed – to family farms when there are no sufficiently attractive alternatives in industry and services (Simpson 1997). Other works have considered variables such as sectoral differences in human capital and hours worked, differences in amenities and the cost of living, geography,⁶ institutions such as land property rights, ethnic fractionalization, and even measurement errors in agricultural value added data. It has been pointed out, however, that a ‘puzzlingly’ large agricultural gap remains even when controlling for many of those variables (Gollin, Lagakos, and Waugh 2014). Agricultural productivity and non-agricultural productivity interact in a very complicated way, and it should be acknowledged that much remains unknown about the specific mechanisms that push towards sectoral income divergence.

3.2. *The political economy debate: the farm problem*

The agricultural productivity gap has very important socio-economic implications, as it is the main source of an agricultural *income* gap. The key idea behind the so-called ‘farm problem’ is that gains in agricultural output are not usually matched by a comparable advance in farm incomes, which poses the challenge of ensuring farmers a ‘fair income’ (Tracy 1964). Importantly, this is a different problem from that of *low* absolute agricultural income. The farm problem first became a political issue in the relatively rich United States, not in the places with the poorest farmers on the planet. The farm problem is a fundamentally political matter, only considered a problem by some. We will argue, however, that the economic effects derived from the policy responses to the agricultural income gap have been massive and continue to this day.

As described in de Hevesy (1940) and Malembaum (1953), rich countries such as the United States and Canada were pioneers in facing the social tensions associated to this political-economy issue over the first decades of the twentieth century. Throughout the 1930s, food surpluses accumulated in the United States while farmers went bankrupt and millions of consumers went hungry. According to Lamartine Yates, here were reversed the ‘gloomy’ predictions of Malthus, with practical consequences as ‘gloomy’ as he ever predicted (Yates 1946). The severe agricultural situation in the United States in 1933 led to the approval of the Agricultural Adjustment Act (AAA), which had the ultimate goal of raising the purchasing power of most agricultural products to their 1909–1914 parity ratio (Olmstead and Rhode 2008; González-Esteban, Pinilla, and Serrano 2016). Agricultural price supports and protectionist measures were generalized, marking what has been called ‘the beginning of the end for *laissez-faire* in agriculture worldwide’ (Winders 2009). Yet, it was not until the post-war years that the farm problem was perceived by contemporaries as structural rather than temporary. Once the food shortages caused by the war had disappeared, it became apparent that many industrialized countries were facing a similar agricultural situation to that of the United

⁶For instance, Bloom and Sachs (1998) argued that being located in the tropics leads to lower physical productivity in agriculture.

States. The farm problem was characterized as a persistent tendency for the aggregate supply of agricultural commodities to grow faster than the aggregate demand for them, so that agriculture was burdened constantly with an excess supply of labour, even when business was expanding and there were brisk job opportunities in non-agricultural industries (Schultz 1945). The continuing disparity between farm incomes and incomes in other sectors inevitably became a major concern of governments, and therefore a major determinant of their agricultural policies (González-Esteban, Pinilla, and Serrano 2016). The most common political response to the farm problem, both in the US and in Western Europe, was directed towards the demand side, comprising price supports, export subsidies, and a wide range of protectionist measures for agriculture. This had many consequences. Since the US entered the post-war years as the world hegemonic leader, 'not only did agriculture receive special treatment in the GATT, but the special treatment also appears to have been tailored to fit the US farm programs then in existence' (Hathaway 1987, 187). Institutions regulating the international agricultural trade explicitly allowed the farm subsidies operating in rich countries, thus 'causing too much food to be produced in regions not well suited to farming ... and too little to be produced in the developing countries of the tropics' (Paarlberg 2010, 104). This is what was referred to by D.G. Johnson as a major 'disarray' in world agriculture (Johnson 1973). This international institutional framework⁷ encouraged the application of anti-agricultural biased policies in developing countries and had long-term adverse effects regarding food security and agricultural development in those countries (Friedmann 1992; González-Esteban 2018). Finally, although price supports in industrialized countries were intended to ensure farmers a 'fair income' while adapting basic agricultural supplies to demand, they failed to tackle the problem of overproduction (Tracy 1964).

Reflections on the farm problem have often been made in the light of a particular view on the causes of the productivity gap. This is a complex debate with many ramifications, yet it is possible to distinguish between two general views on the relationship between public policies and the agricultural productivity gap. First, there is the view that the gap was ultimately caused by public intervention. The main argument goes back to the shift of comparative advantage in farm products that took place over the last third of the nineteenth century. The narrative put forward by authors such as Tracy (1964) is that the protectionist measures demanded by the inefficient European farms led to a growth in world supply exceeding that of demand. Although excess supplies were responsible for the persistent fall in agricultural prices, governments continued to approve measures that tried to protect their farmers by stimulating national production, thus aggravating the problem in the long term. Then, it is argued that this process continued and gained intensity in the decades following World War II, leading to a major disarray in world agriculture (Johnson 1973). The main proponents of this approach have often emphasized the working of the market to restore the equilibrium (i.e. an equal remuneration of production factors between sectors), and have commonly advocated

⁷According to Friedmann (1993), this institutional framework was a defining feature of the so-called second food regime: a 'rule-governed structure of production and consumption of food on a global-scale' that originated with the signing of the GATT in 1947 (Friedmann 1993, 30). Although the height of the second food regime was roughly 1947 to 1973, it has frequently been argued that certain institutional elements of the regime have endured to this day (Pritchard 2009; Magnan 2012; González-Esteban 2018).

eliminating 'distortions'. This view has been predominant among agricultural and development economists. To name a few, some significant examples are Schultz (1945, 1964, 1978), Tracy (1964), Ruttan and Hayami (1984), Krueger, Schiff, and Valdés (1988), and Anderson, Rausser, and Swinnen (2013). In contrast, proponents of the alternative vision do not consider protectionism as the cause of the farm problem, but rather as a consequence of it. This view was presented in detail in Koning (2002), who situated the origins of the problem, in the 'encompassing transformation of the Western world economy' that accompanied the rise of protectionism over the last decades of the nineteenth century (Koning 2002, 171). According to this approach, the observed inability of agriculture to keep pace with industry had a lot to do with the differential characteristics of the agricultural sector – analysed, as mentioned in the previous section, by authors such as Clark (1940), Kuznets (1955; 1973) and Prebisch (1986) – including its reduced ability to achieve economies of scale and the particular nature of demand for agricultural products. The fact that 'large farmers who were calling for government support were not just uneconomic gentleman farmers, but often efficient entrepreneurs' makes it possible to speak of a *failure of agrarian capitalism* (Koning 2002, 172). Supporters of this approach do not deny that protectionism may have had a long-term impact in agricultural trends, but they consider that the agricultural productivity gap has structural roots. The differences between the two approaches are also clear with regard to the role of the market as an equilibrating force, since Koning (2002) and *structural heterogeneity* advocates also point out that the history of world agriculture over the last century has been characterized by a *permanent* disequilibrium.

4. The structural transformation and the agricultural gap

Most countries of the world have made substantial progress on their own path of structural change throughout the second half of the twentieth century and the early years of the twenty-first. This means that there is now enough empirical evidence to identify the most noticeable regularities in this process. Of course, we are interested in analysing the evolution of (relative) productivity in the agricultural sector.

4.1. Measuring the agricultural gap

Recent empirical studies on the sectoral productivity gap have proposed two different – yet complementary – indicators to approximate the gap (Timmer 2007; Dorin, Hourcade, and Benoit-Cattin 2013; Andersson and Palacio Chaverra 2016): the 'Labour Income Gap' (LIG) and the 'Labour-Income Ratio' (LIR). These are referred to as *income* indicators by Dorin, Hourcade, and Benoit-Cattin (2013) because they are based on the statistics of value added in the agricultural and non-agricultural sectors. We will also refer to them as LIG and LIR, although we believe that they reflect differences in productivity rather than income (i.e. depending on the structure of the food chain, the politics of food, and other factors, income per farmer may be more or less than output per farmer). These indicators are based on a simple comparison between the average agricultural output per farmer and the average total output per worker, measured in local currency and at current prices. This means that one must also be very cautious when interpreting them as 'productivity' indicators, since time series and international comparisons are also

reflecting terms of trade. As mentioned before, this idea was already expressed by Clark (1940), who, like us, was also predominantly interested in approaching the agricultural gap in this way.

As mentioned before, the LIG and the LIR are complementary indicators. The LIG illustrates the difference between the share of agriculture in total value-added (Ya/Y) and that of farmers in total labour (La/L). In turn, the LIR can be expressed as $(Ya/Y) / (La/L)$ or, alternatively, as $(Ya/La) / (Y/L)$. Therefore, the LIR directly compares agricultural labour productivity with overall productivity. Note that the LIR is usually between 0 and 1 (agricultural productivity is lower than the national average) and it approaches 1 as agriculture becomes more productive in relation to other sectors. On the contrary, the LIG is commonly negative and tends towards 0 as countries grow.

4.2. Main global trends

Drawing on the LIG, Figure 3 offers an overview of the process of structural change and its consequences in terms of the distribution of production and employment between 1980 and 2015.

As may be observed, countries in the early stages of the structural transformation process are characterized by high shares of agricultural production in total value added and by much higher shares of active population devoted to agriculture. Therefore, poorer countries tend to have strong and negative LIGs, reflecting the importance of agricultural output in overall output, and also the lower productivity of their agricultural workers when compared to the population devoted to other economic activities (i.e. industry and services). Since the share of labour force in agriculture and the share of agricultural output in total output tend to decrease as structural change takes place, the LIG (the difference between two magnitudes that tend to get smaller and smaller) tends to decrease automatically as countries grow. Drawing on this type of data, some authors have argued that reallocation from agriculture to non-agriculture will take place until the process 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' (Andersson and Palacio Chaverra 2016, 104). We will argue, however, that the perceived trend towards a 'world without farmers' (Timmer 2007) should not be confused with the idea that economic growth is responsible for the narrowing of the agricultural productivity gap. This may be best seen in Figure 4, which relates per capita income to both the LIG and the LIR.

As may be observed, the LIR (right axis) is consistently between 0 and 1 (the average LIR value is roughly 0.5, and less than 5% of all LIR observations are greater than 1). In fact, there does not seem to be a clear correlation between the LIR and GDP per capita, which means that the agricultural productivity gap is manifest in both rich and poor countries. The LIG, for its part, suggests that the 'farm problem' in rich countries has turned into a minor issue due to the reduced importance of agriculture in both labour and GDP, but this should not be confused with the idea that intersectoral inequality decreases as countries grow. This has several implications. First, in no way can it be inferred that the factors that originally motivated the

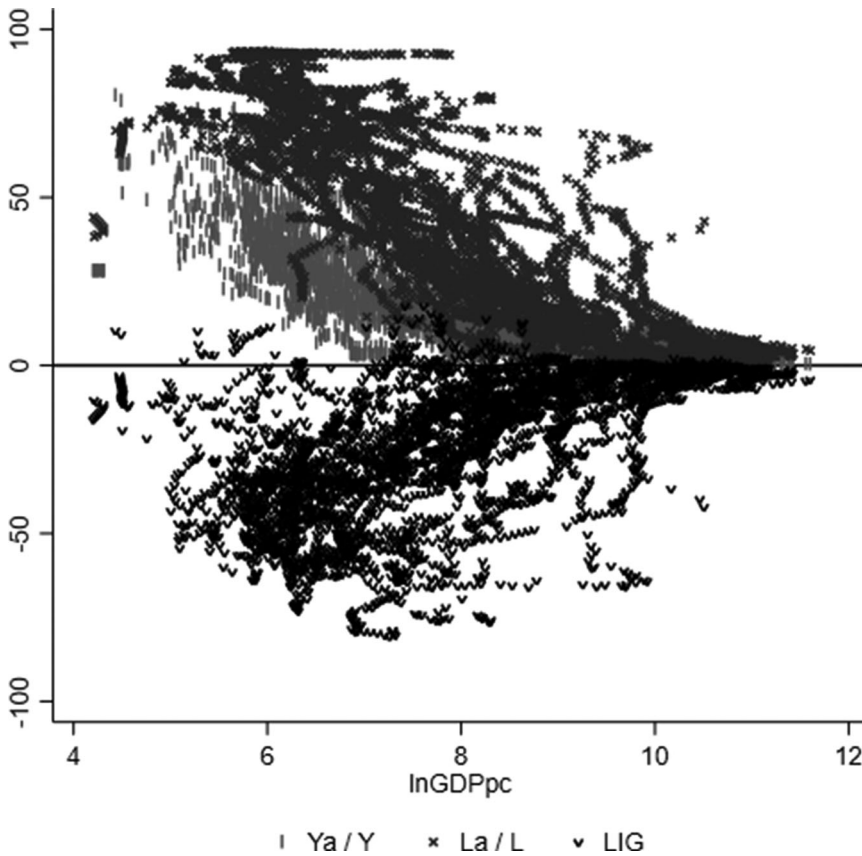


Figure 3. The LIG and the structural transformation, 1980–2015. Source: author's elaboration from FAO (2018) and United Nations (2018).

Note: Data on the share of agriculture in total value added (Ya/Y) is measured in local currency (LCU) and has been extracted from FAO (2028). The share of active population devoted to agriculture (La/L) is from United Nations (2018). The Labour Income Gap (LIG) has been constructed as the absolute difference between Ya/Y and La/L . The logarithm of GDP per capita ($\ln\text{GDPPc}$) is expressed in real terms (2010 US \$) and is also from FAO (2028). Each point in the graph corresponds to a country and a year between 1980 and 2015. The list of countries is available in the appendix. The 'agricultural sector' comprises all activities included in ISIC REV. 3 (agriculture, hunting, forestry, and fishing) according to the International Standard Industrial Classification of All Economic Activities.

agricultural productivity gap (as discussed in the previous section) have disappeared or been mitigated. Second, it should not be expected that economic growth will tend to narrow the gap in the future, just as it has not done so in the past. Third, given that the 'root problem' persists, it seems reasonable to expect that historical claims for higher incomes for the agricultural sector will also persist, both in developed and developing countries.⁸

⁸Of course, these demands will adapt to changing national circumstances and are likely to be embedded in broader discourses on sustainable development and other rural concerns (depopulation, unequal access to public services ...): see Collantes and Pinilla (2011).

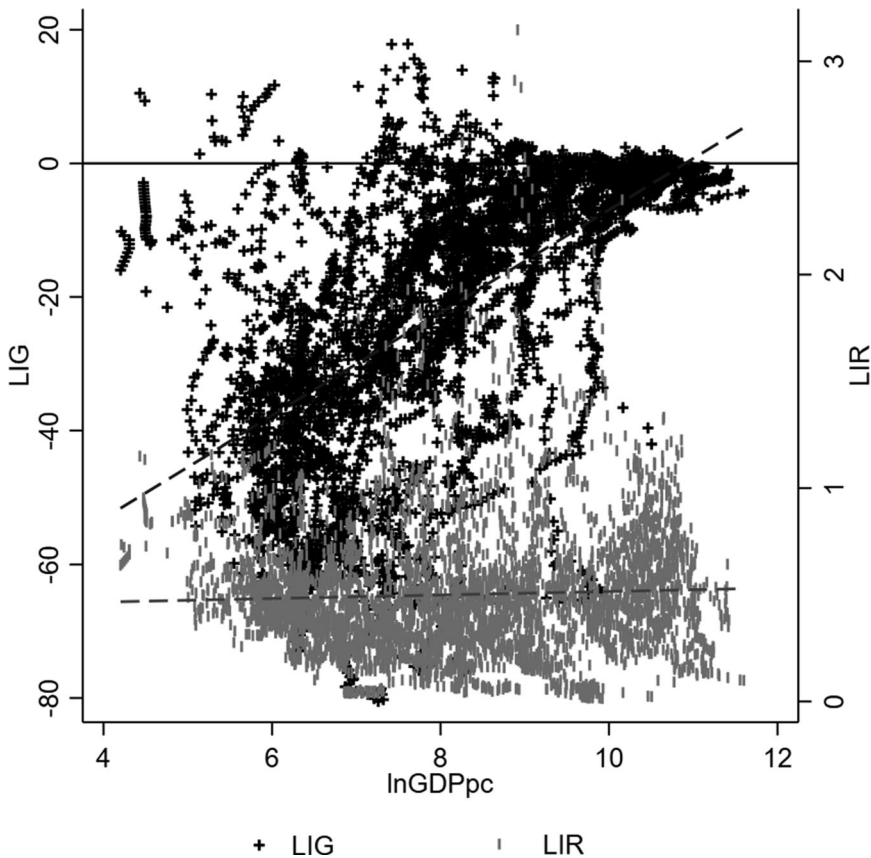


Figure 4. LIR and LIG, related to GDP (1980–2015). Source: author's elaboration from FAO (2018) and United Nations (2018).

4.3 Intensification and mechanization

Figure 4 masks some national episodes of convergence between the productivity of the agricultural sector and that of the economy as a whole. Under what circumstances have certain countries managed to reduce the productivity gap between agriculture and the rest of the economy? The empirical evidence shows that a decreasing productivity gap – i.e. a growing *LIR* – may be achieved through different processes. Of course, it may well be that the productivity gap is reduced with no agricultural productivity increases. This has indeed happened in some countries, over relatively short periods of time, coinciding with major crises in the industrial and service sectors. However, (1) this hardly represents a good situation for farmers or anyone else, and (2) the general context in most countries over the last 35 years has been one of productivity growth in the economy. Therefore, most episodes of productivity convergence have occurred because productivity in the agricultural sector has grown faster than in the industrial/service sectors. But what are the sources of agricultural productivity growth?

Drawing on Hayami and Ruttan (1970) and Malassis and Padilla (1986), different patterns of agricultural production may be characterized by introducing the following identity:

$$Y_a/N = Y_a/A * A/L_a * L_a/N$$

where Y_a denotes agricultural production, N total population, A the acreage of cultivated land, and L_a the number of agricultural workers. According to Dorin, Hourcade, and Benoit-Cattin (2013), this identity places the share of agricultural labour as an important parameter of the ‘growth engine’ at play. Indeed, it introduces a central question: ‘how far past increases in agricultural per capita production were driven by ‘intensification’ or, alternatively, by the ‘discharging’ of labour from agriculture to other sectors that enables land per worker to increase and ‘mechanization’ to develop?’ (Dorin, Hourcade, and Benoit-Cattin 2013, 5). This may be seen more clearly in the following identity, which can be easily derived from the previous one:

$$Y_a/L_a = Y_a/A * A/L_a$$

Thus, agricultural labour productivity (Y_a / L_a) may be raised through improved land productivity (Y_a / A ; ‘intensification’) and through increased land availability per agricultural worker (A / L_a ; ‘mechanization’). As Figure 5 illustrates, there has been a clear association between the evolution of agricultural labour productivity and both the evolution of land productivity and land availability over the period 1980 to 2015.

Improvements in land productivity and land availability per agricultural worker have contributed to the global agricultural labour productivity growth. But which factor has been more important? And how are intensification and mechanization related to LIR trends? Figure A1 (in the appendix) shows country growth rates of Y_a/L_a , Y_a/A , and A/L_a between 1980 and 2015. The graph shows which part of the growth of Y_a/L_a has been due to the growth of Y_a/A , and which part has been due to the growth of A/L_a .

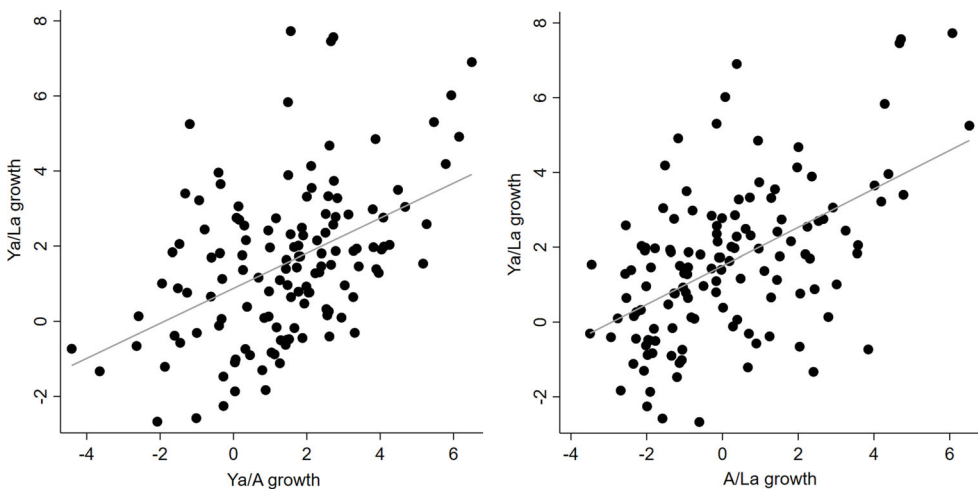


Figure 5. Agricultural labour productivity growth vs land productivity growth (left) and land availability growth (right), 1980-2015. Source: author’s elaboration from FAO (2018) and United Nations (2018).

Countries have been grouped by the observed evolution of the productivity gap (1. LIR worsening, 2. Moderate LIR variations, 3. Moderate LIR improvements, and 4. Great LIR improvements) and some regularities may be observed. Overall, it has been much easier to increase land productivity than to increase land availability per agricultural worker. Of the 132 countries that have been considered in this study,⁹ the clear majority (103) have managed to increase land yields, but less than half (59) have now more land available per farm worker than they did 35 years ago. This is most worrying, since, as shall be discussed, it seems that it has been the ‘discharging’ – and not the ‘intensification’ – which has contributed more to reduce the productivity gap between agriculture and the rest of the economy.¹⁰ Out of the 33 countries where the LIR has deteriorated the most, in 25 the area available for cultivation per farm worker has been reduced. On the other hand, in most of the countries in which the gap has narrowed the most land availability per agricultural worker has increased (28 out of 33).

Figure A1 also shows that most countries where the LIR has deteriorated have experienced a disappointing evolution in agricultural labour productivity, whereas most countries included in the group of ‘great LIR improvements’ have experienced remarkable progress (something that, as mentioned before, has had much to do with increased land availability). This can best be seen in Figure 6, which shows the correlation between agricultural labour productivity growth and the absolute LIR growth (which was of course expected, since the LIR depends directly on Y_a/L_a).

There are, however, significant exceptions. As shown in Figure A1, there have been many countries where the growth of agricultural labour productivity has been substantial and yet the income gap has widened (China, Vietnam, Myanmar, India ...). When it comes to the evolution of the agricultural gap, it is not only agricultural labour productivity growth that matters, but also what happens in the other sectors. And, although there is indeed a positive relationship between general labour productivity and agricultural labour productivity growth – probably reflecting the effect of certain general conditions to economic growth such as national institutions as well as the presence of linkages between agriculture and the rest of the economy – that relationship is not as strong as could be expected (see Figure 7).

Considering the importance that the increase in available land per agricultural worker seems to have had in the cases of productivity convergence, the next section will identify different paths of agricultural transformation according to the evolution of the absolute number of agricultural workers.

4.4. Patterns and regularities

There is a compelling reason to include the evolution of L_a as a defining feature of the model of agricultural growth. The LIR depends directly on the evolution of agricultural labour productivity, which in turn depends on land availability per agricultural worker. If L_a is growing, and no free land is available (which is the case in most developing countries), the only way of raising agricultural labour productivity is improving land yields (which may be achieved through more inputs and ‘intensification’ practices). On

⁹The sample incorporates both developed and developing countries. See Table A1 in the Appendix for detailed information on the countries included.

¹⁰This is true despite the well-established fact that output per unit of land tends to be greater in small farms than in large farms. In this regard, see Berry and Cline (1979)

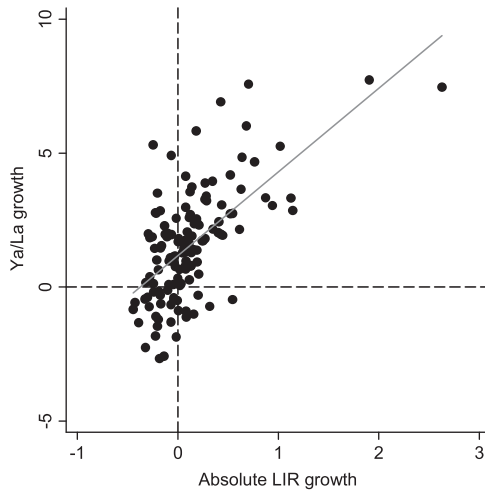


Figure 6. Agricultural labour productivity growth vs absolute LIR growth (1980–2015). Source: author’s elaboration from FAO (2018) and United Nations (2018).

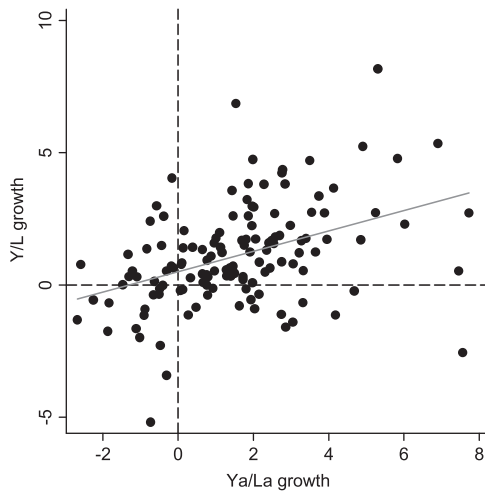


Figure 7. General labour productivity growth (Y/L) vs agricultural labour productivity growth (Ya/La) (1980–2015). Source: author’s elaboration from FAO (2018) and United Nations (2018).

the contrary, if agricultural population is decreasing, higher agricultural labour productivity may also be achieved through ‘mechanization’ (i.e. more cultivated land per worker thanks to the incorporation of tractors and combine harvesters). Considering this, Dorin, Hourcade, and Benoit-Cattin (2013) proposed four historical alternative pathways of agricultural development:

- (a) The ‘*Lewis Path*’¹¹: the number of farmers decreases, and farm and nonfarm labour incomes converge.

¹¹The term ‘Lewis’ refers to William Arthur Lewis. Much of this author’s notoriety is due to a 1954 paper in which he modelled structural change in a dual economy with unlimited supplies of labour (Lewis 1954).

- (b) The '*Lewis Trap*': there is a growing gap between agricultural and non-agricultural productivity. The active population in agriculture increases.
- (c) The '*Farmer-Developing Path*': labour incomes converge despite the growing agricultural workforce.
- (d) The '*Farmer-Excluding Path*': there are fewer farmers and the income gap with non-agricultural workers widens.

Figure 8 provides some illustrative examples of agrarian transformation over the period 1980–2015. Following the approach by Dorin, Hourcade, and Benoit-Cattin (2013), Figure 8 represents the cumulative annual growth rate from 1980 (= 0) to 2015 of (1) the active population in agriculture (x-axis), and (2) the income gap between agriculture and the rest of the economy, measured as *LIR* (y-axis). The x-axis has been plotted inversely, so that shifts to the right indicate a decrease in the agricultural labour force.

As may be observed, countries such as Japan, Germany, and the United States have followed a '*Lewis Path*' over this period, because decreasing agricultural population has been accompanied by a falling productivity gap between the agricultural sector and the rest of the economy (these are the countries whose trajectory is framed in the upper right quadrant). If the graph included countries such as France, Spain, Italy, Canada, Romania, Bulgaria, and Brazil it would be possible to find a similar path. On the other hand, there are certain countries, like India and China, where agricultural population has grown significantly while becoming relatively less productive. Many countries have been caught into this '*Lewis-trap*' (lower left quadrant): Equatorial Guinea, Botswana, Lesotho, Ghana, Bhutan, Ruanda, Afghanistan, Zambia, Perú, Bolivia, and Guatemala, to name just a few. Figure 8 also includes an example of a '*Farmer-developing path*' (upper left quadrant): Pakistan. In this country, agricultural population has increased while managing to converge in income with the workers from other sectors. Other countries in this situation would be Nicaragua, Chile, Liberia, Algeria, Jordan, Cameroon, and Namibia. Finally, though not included in the graph, some European countries –

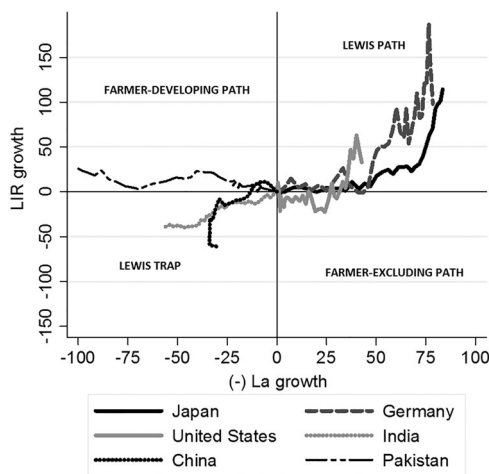


Figure 8. Agricultural pathways in different countries, 1980–2015. Source: author's elaboration from FAO (2018) and United Nations (2018).

Poland, Portugal, Switzerland, Denmark – have gone through a ‘farmer-excluding path’ over this period.

This categorization of paths can be used to search for similarities across countries and over time. Figure 9 shows countries’ absolute *LIR* growth and *La* growth between 1980 and 2015, by income group.

It is striking that no low-income country (except perhaps North Korea) and no lower-middle income country (apart from Mongolia, Nicaragua, and Morocco, where *La* has decreased only slightly) have managed to embark upon a ‘Lewis Path’ over the studied period. Among the countries whose agricultural population has increased in absolute numbers, some of them have managed to reduce the agricultural gap (for instance, Liberia, Sierra Leone, Syria, Togo, and Jordan).

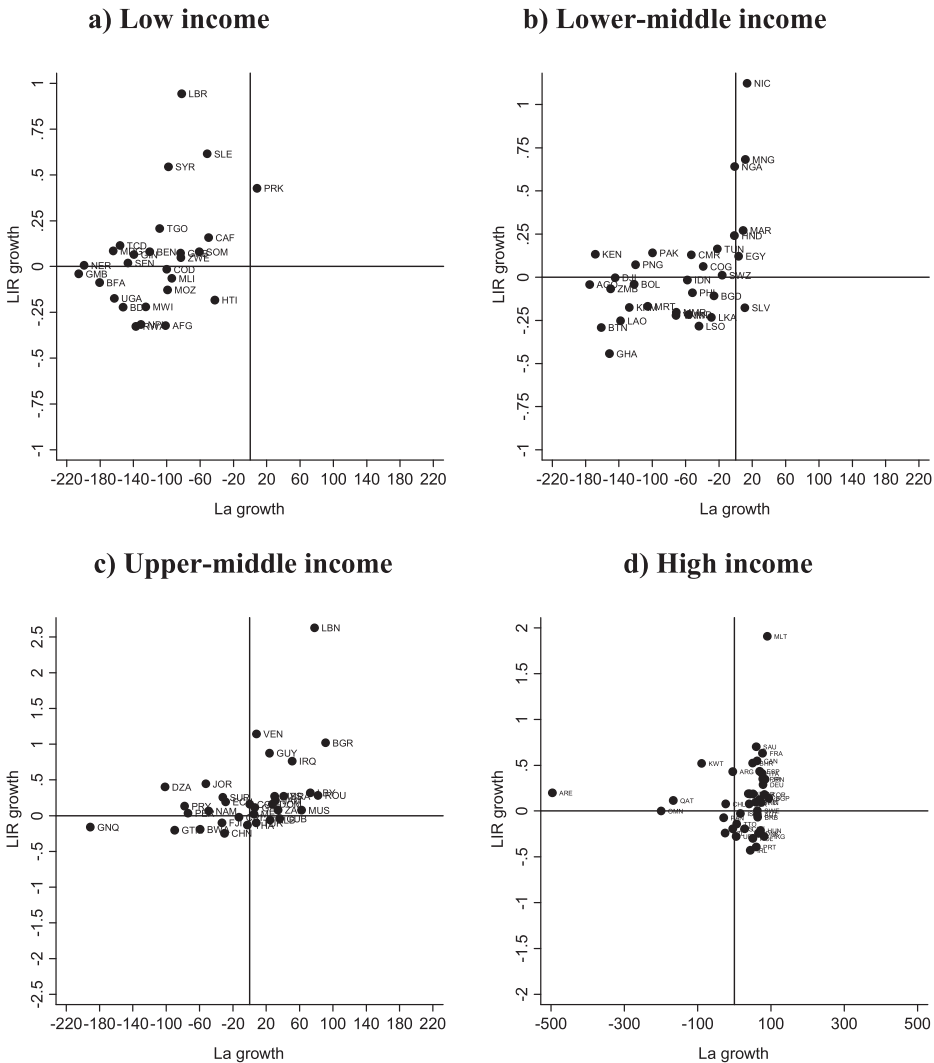


Figure 9. Absolute *LIR* growth and *La* growth 1980–2015, by income group. Source: author’s elaboration from FAO (2018) and United Nations (2018). The x-axis has been plotted inversely, so that shifts to the right indicate a decrease in the agricultural labour force.

paths' may be reflecting successful 'intensification' practices, particular agro-export economy structures that have benefited from favourable international terms of trade, and/or perhaps disappointing results in the productivity evolution of industry and services. However, in most countries in which La has increased, the productivity gap has deteriorated. Since the most populous countries of the world belong to this group – i.e. India, China, Indonesia, Bangladesh, Philippines, Vietnam, Myanmar, Uganda, and Afghanistan – it seems that most of the world population live in countries that have been caught into the 'Lewis trap'. This probably has much to do with their inability to use the 'discharging' process as a source of agricultural labour productivity growth.¹² China, India, and Myanmar are only a few examples of countries whose agricultural labour productivity has not been able to grow at the same pace as the economy. This is the rule and not the exception. Although in absolute terms the farmers in these countries are far more productive today than they were 35 years ago, their relative productivity within the country has deteriorated. This has important political-economy implications, since those countries are facing a very similar situation to that experienced by the industrialized countries roughly a century ago (see Figure 1), just as they are considering similar (protectionist) economic policy measures and development strategies to cope with it (Chang 2009).

It has been argued that some historical patterns that have traditionally pushed towards sectoral productivity divergence may disappear in the future. In particular, the long-term decline of the agricultural terms of trade (Grilli and Yang 1988; Cashin and McDermott 2002) could reverse and start acting as a convergence force. It has been noted that the Prebisch-Singer hypothesis has become substantially weaker recently, as the relative prices of certain key primary commodities have increased (Yamada and Yoon 2014; FAO 2021). Some authors have talked about the 'end of the cheap food era' (McMichael 2009) and others have highlighted the potential of biofuels to reverse the historical trend of declining agricultural prices (Peskett et al. 2007). However, the future evolution of the agricultural terms of trade remains largely unpredictable, since it depends on unforeseen developments in technology, climate change, international relations, and many other variables such as national and international policies. In any event, it is by no means clear that a reversal in the terms of trade would be sufficient to offset the effect of the other 'unbalancing' forces described in this paper.

5. Conclusions

It has been argued that

the final outcome of the structural transformation, already visible on the horizon in rich countries, is an economy and society where agriculture as an economic activity has no distinguishing characteristics from other sectors, at least in terms of the productivity of labour and capital, or the location of poverty. (Timmer and Akkus 2008, 4)¹³

¹²One must be cautious in drawing conclusions from these trends, since they depend heavily on the starting point of LIR (i.e. in this study, its value in 1980). Figure 9 shows that there is a significant number of high-income countries that have entered a 'farmer-excluding path'. Yet, this does not necessarily mean that farmers from these countries are relatively less productive than those from countries that have embarked into a 'farmer-developing path' or a 'Lewis path' over the last 35 years. It only means that the agricultural gap in those countries has increased over the studied period.

¹³Although not explicitly stated, this idea also seems to underlie the World Bank Development Report (2008): for instance, see pages 38–39.

However, one of the findings of this paper is that the agricultural productivity gap in low-income countries is strikingly similar to that in rich countries. The analysis of different national experiences over the last century and a half shows a general tendency for agricultural productivity to grow more slowly than overall productivity. This is a stylized fact for which various (complementary) explanations have been provided. While some authors have pointed to state intervention as the root-cause of the gap, we have argued that the gap is likely to be structural in nature. Our view is inspired by the *structural heterogeneity* concept, which assumes the existence of enduring inter-sectoral differences in the ability of firms to innovate and absorb technology, as well as in the institutional framework. Clark's statement that the world was still 'within a very long distance' of obtaining the inter-sectoral equilibrium – which was made more than 80 years ago – is still absolutely valid. This is probably because there is no overall trend towards equilibrium (or at least there has not been so far). Our results seem to support Koning's (2002) approach: the evolution of the world economy has been a 'dynamic process, in which unbalancing forces constantly had the upper hand over equilibrating forces' (Koning 2002, 171). We also believe that the origins of those unbalancing forces may be traced back to the late nineteenth century, following a fundamental process of profound and long-lasting transformation of the world economy.

The fact that there has not been a general trend towards equilibrium does not mean that there has not been a narrowing of the productivity gap in some countries over the last decades. We have argued that these episodes of convergence have not been due to protectionism, but primarily to trends in agricultural labour supply: millions of farmers left the countryside and started living in the cities. The process of structural change has commonly led to an increased availability of land per worker and to substantial gains in agricultural productivity due to mechanization. This trend, observed in some industrialized countries, has sometimes been referred to as the 'Lewis Path' and has commonly been put forward as a major road to economic growth in developing countries. However, as Timmer and Akkus note, 'the economic growth process as manifested in the structural transformation has become progressively less successful at integrating low-productivity agricultural labour into the rest of the economy' (Timmer and Akkus 2008, 22). Indeed, there are growing doubts about the ability of developing countries to replicate the 'Lewis Path', since many of these countries face significant growth in agricultural labour supply rather than increased per capita land availability. Moreover, increased land productivity, whether due to the introduction of the so-called green revolution package – high yielding seeds, artificial fertilizers, genetically modified organisms – or due to the successful application of agroecological principles, does not ensure convergence of farm productivity either. This is because increases in supply may translate easily into lower prices.

All things considered, do we advocate the agro-sceptic or the agro-proponent approach? The answer to this question is twofold. On the one hand, we are agro-sceptical because we believe that agriculture does not have as high a potential for productivity growth as other sectors. The so-called Petty's law remains a brilliant and entirely correct generalization. Moreover, structural change has probably been decisive in those countries where productivity in agriculture has grown the most. This is what Timmer refers to when he quotes Chairman Mao's famous words: 'the only way out for agriculture is industry' (Timmer 2007, 5), and it is also the idea behind the World Bank's *Development Report* (2008). On the other hand, however, it could be argued that, sometimes, the only

way for industry and services is agriculture. This was the idea of early development economics such as Clark, Kuznets, and others who highlighted the role of agriculture in promoting structural change by providing capital, labour, linkages, commodities and a market for industry and services. Furthermore, the existence of 'Lewis traps' suggest that the solution of transferring people from the 'bad' to the 'good' sectors is not always within reach: making the 'bad' sectors better may also be necessary unless there is truly high-speed growth and rural demographics are quite mature already. Lastly, the arguments of agro-proponents based on the non-economic functions of agriculture (i.e. environmental and social functions) should also be taken into account.

Finally, it is worth reflecting on the socio-economic and political implications of the agricultural productivity gap. The ongoing COVID-19 pandemic has shown the prevalence of irregular, often exploitative and illegal work relationships in the agricultural labour market, as well as the fragility of migrant workers who are often engaged in agricultural work in developed countries (Bisoffi et al. 2021; FAO 2021). The agricultural productivity gap is not directly responsible for this, but it helps to explain the existence of a segmented labour market. Of course, the lower productivity of agriculture also helps to explain lower farm income. It has been said that 'the economies of rich countries really do look as if their agricultural sectors have basically disappeared' but that 'no external observer would believe so' based on their policies (Timmer 2007, 2). Indeed, although protecting the agricultural sector from international competition and providing price supports or direct income subsidies to farmers has consistently been conceptualized as a harmful strategy, it has also been the completely uniform response to the political tensions associated to the farm-problem (Lindert 1991; Chang 2002). In fact, although public support to farmers in industrialized countries has been reduced in recent decades, it certainly remains at very high levels (Collantes 2020).¹⁴ Some authors have pointed out that the shift from price supports to decoupled payments have not ended an agricultural trading system in which success depends less on comparative advantage than on comparative access to subsidies (Botella-Rodríguez 2017). As Koning put it, 'the direct payments game is a mercantilist ploy, not a step towards free trade as it has commonly been depicted' (Koning 2017 164). Yet, when it comes to the agricultural productivity gap, it is quite clear that agricultural 'assistance' has not helped to reduce it (in fact, it is more than likely that it exacerbated disparities). This is not to say that agricultural support policies have not had some success in certain areas,¹⁵ but reducing productivity differences between agriculture and the rest of the economy is not one of them. The protectionist response to the farm problem has, however, generated numerous problems. It has many times been pointed out that, if farm-financed social welfare has worked at all, it has only done so for prosperous landowners (Murray Li 2009). Subsidized modern agriculture has come at a high social and environmental cost, including the depletion of soils, pollution of groundwater, and increased inequalities among farmers. In this regard, some of the

¹⁴The empirical finding that the countries with the fewest farmers (in relative terms) are precisely those that protect them the most has been referred to as the 'paradox of development' (Swinnen 2018). There is a whole field of political-economy studies on this subject, carried out by political scientists such as Olson (1990) and Sheingate (2001), and by historians such as Knudsen (2009). A good summary can be found in Collantes (2020).

¹⁵See Collantes (2020) for a recent assessment of the Common Agricultural Policy.

arguments defending alternative forms of support are not without merit. Drawing on the idea of multifunctionality, it has been claimed that local farmers should be paid for by-products of commodity production such as landscape conservation, reduced carbon footprints, and healthier food (Losch 2004). If farmer's incomes are to be 'guaranteed', it is reasonable to expect payments of any kind to be conditioned to sustainable – socially and environmentally – practices.

With specific regard to developing countries – and given the nature of the agricultural productivity gap – it is presumable that lobbying for price supports and agricultural protectionism will persist or even intensify. Again, if farm incomes are to be 'guaranteed', perhaps the agroecological approach would make it possible to do so on a fairer basis from a social and environmental point of view. However, although agroecological approaches are perfectly compatible with output growth and a gradual mechanization of farming, it must be acknowledged that the potential for labour productivity growth in labour-intensive models is significantly limited by available land. Thus, the challenge in developing countries is to design policies in support of sustainable agriculture that do not slow down structural change but enhance it, stimulating a feedback process based on the creation of linkages between agriculture, industry, and services.

In this paper a differentiation has been made between what we have called the 'root problem' (the agricultural productivity gap) and the 'farm problem' (its general socio-economic and political implications). We argue that the *farm problem* has not yet been given a satisfactory solution because the widespread political response (always protectionist to some extent) tends to aggravate the *root problem*. Given that the latter is probably structural in nature and definitely seems very difficult to correct, the ways of dealing with the farm problem need to be reconsidered. A reasonable approach is to look for ways to bring the prices paid for primary products closer to prices that reflect their – much higher – social and environmental cost. This is something that the market will not do, but that state intervention has also proven to be profoundly ineffective (if not counterproductive). Indeed, we should pay full attention to the proposals that historians, economists and policymakers will surely make on how to manage this long-lasting failure of agrarian capitalism.

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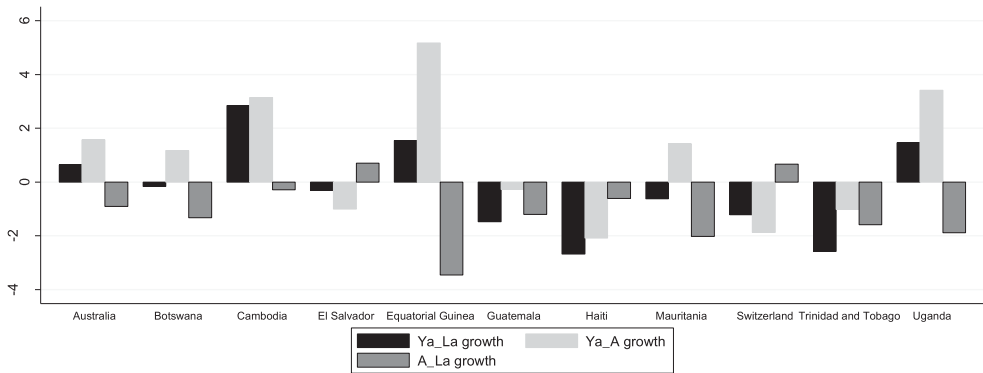
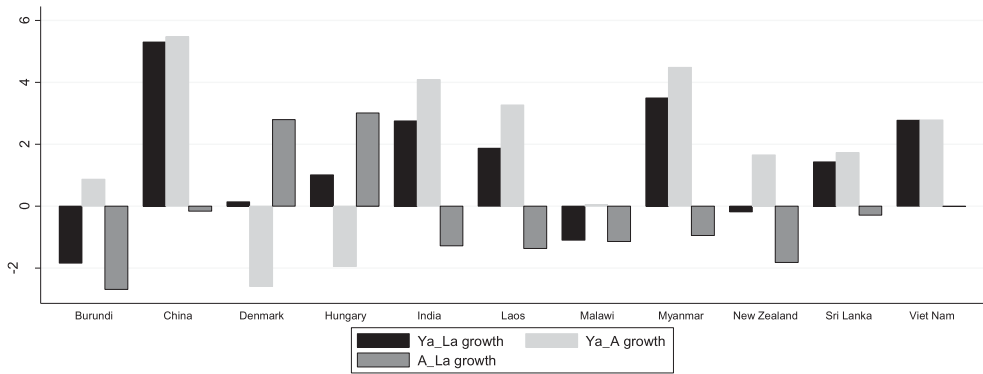
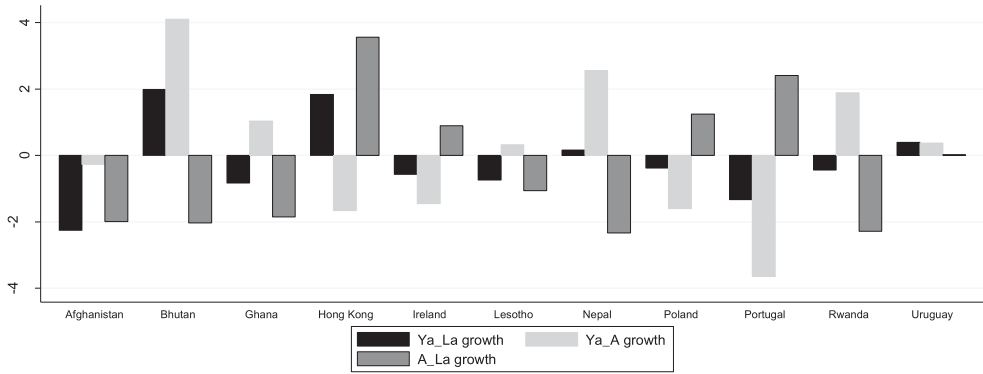
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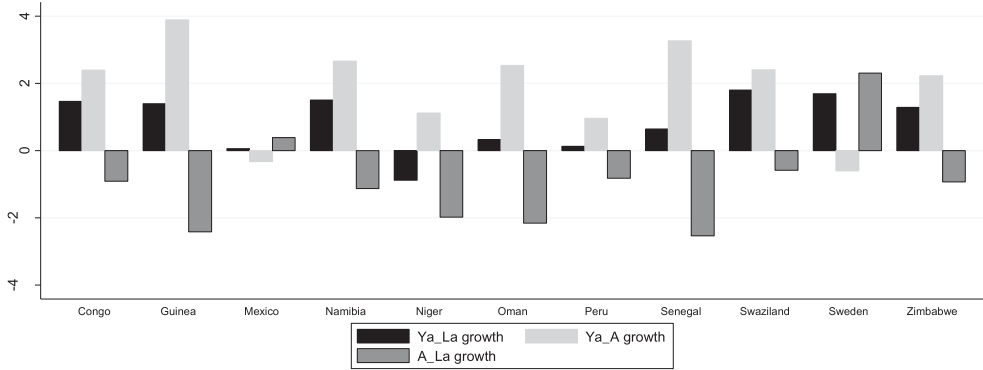
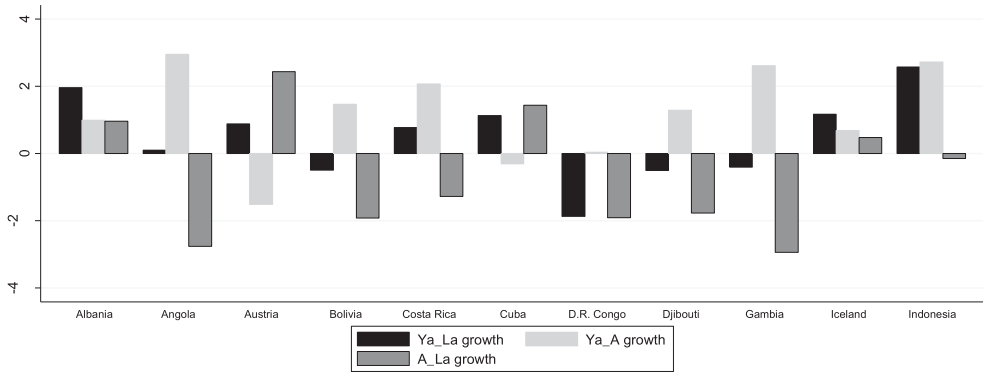
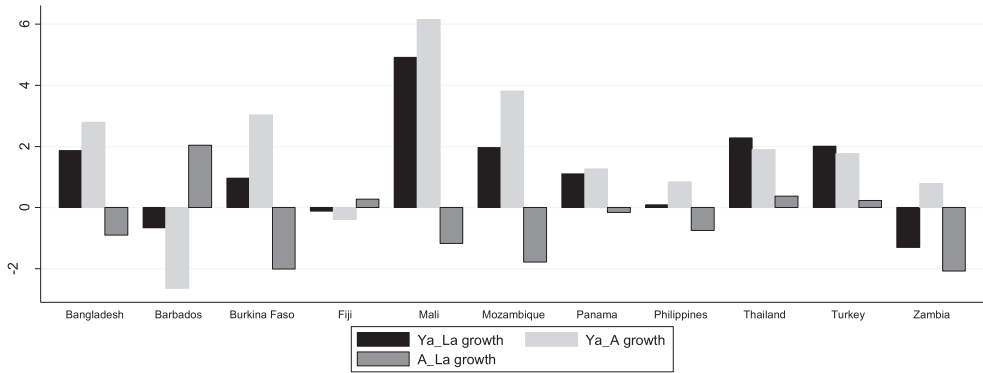
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Appendix

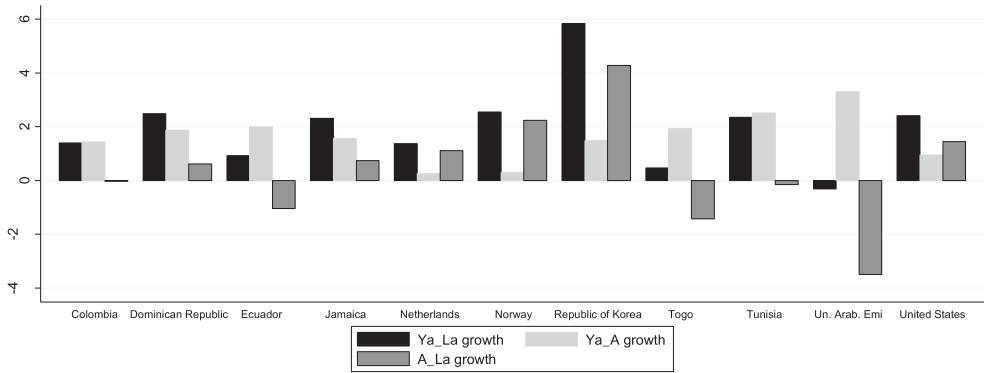
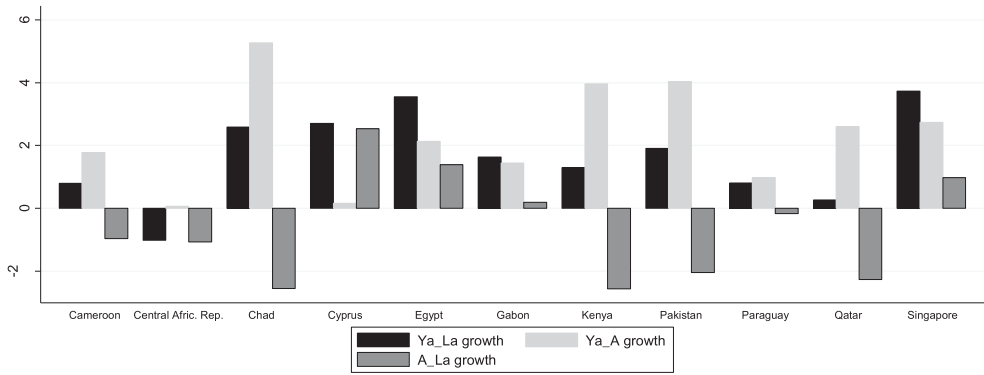
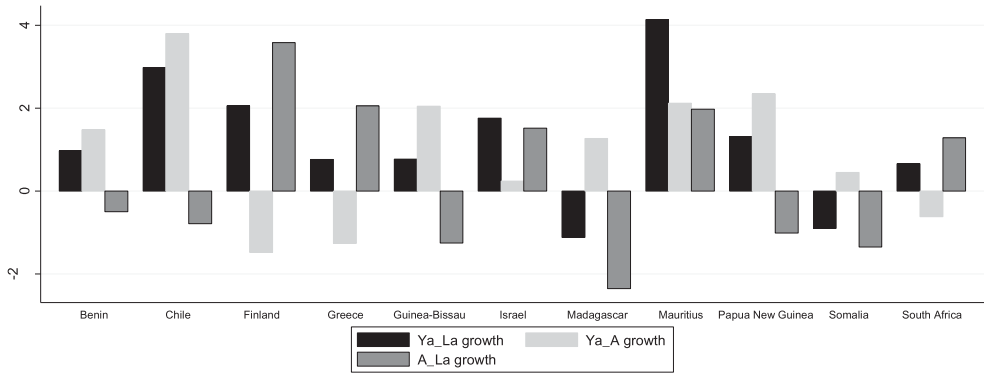
(a) LIR worsening



(b) Moderate LIR variations



(c) Moderate LIR improvements



(d) Great LIR improvements

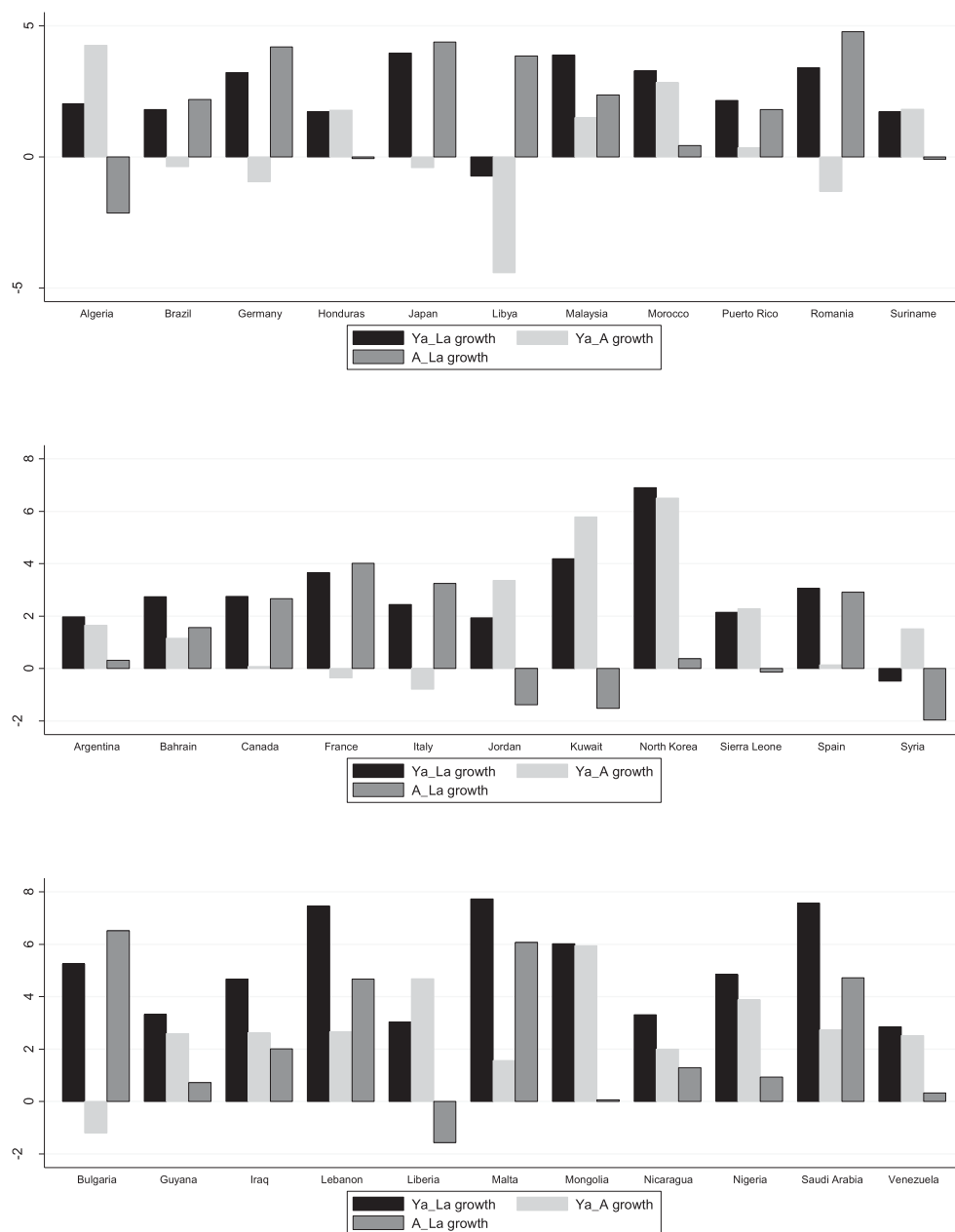


Figure A1. Growth of agricultural labour productivity, land productivity and land availability per agricultural worker, by country, 1980–2015. Countries have been grouped by absolute LIR growth. Source: author’s elaboration from FAO (2018) and United Nations (2018).

Table A1. List of countries included in the dataset, by region.

East Asia & Pacific	Europe & Central Asia	Latin America & Caribbean	Middle East & North Africa	North America	South Asia	Sub-Saharan Africa
Australia	Albania	Argentina	Algeria	Canada	Afghanistan	Angola
Cambodia	Austria	Barbados	Bahrain	United States	Bangladesh	Benin
China	Bulgaria	Bolivia	Djibouti		Bhutan	Botswana
China, Hong Kong SAR	Cyprus	Brazil	Egypt		India	Burkina Faso
Democratic People's Republic of Korea	Denmark	Chile	Iraq		Nepal	Burundi
Fiji	Finland	Colombia	Israel		Pakistan	Cameroon
Indonesia	France	Costa Rica	Jordan		Sri Lanka	Central African Republic
Japan	Germany	Cuba	Kuwait			Chad
Lao People's Democratic Republic	Greece	Dominican Republic	Lebanon			Congo
Malaysia	Hungary	Ecuador	Libya			Côte d'Ivoire
Mongolia	Iceland	El Salvador	Malta			Democratic Republic of the Congo
Myanmar	Ireland	Guatemala	Morocco			Equatorial Guinea
New Zealand	Italy	Guyana	Oman			Gabon
Papua New Guinea	Netherlands	Haiti	Qatar			Gambia
Philippines	Norway	Honduras	Saudi Arabia			Ghana
Republic of Korea	Poland	Jamaica	Syrian Arab Republic			Guinea
Singapore	Portugal	Mexico	Tunisia			Guinea-Bissau
Thailand	Romania	Nicaragua	United Arab Emirates			Kenya
Timor-Leste	Spain	Panama	Yemen			Lesotho
Vietnam	Sweden	Paraguay				Liberia
	Switzerland	Peru				Madagascar
	Turkey	Puerto Rico				Malawi
	United Kingdom	Suriname				Mali
		Trinidad and Tobago				Mauritania
		Uruguay				Mauritius
		Venezuela				Mozambique
						Namibia
						Niger
						Nigeria
						Rwanda
						Senegal
						Sierra Leone
						Somalia
						South Africa
						Swaziland
						Togo
						Uganda
						United Republic of Tanzania
						Zambia
						Zimbabwe

Source: author's elaboration.