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Structural Change in Ghana 1960-2010*

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Abstract

Development is associated with the structural transformation, i.e. the decline of agriculture and the rise of manufacturing and services. Conversely, the lack of structural change can constrain development, as exemplified by Sub-Saharan Africa. This case study investigates the causes and consequences of the lack of structural change in Ghana over the period 1960-2010. Fifty years after independence, Ghana remains a poor and mainly agricultural economy, with limited industrialization and an unproductive service sector. First, we use the methodology of McMillan and Rodrik 2011 to estimate the contribution of structural change to productivity growth for 9 aggregate sectors, 15 aggregate sectors and 20 manufacturing subsectors. We find that structural change was neither growth-enhancing nor growth-reducing and that changes in overall productivity were mostly explained by the performance of individual sectors. Second, we look at individual sectors and discuss why growth-enhancing structural change did not occur in Ghana. Third, we refine the analysis by examining the respective roles of economic geography, informality and government policies in structural change. Lastly, Ghana has transitioned into a more efficient and formalized economy in the last 20 years.

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1 Introduction

Development is associated with the structural transformation, the decline of agriculture and the rise of manufacturing and services. Standard structural transformation models distinguish “labor push” and “labor pull” factors as the main drivers of this transition (Alvarez-Cuadrado and Poschke, 2011). The labor push approach shows how a rise in agricultural productivity - a green revolution - reduces the food problem and releases agricultural labor for the modern sector (Schultz, 1953; Gollin, Parente and Rogerson, 2002, 2007). The labor pull approach describes how a rise in non-agricultural productivity - an industrial revolution - attracts underemployed labor from agriculture into the modern sector (Lewis, 1954a; Harris and Todaro, 1970; Hansen and Prescott, 2002; Lucas, 2004). No matter the origin of structural change, labor moves from lower-productivity to higher-productivity activities and overall labor productivity increases in the economy.

Historical data indicates that this model has been successively followed by England in the 18th-19th century, France, Germany and the United States in the 19th and early 20th centuries, Japan and South Korea in the 20th century, and Malaysia and China in the late 20th century (Bairoch, 1988; Young, 2003; Kim and Margo, 2004; Brandt, Hsieh and Zhu, 2008; Allen, 2009). What about Sub-Saharan Africa? In 2010, Sub-Saharan Africa is still poor, with the same per capita GDP as Western Europe and the U.S. in 1860 (Maddison, 2008). This non-evolution is related to the lack of structural transformation. First, there has been no green revolution in Africa. Its food yields have remained low (Evenson and Gollin, 2003; Caselli, 2005); in 2009, cereal yields were 2.8 times lower than in Asia, while yields were 2.1 times lower for starchy roots (FAO, 2010). The fact that agriculture still accounts for 58% of employment and 20% of GDP indicates the magnitude of the “food problem” for a large share of the population. Second, there has been no industrial revolution in Africa. Its manufacturing and service sectors are relatively small and unproductive (McMillan and Rodrik, 2011; Badiane, 2011); in 2007, employment shares in industry and services were 10% and 26% for Africa, but 24% and 35% for Asia, and African labor productivity was 1.7 and 3.5 times lower in industry and services, respectively (World Bank, 2010). It is thus essential to study the causes and consequences of the lack of structural change in Africa.

In this case study, we replicate the methodology of McMillan and Rodrik (2011) and focus on one African country, Ghana. Why McMillan and Rodrik (2011)? Because their method allows one to decompose changes in overall productivity into changes of productivity within sectors and changes in the allocation of labor between sectors. They call the second channel the “structural change” channel. If labor moves from low-productivity to high-productivity sectors, overall labor pro-
ductivity increases and structural change is growth-enhancing. If labor moves from high-productivity to low-productivity sectors, productivity decreases and structural change is growth-reducing. Then why only one country? Because country case studies force us to understand the historical and institutional context in which these mechanisms operate. If structural change is growth-reducing, there must be idiosyncratic factors that explain why employment relatively increases in lower-productivity sectors. Lastly, why Ghana? Because it provides an ideal laboratory to understand the failure of structural transformation in Africa, as argued below.

First, the political evolution of Ghana has often been an indication of what would happen a few years later in the rest of the continent. Figure 1 shows the evolution of political regimes in Ghana and Africa from 1960 to date. Ghana was the first independent African country in 1957, one year before Guinea and three years before 16 other countries. Ghana quickly became a single-party autocracy with an autocratic president, Kwame Nkrumah. After his overthrow in 1966, Ghanaian politics became marked by a succession of military coups and fragile political regimes. Institutions improved after 1992, with the transition to democracy. Ghana is now one of the most democratic African countries.

Figure 1: Evolution of Political Regimes in Ghana and Africa, 1957-2010.

![Figure 1: Evolution of Political Regimes in Ghana and Africa, 1957-2010.](image)

Notes: This figure plots the revised combined polity score for Africa (average) and Ghana. Polity IV define three regime categories: autocracies (-10 to -6), anocracies (-5 to +5) and democracies (+6 to +10). See Data Appendix for data sources.
Second, the economic evolution of Ghana is symptomatic of what happened elsewhere. Figure 2 shows the evolution of income in Ghana and Africa from 1960 to date. The country has been dependent on natural resource exports throughout the post-independence period, whether cocoa, mining (mostly gold) or timber, and its manufacturing and service sector have remained small and/or unproductive. Figure 3 confirms the weight of commodity exports in total exports throughout the period. Economic growth in the immediate post-independence period was driven by import substitution industrialization and an increasing role of the government in the economy. However, income declined in the 1970s and early 1980s due to macroeconomic disequilibria and austerity measures that were adopted as a result of mounting public deficits (see Fig. 2). Growth resumed after two structural adjustment programmes (1983, 1987-1989), an improvement in the business environment and booming commodity prices post-2000 (see Fig. 2). According to McKinsey (2011), Ghana now belongs to the group of Africa’s transition economies, that also includes countries like Senegal, Kenya or Mozambique: although its GDP is lower than the diversified North African economies and the African oil and gas exporters, its economy is growing rapidly, it increasingly exports manufactured goods and it could soon compete with low-cost emerging economies in Asia.

Figure 2: Evolution of Per Capita GDP in Ghana and Africa, 1960-2010.
Figure 3: Ghana’s Exports of Main Commodities (%), 1960-2010.

Notes: This figure plots the share of primary commodities in total exports. Total reports the total contribution of cocoa, timber and mining exports. See Data Appendix for data sources.

Third, Arthur Lewis, the intellectual father of structural transformation, wrote a report on industrialization in Ghana in 1954 (Lewis, 1954b). He was also Ghana’s first chief economic advisor in 1957-1958, but Nkrumah and Lewis strongly disagreed over the policies to adopt to develop Ghana. His economic analysis and its policy recommendations for Ghana will be useful as a benchmark to gauge the various policies implemented over the past 50 years. Retrospectively, his analysis of the strengths and flaws of the immediate post-independence Ghanaian economy and his recommendations were probably right.

Lastly, analyzing structural change in one country supposes that we have access to sectoral productivity and employment data over a rather long period. Sub-Saharan Africa is not only poor, but it is also suffering from data shortage, which limits our ability to better understand why it is poor. Fortunately for us, Ghana has one of the best statistical systems in Africa, and all the data used in this study could be obtained by working closely with various institutions in Ghana and at several university libraries in England. There are probably only a few African countries where such results can be replicated today.

The case study is organized as follows. Section 2 describes the broad patterns of economic development and structural change in Ghana from 1960 to date. Sec-
tion 3 presents various results on structural change using data for 9 sectors, 15 sectors and 20 manufacturing subsectors in 1960-2006. Section 4 focuses on the geography of structural change, the respective contributions of formal and informal employment to structural change and the role of public policies in promoting structural change. Section 5 concludes.

2 Patterns of Economic Development and Structural Change, 1960-2010

2.1 Economic History of Ghana

This section summarizes the economic history of Ghana, which is useful in determining turning points that could affect patterns of structural change. This section draws on Aryeetey, Harrigan and Nissanke (2000), Agyeman-Duah (2008), Kolavalli et al. (2011)

1957: At independence, Ghana was one of the most developed Sub-Saharan African non-island countries. It was the leading British colony and the fact that cocoa boomed there in the 1930s made it one of the leaders of the African “cash crop revolution” (Tosh, 1980; Teal, 2002; Austin, 2008; Jedwab, 2011). According to Arthur Lewis (Lewis, 1954b), Ghana could not develop without Import-Substitution Industrialization (ISI). Yet pursuing this strategy was not possible in the 1950s for two reasons (Pickett and Shaeeldin, 1990; Agyeman-Duah, 2008). First, the price of labor was too high because land was still relatively abundant. So Ghana was not in a situation of surplus labor in the agricultural sector and the development of labor-intensive manufacturing for the home and foreign markets implied that the country first needed a “vigorous agricultural programme”. Although Arthur Lewis is often described as a proponent of the labor pull hypothesis and pro-industrialist policies, he clearly thought that labor push factors were more important for Ghana at that time. Second, there were not enough skilled people in the economy, so developing capital-intensive manufacturing was not a sound economic strategy. Arthur Lewis thus recommended the colonial government to increase agricultural productivity and lay the foundations for industrialization in the future by providing infrastructure and investing in human capital, so as to create a larger, healthier and more educated labor force. As Pickett and Shaeeldin (1990) put it: “Lewis thus thought that many years would elapse before large investments in industry could be justified economically.”

1957-1966: When Kwame Nkrumah took power in 1957, his government adopted
a capital-intensive ISI strategy where the government was at the centre. This strategy was in line with Lewis’ model of development, but was in contradiction with Lewis’ own recommendations to be more “patient”. The rationale behind Nkrumah’s policy was that development would only come from industrialization and that the surplus from the agricultural sector (e.g., cocoa) had to be used to expand the industrial sector. Due to coordination failures, only an enlightened leader could implement this massive industrial policy, or “big push”. Another benefit of a strong state was that it promoted national building, especially in a context of marked ethnic fractionalization. Investment rates increased but this evolution was mostly driven by public investments, as exemplified by Figures 4 and 5 that plot the investment rates and the GDP share of government expenditure from 1960 to date. There were 53 state enterprises and 12 public boards in 1966 (Agyeman-Duah 2008). Government consumption also increased, as the number of publicly-paid employees increased from 140,000 in 1957 to about 280,000 in 1965. Yet these investments had no impact on per capita GDP due to wrong investment decisions, mismanagement and the inflationary effect of import restrictions. When cocoa prices collapsed in 1965, the government had to rely even more on printing money and public debt, and Nkrumah was overthrown in 1966.

Figure 4: Ghana’s Investment Rates (% GDP), 1960-2010.

Notes: This figure plots the investment rates for Ghana as a whole (gross fixed capital formation = GFCF), and separately for the private and public sectors. See Data Appendix for data sources.
1966-1981: The Nkrumah presidency was followed by a succession of military coups and fragile political regimes, interrupted by short democratic episodes. The National Liberation Council (NLC) was composed of army and police officers and assumed executive power till 1969 when Kofi Busia was democratically elected. Busia was overthrown by another army coup in 1972 and Colonel Acheampong became the new head of state till 1978. Although Nkrumah was held responsible for the lack of economic growth before 1966, the following NLC, Busia and Acheampong governments all adopted the same policies, with a more limited budget. Government consumption remained high (see Fig. 4 and 5) and the number of state enterprises kept increasing, while the country accumulated debt, inflation was soaring and private investment was collapsing. As a result, between 1974 and 1983, per capita income declined by 34.9% (see Fig. 2).

1981-2001: When Lieutenant Jerry Rawlings came to power after two successive coups in 1979 and 1981, he also thought that the economic situation was due to management issues rather than to poor policies (Agyeman-Duah, 2008). By 1983, Ghanaians had the same level of per capita income as in 1939: Cocoa produc-
tion had collapsed, the manufacturing sector was severely affected by cronyism, import restrictions and price controls, infrastructure was in a dire state, Ghana had just been hit by the worst drought in fifty years, there was hyperinflation and the state was bankrupt. Added to that there was the repatriation of about 1 million Ghanaians from Nigeria which added to the economic, political and social pressures (Killick, 1978). Rawlings had no choice but to implement the Economic Recovery Program in 1983, a structural adjustment program under the guidance of the World Bank and the International Monetary Fund. The government initially reduced expenditure while creating incentives for the development of the private sector, such as abolishing price controls and import restrictions. From 1987 to 1989, state enterprises were privatized and the Ghanaian cedi was further devalued. The economy slowly recovered (see Figures 2, 4 and 5) and Rawlings was democratically elected in 1992 and re-elected in 1996.

2001-2010: In 2001, Rawlings peacefully handed over power to his main opponent John Kufuor. The macroeconomic situation was still unstable but the economy rapidly took off, showing annual growth rates of 5-6% (see Fig. 2). This evolution was not coincidental as there was continuous improvement across all dimensions. Ghana is now one of the most democratic countries in Africa. It is also the only country where there have been two peaceful political transitions, as challenger John Atta Mills won the presidential election in 2008. The business environment became more favorable, which can be captured by rising investment rates, in both the public and private sectors (see Fig. 4). The value of cocoa and gold exports has boomed, and the manufacturing and service sectors have become more competitive and more productive. The issue now is whether this economic growth is sustainable. Is Ghana just benefitting from rising commodity prices or is the Ghanaian economy experiencing growth-enhancing structural change? It is all the more important that Ghana has started to export oil to foreign countries, which could push economic growth even further (the GDP growth rate was 11.8% in 2011) or have a detrimental effect on long-term development due to the Dutch Disease and the institutional resource curse.

Turning points that should be used for the analysis are 1957, 1966, 1974, 1983, 1992, 2001 and 2010. We have sectoral GDP data for most years between 1960 and 2010, but that is not the case for sectoral employment data. Although employment data is only available for 1960, 1970, 1984, 1992, 2000, 2006 and 2010, we believe that the periodicity of our data set captures relatively well the economic history of Ghana. The 1960-1970 period was characterized by ISI policies and income stagnation. The 1970-1984 period was marked by structural problems

2.2 The Sectoral Composition of Ghana’s Economy

In 1960, agriculture still accounted for 51.1% of GDP and 61.8% of the labour force. Figure 6 shows the sectoral composition of GDP from 1960 to date, while Figure 7 plots the sectoral composition of employment for the same period. While Ghana experienced some structural change—a decline in agricultural employment till 1966, the period from 1967 to 1984 saw a decline in economic activity and structural change in the wrong direction. The GDP share of agriculture even increased to 60.7% in 1978, while both the industrial and service sectors collapsed. Interestingly, the service sector resumed its expansion in the late 1970s and early 1980s, while industrial output only returned to its pre-crisis level in 1986.

![Figure 6: Sectoral Composition of GDP (%), 1960-2010.](image)

Notes: This figure plots the sectoral composition of GDP, using the three aggregate sectors “agriculture”, “industry” and “services”. See Data Appendix for data sources.

Before analyzing one by one the specific evolution of each sector, we would like to make three comments. First, economic development and structural change
are intertwined, as shown by the comparison of Figures 2 and 6. Periods of economic growth are associated with a decreasing agricultural share of GDP, whereas periods of economic stagnation or decline see a rise in the same share. Second, structural change in Ghana did not manifest itself in terms of less agriculture and more industry, but less agriculture and more services. The GDP and employment shares of industry are almost the same in 2006 as in 1960. This is interesting as Ghana’s economic development seems to happen without industrialization, contrary to what occurred in South-East Asian countries or China today. Third, the employment share of agriculture has decreased from 61.8% in 1960 to 54.3% in 2006 and 41.6% in 2010, while its GDP share has decreased from 51.1% to 43.2% in 2006 and 43.0% 2010 during the same period. Basic calculations indicate that agricultural productivity was almost the same in 2006 as in 1960, which confirms the lack of green revolution for most of the period. Agricultural productivity strongly increased after 2006, yet this had no effect on the industrial sector.

**Agriculture:** The GDP and employment shares of agriculture have remained almost unchanged between 1960 and 2006, with the exception of the 1967-1984
period when the economy was contracting and the GDP and employment contributions of the industrial and service sectors were decreasing. What could account for this non-evolution? Agriculture consists of four sectors in Ghana: “agriculture, hunting and livestock”, “cocoa”, “forestry and logging” and “fishing”.

Figure 8: Sectoral Composition of GDP (%), Agriculture, 1960-2010.

![Sectoral Composition of GDP (%), Agriculture, 1960-2010.](image)

Notes: This figure plots the sectoral composition of agricultural GDP, using four agricultural sectors. See Data Appendix for data sources.

First, Figure 8 shows that the GDP share of “agriculture, hunting and livestock” more or less the food sector has remained high (around 30%) throughout the period and has even increased during the 1967-1984 period. Employment has followed a parallel evolution, except in 2006-2010, when employment decreased relatively more in this sector than in the other sectors. As a result, food productivity strongly increased in 2006-2010, after more than 50 years of stagnation. Why did food productivity remain low until 2006? Clearly, the “food problem” forces farmers to remain in the food sector. In 2000, Ghanaians derived 71.2% of their calorie intakes and 58.7% of their protein intakes from cereals and starchy roots (FAO, 2010). Yet cereal yields in Ghana are respectively 2.0 and 4.7 times lower than in Asia and the U.S.. Yields are respectively 1.5 and 3.8 times lower if we consider starchy roots instead. These low yields are partly explained by: (i) population pressure and a decrease in the land-labor ratio from 1.19 Ha per farmer in 1960 to 0.92 in 2006, (ii) a low adoption rate of modern agricultural inputs, e.g.
Ghanaian farmers only use 2 kg of fertilizer per hectare against 94 kg per hectare in the rest of the world in 2000 (World Resources Institute, 2007), and (iii) a low level of mechanization, e.g. there are only 4.9 tractors per 100 sq. km of arable land in Ghana against 120.7 in Asia and 256.8 in the U.S. in 2000 (World Bank, 2010). Why did food productivity increase after 2006? Interestingly, the GDP share of the food sector remained unchanged while the number of people working in this sector decreased, so Ghana had surplus labor in 2006. The economy has finally become “Lewisian”. This performance is reflected by booming yields: while cereals and starchy roots yields have remained unchanged between 1995 and 2005, they both increased by 27% between 2005 and 2010. Whether this evolution reflects a new green revolution in Ghana is difficult to say based on only a few years of data. There are other reasons why productivity may have gone up, for example world food prices have dramatically increased after 2006.

Second, the cocoa sector has collapsed from the early 1960s, due to low producer prices after 1958, restrictive migratory policies after 1969 and frequent droughts in the early 1980s. This is all the more important as cocoa has accounted for 48% of total exports on average during the 1960-2010 period. It should also be noted that sectoral GDP does not properly capture the economic weight of cocoa in Ghana’s GDP as it is measured at producers’ prices. The producer price of cocoa has always been fixed by the government and its Cocoa Marketing Board to protect farmers against fluctuating international prices. Yet since the producer price was always below the international price, this served as a taxation mechanism of the sector (Bates, 1981). Accounting for this measurement issue, cocoa has accounted for 10.0% of GDP in 1960-2010 against 5.4% right now. This is in accordance with an average taxation rate of about 46% in 1960-2010. While this could be an issue in measuring “real” productivity in the cocoa sector, we abstract from it in the rest of the analysis and use official data.

Third, the GDP and employment shares of the forestry and fishing sectors were the same in 2010 as in 1960. While the fishing sector contributes little to the economy, the forestry and logging sector has boomed after 1992. Both productivity and employment have relatively increased.

**Industry:** Interestingly, the GDP and employment shares of industry have not

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1. We estimate the true economic weight of the cocoa sector by recalculating the total added value of the sector if producers had been paid the export price at the main port (minus an estimate of average transportation costs) instead of the distortedly low producer price.

2. As shown in Jedwab (2011), the cocoa boom in the Western province has led to massive deforestation, with positive externalities on the logging sector. However, the boom will probably be short-lived, as the sector does not follow sustainable forestry practices. The forested surface of Ghana has decreased from 2.1 million hectares in 1970 to 1.6 million in 2001.
changed much over the past 50 years, with the exception of the late 1970s and early 1980s when the sector was shrinking (see Fig. 6 and 7). In 2010, it accounts for 13.5% of GDP and around 10.8% of employment. Industry consists of four sectors in Ghana: “manufacturing”, “public utilities” (water, gas and electricity), “mining and quarrying” (gold, bauxite, manganese and diamonds) and “construction”. The Nkrumah government and the following governments all thought that development could only come from industrialization. Massive public investments in the 1960s and 1970s led to a slight increase in the GDP and employment shares of manufacturing (see Figure 9). Productivity increased but this rise was not sustainable as it did not represent a structural change of the economy but biased public policies. When per capita income declined after 1976, the whole manufacturing sector contracted and productivity dropped. Manufacturing production did not resume before the structural adjustment program in 1983. Yet manufacturing productivity in 2010 was about the same as in 1970, which confirms the lack of structural transformation in this subsector. Manufacturing exports have also remained very small, due to high wages relative to productivity (Teal, 1999).

Figure 9: Sectoral Composition of GDP (%), Industry, 1960-2010.

Notes: This figure plots the sectoral composition of industrial GDP, using four industrial sectors. See Data Appendix for data sources.

Construction tends to follow economic activity and there have been two urban housing and infrastructure construction booms in the early 1960s and the late
2000s. “Public utilities” and “mining” have not contributed much to industrial development. The mining sector collapsed in the 1960s and 1970s due to low investment levels and poor maintenance. Nevertheless, mining GDP may not capture the true economic weight of mining in Ghana’s economy as it is measured at producers’ prices, for the same reasons as for cocoa. Accounting for this measurement issue increases the share of mining in GDP from 2.4% to 6.3% in 1960-2010. Again, we abstract from this issue in the rest of the analysis. The contribution of the mining sector is likely to increase in the future as a result of oil exports. For example, it jumped to 8.5% of GDP in 2011 (6.8% considering oil only).

**Services:** Till the late 1970s, the expansion of the service sector was limited by the economic crisis in 1967-1983 (see Fig. 6 and 7). The GDP share of services is now around 43.5% against 30.7% in 1960. The employment share has increased even more, from 23.2% in 1960 to 43.1% in 2010, and productivity has decreased. Yet this evolution masks significant disparities across sectors. Services consist of five subsectors in Ghana: “wholesale and retail trade, hotels and restaurants”, “government services”, “finance, real estate and business services”, “transport, storage and communications” and “community, social and personal services”. Figure 10 plots the sectoral composition of service GDP from 1960 to date.

First, the GDP share of “wholesale and retail trade, hotels and restaurants” has been continuously increasing over time. The trade sector shrank relatively less than the other sectors during the economic crisis in 1978-1986, and its contribution to GDP mechanically (and temporarily) increased. It increased even further from the early 1980s, as a result of globalization (and an increasing dependence upon food and manufacturing imports) and tourism. The number of tourists has steadily grown after 1985, from less than 100,000 arrivals in 1985 to around 1 million in 2010. The share of service exports has increased from 0.6% of GDP in 1985 to 10.3% in 2005, with most of this evolution being driven by tourism. This share has since decreased to around 5.0% as other sectors have boomed even more.

Second, “government services” have remained relatively stable over the past 50 years, around 7.7% of GDP in 1960 and 8.3% in 2010. This sector is clearly procyclical, and shrank as a result of the economic crisis. The evolution of the “finance, real estate and business services” subsector was relatively more important in the 1960s, when government banks would play a significant role in the economy. Lastly, the “transport, storage and communications” and “community, social and personal services” contribute little to GDP. Additional data indicates that there has been a mini-boom in the “communications” sector, probably as a result of the new technologies of information and communication. Yet the GDP share of communications remains quite low, at 0.8% of GDP in 2010.
3 Methodology and Main Results

The following analysis replicates and extends the analysis of McMillan and Rodrik (2011) to the 1960-2010 period for Ghana. First, per capita GDP ($PCGDP_t$) is a function of the activity rate $L_t/N_t$, the employed population divided by the total population of the country, and labor productivity $P_t$, gross domestic product $GDP_t$ divided by the employed population $L_t$:

$$PCGDP_t = L_t/N_t \times GDP_t/L_t = L_t/N_t \times P_t$$  \hspace{1cm} (1)

In the case of Ghana, per capita GDP has increased from $955.5$ in 1960 to $1350.9$ in 2010. The activity rate has remained the same throughout the period, around 40%, which means there are two workers for every three non-workers. The evolutions of per capita GDP was thus driven by changes in labor productivity growth. According to McMillan and Rodrik (2011): “It can be achieved in one of two ways. First, productivity can grow within existing economic activities through

[3Broadly defined, the activity rate is the share of the population that constitutes labor supply. The labor force consists of all residents who are working or looking for a job. We adopt a more narrow definition and only considers residents who are working.]
capital accumulation or technological change. Second, labor can move from low-
productivity to high-productivity activities, increasing overall labor productivity
in the economy. This can be expressed using the following decomposition:

\[
\delta P_t = P_t - P_{t-1} = \sum_j \theta_{j,t-1} \ast (P_{j,t} - P_{j,t-1}) + \sum_j (\theta_{j,t} - \theta_{j,t-1}) \ast P_{j,t}
\]

(2)

where \(P_t\) and \(P_{j,t}\) refer to economy-wide and sectoral labor productivity levels
(for sector \(j\)), respectively, and \(\theta_{j,t}\) is the share of employment in sector \(j\). The
first term in the decomposition is the weighted sum of productivity growth within
individual sectors, where the weights are the employment share of each sector at the
beginning of the time period. We call this the “within” component of productivity
growth. The second term captures the productivity effect of labor re-allocations
across different sectors. It is essentially the inner product of productivity levels (at
the end of the time period) with the change in employment shares across sectors.
When changes in employment shares are positively correlated with productivity
levels, this term will be positive. Structural change will increase economy-wide
productivity growth. We will call this second term the “structural change” term.”

There are four questions here: (i) Is labor productivity increasing or decreasing?,
(ii) What are the respective contributions of the within and structural change
components? (iii) Which sectors are driving the results? and (iv) Are results
driven by the number of sectors? If sector \(s\) consists of two subsectors \(s_1\) and \(s_2\), a
productivity change in sector \(s\) is due to its within term and its structural change
term. Yet the contribution of the latter term is not estimated if sectoral data is
not disaggregated. As a result, the estimate of the structural change term for the
economy as a whole could depend on how disaggregated the sectoral data is.

3.1 Analysis on 9 Sectors: Main Results

We use the same 9 sectors as in Timmer and Vries (2007) and McMillan and
Rodrik (2011). We have collected GDP and employment data for the following
the periodicity of the data allows to capture the main turning points of Ghana’s
economic history. Table 1 displays labor productivity for each sector and the
economy as a whole in 2005-06. We choose 2005-06 to compare our estimates
for Ghana with other countries studied by McMillan and Rodrik (2011). First,
economy-wide labor productivity is 9.7 times lower than in the rest of the world.
Second, labor productivity in Ghana is always relatively lower, whichever sector is
considered. Third, the Ghanaian ranking of sectors in terms of labor productivity
is relatively similar to what can be found elsewhere. Interestingly, the mining
Table 1: Sectoral Labor Productivity in 2005-06 (2000 PPP $US), 9 Sectors.

<table>
<thead>
<tr>
<th>Sector</th>
<th>McMillan and Rodrik 2011</th>
<th>Case Study on Ghana</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mining and Quarrying (min)</td>
<td>1</td>
<td>154,658</td>
</tr>
<tr>
<td>Public Utilities (pu)</td>
<td>2</td>
<td>146,218</td>
</tr>
<tr>
<td>Finance, Insurance, Real Estate &amp; Business Services (fire)</td>
<td>3</td>
<td>62,184</td>
</tr>
<tr>
<td>Transport, Storage and Communications (tsc)</td>
<td>4</td>
<td>46,421</td>
</tr>
<tr>
<td>Manufacturing (man)</td>
<td>5</td>
<td>38,503</td>
</tr>
<tr>
<td>Construction (con)</td>
<td>6</td>
<td>24,462</td>
</tr>
<tr>
<td>Wholesale and Retail Trade, Hotels and Restaurants (wrt)</td>
<td>7</td>
<td>22,635</td>
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<tr>
<td>Community, Social, Personal and Government Services (cspgs)</td>
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<td>Agriculture, Hunting, Forestry and Fishing (agr)</td>
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<td>Economy-wide</td>
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<td>27,746</td>
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</tbody>
</table>

Notes: This table displays sector labor productivity (in 2000 PPP $US) using a decomposition of 9 sectors as in McMillan and Rodrik 2011. See Data Appendix for data sources.
sector is not as productive in Ghana as in the rest of the world, but we believe that the difference stems from the fact that some countries export oil and gas, which are very profitable capital-intensive economic activities. Ghana exports gold, but also manganese, bauxite and diamonds in small quantities. Producer prices have also been manipulated so that the true contribution of mining is not well captured. The Ghanaian manufacturing sector is much less productive than in the rest of the world, which could be true across sectors due to limited human capital, mismanagement, etc., or due to a composition effect, if more unproductive manufacturing subsectors are relatively more represented within the manufacturing sector, e.g., clothing, furniture, processed foods, etc. Lastly, agricultural labor productivity is 7.8 times relatively lower in Ghana (see Section 2.2).

Appendix Figures A.1-A.7 show the correlation between sectoral productivity and the change in employment shares for various periods. Appendix Figure A.1 reproduces the figure for 1990-2005 Ghana in McMillan and Rodrik (2011), while Appendix Figures A.2-A.7 display these correlations for the following periods: 1960-1970 (whose average annual growth rate is 0.83%), 1970-1984 (-3.83%), 1984-1992 (1.26%), 1992-2000 (1.38%), 2000-2006 (4.50%) and 2006-2010 (1.82%). There is structural change in the right direction when this correlation is positive, and structural change in the wrong direction when this correlation is negative. Except between 1992 and 2000, there has been no structural change or structural change in the wrong direction, as employment has increased in relatively less productive sectors. These results are in line with McMillan and Rodrik (2011) who argue that structural change has usually been growth-reducing in Africa. Contrary to Appendix Figure A.1, we show that growth-enhancing structural change only happened between 1992 and 2000, as a result of a significant decline in agricultural employment. Nevertheless, these changes may not necessarily lower economy-wide labor productivity if they are more than offset by within-sector productivity growth. This is what we examine now.

We use the decomposition of equation (2) to estimate the respective contributions of the within and structural components of labor productivity growth. Table 2 display the results for the six periods of study. Following the classification of Timmer and Vries (2007), 1960-1970, 1984-1992, 1992-2000 and 2000-2006 have been periods of “moderate growth”, while there have been “growth decelerations” in 1970-1984 and “growth accelerations” in 2000-2006.

First, except in 1992-2000 and 2006-2010, the structural component has been negative and has little contributed to the change in labor productivity. For example, “Agriculture”, “Manufacturing” and “Community, Social, Personal and Government Services” are the three less productive sectors in 2006. For the structural component to be positive, we need people to move from these sectors to higher-productivity sectors. Regarding agriculture, the employment share decreased in 1992-2000, while agricultural productivity only slightly increased. This
Table 2: Decomposition of Productivity Growth, 9 Sectors, Ghana 1960-2010.

<table>
<thead>
<tr>
<th>Period</th>
<th>Labor Productivity</th>
<th>Component due to:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>at starting year</td>
<td>within</td>
</tr>
<tr>
<td></td>
<td>growth (annual, %)</td>
<td></td>
</tr>
<tr>
<td>1960-1970</td>
<td>2622.4</td>
<td>0.87</td>
</tr>
<tr>
<td>1970-1984</td>
<td>2849.7</td>
<td>-3.78</td>
</tr>
<tr>
<td>1984-1992</td>
<td>1650.6</td>
<td>2.82</td>
</tr>
<tr>
<td>1992-2000</td>
<td>2017</td>
<td>0.32</td>
</tr>
<tr>
<td>2000-2006</td>
<td>2189.8</td>
<td>5.12</td>
</tr>
<tr>
<td>2006-2010</td>
<td>2851.1</td>
<td>2.36</td>
</tr>
</tbody>
</table>

Notes: This table displays labor productivity at starting year (in 2000 PPP $US) and the decomposition of annual productivity growth (%) into its “within” and “structural change” components. See Data Appendix for data sources.

explains why the structural component became positive. In 2006-2010, the employment share of agriculture has further decreased, but agricultural productivity has strongly increased and the employment reduction had no effect on overall productivity. This would have been different if the agricultural sector had remained very unproductive. As shown by Gollin, Parente and Rogerson (2002), any increase in food productivity decreases agricultural employment if the income elasticity of demand for food is less than one. We should not expect any major growth-enhancing effect of structural change then, at least in the short term. Regarding manufacturing, productivity has always been relatively small, except maybe in 1970, after years of major public investments in the sector. Employment decreased with the economic crisis in 1984 and 1992, but not by much. Similarly, the employment share of “Community, Social, Personal and Government Services” has only slightly decreased during that period. Yet this could hide the fact that the employment share of government services has decreased while the employment share of community, social and personal services has increased.

Second, within-sector productivity has collapsed between 1970 and 1984, and this was true across all sectors. Some sectors might have been relatively more severely hit by this evolution, such as manufacturing (productivity dropped by almost 60%). Yet the fact that the decline was widespread indicates the importance of national rather than sectoral factors. The fact that within-sector productivity has boomed in 2000-2006 and that all sectors were symmetrically concerned also goes into this direction. In the end, the two periods of “growth deceleration” and “growth acceleration” have been the product of the within component. We now investigate how using more disaggregated sectoral data affects the results.
3.2 Analysis on 15 Sectors

We have been able to collect GDP and employment data for 15 sectors for the same years as before. These are the same sectors as the ones described in Section 2.2. These sectors are also listed in Appendix Table A.1. We use the same decomposition of equation (2) to estimate the respective contributions of the within and structural components of labor productivity growth. Table 3 display the results for the six periods of study. We also report the estimate of the structural change component when using 9 sectors only (as in Table 2).

Table 3: Decomposition of Productivity Growth, 15 Sectors, Ghana 1960-2010.

<table>
<thead>
<tr>
<th>Period:</th>
<th>Labor Productivity at starting year growth (annual, %)</th>
<th>Component due to:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>within structural</td>
<td>structural (9 sectors)</td>
</tr>
<tr>
<td>1960-1970</td>
<td>2622.4</td>
<td>0.83</td>
<td>0.88</td>
</tr>
<tr>
<td>1970-1984</td>
<td>2849.7</td>
<td>-3.83</td>
<td>-3.72</td>
</tr>
<tr>
<td>1984-1992</td>
<td>1650.6</td>
<td>2.54</td>
<td>3.56</td>
</tr>
<tr>
<td>1992-2000</td>
<td>2017</td>
<td>1.03</td>
<td>-1.00</td>
</tr>
<tr>
<td>2000-2006</td>
<td>2189.8</td>
<td>4.50</td>
<td>5.08</td>
</tr>
<tr>
<td>2006-2010</td>
<td>2851.1</td>
<td>2.74</td>
<td>1.56</td>
</tr>
</tbody>
</table>

Notes: This table displays labor productivity at starting year (in 2000 PPP $US) and the decomposition of annual productivity growth (%) into its “within” and “structural change” components. See Data Appendix for data sources.

The estimates of the structural change component are modified upward in 1992-2000 and 2006-2010 when using 15 sectors. This means there was some growth-enhancing reallocation within the 9 sectors that we did not account for before.

We look at individual sectors to identify which subsectors have been driving these results. For each sector which can be decomposed, we compare the total structural terms when it is not decomposed and when it is decomposed into several subsectors in 1992-2000. The structural term strongly increases for “Wholesale and Retail Trade, Hotels and Restaurants” when we decompose it into “Wholesale and Retail Trade”, “Hotels and Restaurants” and “Forestry and Logging” were the three most productive sectors in 2005-06. The three least productive sectors were “Community, Social and Personal Services”, “Agriculture (Other than Cocoa)” and “Manufacturing”. “Community, Social and Personal Services” is a refuge sector for the poor, while “Manufacturing” is mostly labor-intensive and unproductive in Ghana, as discussed below in Section 3.3.

The total contribution (within + structural change) of each sector (N = 9) does not change when using more subsectors (N = 15), whereas the respective contributions of the within and structural change components change if there is some growth-enhancing or growth-reducing structural change within the sector across subsectors.
Trade” and “Hotels and Restaurants”. The structural change term for the trade sector is almost nil while the one for “Hotels and Restaurants” is very high. This means that the employment share has relatively increased in this relatively more productive sector in 1992-2000. This boom was clearly driven by the tourism, as explained in Section 2.2. The second sector for which we observe a significant rise in the structural change component is agriculture, with most of the change being accounted for by the forestry sector (see Section 2.2). The third sector for which there is a noticeable change is “Community, Social, Personal and Government Services”. The Government sector is much more productive than the “Community, Social and Personal Services” sector, and its employment share has been rising after 1992. It seems the two SAPs Ghana had to adopt in 1983 and 1987-1989 have paid off and the government sector has become more productive over time. Repeating the same exercise for the period 2006-2010, we find that most of the change in the aggregate structural term is due to tourism, whose employment share kept growing. It was the second most productive sector of the Ghanaian economy in 2006 and it now accounts for 5.5% of the employed population.

3.3 Analysis on Manufacturing Subsectors

The poor performance of the manufacturing sector in Ghana, and more generally in Africa, leads us to devote one section to this specific sector. We use data from various sources to recreate total GDP and employment for formal and informal manufacturing sectors in 1960, 1970, 1984, 1992 and 2000. Appendix Table A.1 lists all the manufacturing subsectors.\(^6\) The formal manufacturing sector includes all paid employees of large-scale manufacturing firms (≥ 30 employees). The informal manufacturing sector includes all persons engaged in small and medium scale manufacturing firms (0-29 employees). Table 4 indicates that manufacturing productivity is much higher in the formal sector, e.g. it is 22.7 times higher in 2000. The GDP contribution of the formal sector has increased over time, but it decreased in 1984 with the economic crisis. The employment share of the formal sector has remained the same between 1960 and 2000, but the share has increased in 1970-1992, due to the two SAPs. Clearly, development is associated with a formalization of manufacturing and average productivity is driven downward by an unproductive but labor-abundant informal sector. This is confirmed by Figure 11, which shows that the GDP contribution of manufacturing is intrinsically related to the GDP contribution of its formal sector. Productivity in the formal

\(^6\)“Tobacco”, “Petroleum” and “Beverages” were the three most productive formal manufacturing subsectors in 2000. The three least productive subsectors were “Wood”, “Transport Equipment” and “Footwear”.

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manufacturing sector was $13,260 in 2000, compared to $38,503 on average for the whole sector in 2005 in McMillan and Rodrik (2011).

Figure 11: GDP Share of Manufacturing (%), Formal vs. Informal, 1960-2003.


Table 4: GDP, Employment and Productivity in Manufacturing, 1960-2000.

<table>
<thead>
<tr>
<th>Year</th>
<th>Share Mfg. GDP</th>
<th>Share Mfg. Empl.</th>
<th>Labor Productivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Formal (%)</td>
<td>Informal (%)</td>
<td>Formal (%)</td>
</tr>
<tr>
<td>1960</td>
<td>55.3</td>
<td>44.7</td>
<td>9.3</td>
</tr>
<tr>
<td>1970</td>
<td>70.8</td>
<td>29.2</td>
<td>13.3</td>
</tr>
<tr>
<td>1984</td>
<td>62.7</td>
<td>37.3</td>
<td>9.5</td>
</tr>
<tr>
<td>1992</td>
<td>69.9</td>
<td>30.1</td>
<td>5.9</td>
</tr>
<tr>
<td>2000</td>
<td>70.0</td>
<td>30.0</td>
<td>9.3</td>
</tr>
</tbody>
</table>

Notes: This table displays the distribution of manufacturing GDP and employment (%), and sectoral labor productivity (in 2000 PPP $US) for the formal and informal manufacturing sectors. The formal manufacturing sector includes all paid employees of large-scale manufacturing firms (≥ 30 employees). The informal manufacturing sector includes all persons engaged in small and medium scale manufacturing firms (0-29 employees). See Data Appendix for data sources.

Unfortunately, we have no panel data on both formal and informal GDP and employment for all manufacturing subsectors. But we have panel data on formal
GDP and employment for 20 manufacturing subsectors in 1960, 1970, 1984 and 2000. We can test model (2) for formal manufacturing sectors only. In other words, are changes in formal manufacturing productivity mostly driven by the within component or the structural change component? As for the main analysis on 9 or 15 sectors (see Sections 3.1 and 3.2), we find that the within component has a much stronger impact on changes in productivity. The within term was positive in 1960-1970. The strongest changes are observed in food, beverages and tobacco, paper/paper products, printing/publishing, metal products/machinery and transport equipment. These evolutions can be attributed to massive public investments, as Nkrumah thought Ghana should industrialize by transforming raw materials: e.g., cocoa into chocolate, sugar cane into sugar, wood into paper, iron into machinery, etc. The within term was negative in 1970-1984, as all sectors were strongly affected by the economic crisis. These negative effects were reverted in 1984-2000, with economic recovery. The structural term was negative in 1984-2000. Three sectors drive this result, beverages, tobacco and textiles. The employment share of the three sectors decreased, although productivity was either high or increasing. Per capita consumption of tobacco continuously decreased after 1978, leading to a total collapse of the industry. There was “rationalization” in beverages and textiles, which both reduced employment and increased productivity.

Table 5: Decomposition of Productivity Growth, Formal Manufacturing 1960-2000

<table>
<thead>
<tr>
<th>Period</th>
<th>Labor Productivity at starting year</th>
<th>growth (annual, %)</th>
<th>Component due to:</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>within</td>
<td>structural</td>
</tr>
<tr>
<td>1960-1970</td>
<td>11754</td>
<td>2.2</td>
<td>2.3</td>
<td>-0.1</td>
</tr>
<tr>
<td>1970-1984</td>
<td>14624</td>
<td>-4.9</td>
<td>-5.7</td>
<td>0.8</td>
</tr>
<tr>
<td>1984-2000</td>
<td>7290</td>
<td>3.8</td>
<td>5.5</td>
<td>-1.7</td>
</tr>
</tbody>
</table>

Notes: This table displays labor productivity at starting year (in 2000 PPP $US) and the decomposition of annual productivity growth (%) into its “within” and “structural change” components, using panel data for 20 formal manufacturing subsectors. See Data Appendix for data sources.

The issue with the previous analysis is that we do not capture what is happening within the informal manufacturing sector, which nevertheless accounts for 90.7% of total manufacturing employment in 2000. Although we do not have panel data on GDP for informal manufacturing sectors, we have panel data on employment for 40 (20 times 2) formal and informal sectors in 1960-2000. Appendix Table A.2 shows their formalization rate in 2000, i.e. the subsectoral employment
The share of the formal sector,\textsuperscript{7} 10 out of 40 formal and informal sectors account for 84\% of manufacturing employment in 2000 (83\% in 1960). Looking at individual sectors, the informal clothing and furniture sectors altogether accounted for 43\% of total manufacturing employment in 1960, 20\% in 1984 and 37\% in 2000. On the contrary, the informal food and beverages sectors altogether accounted for 18\% in 1960, 50\% in 1984 and 13\% in 2000. As people became poorer, they restricted their consumption to foodstuffs and slashed their consumption of non-essential consumption goods. We also observe significant changes for the informal wood sector, which has been booming as a result of legal and illegal logging in the Western province of Ghana.

4 Extensions: Space, Informality, Public Policies and Structural Change

In this section we address questions on several dimensions of structural change. First, what is the geography of structural change? Are there areas within countries that are experiencing structural transformation while others are left behind? Second, is structural change concomitant to a formalization of employment? Is informality a stepping stone to formality or is it an employer of last resort? Lastly, what is the impact of government policies on structural change?

4.1 The Geography of Structural Change: South vs. North

While sectoral GDP data at the province level is not available, we have employment data for 9 sectors and 7 provinces in 1960, 1970, 1984, 2000 and 2010. The number of provinces has increased over time, from 7 in 1960 to 10 in 2010, so we use province boundaries in 1960. Figure 12 shows the employment share of agriculture, industry and services for each province in 2000, the latest year for which we have census data. We distinguish three groups in terms of sectoral composition: (i) Greater Accra, where most people work in industry and services (88\%), (ii) the Southern provinces (Western, Eastern, Ashanti and Volta), where the sectoral allocation of employment is balanced between agriculture (55\%) and industry-services (45\%), and (iii) the Northern provinces (Brong-Ahafo and Northern), where employment remains mostly agricultural in 2000 (72\%). These geographical patterns reflect the urbanization patterns of Ghana. Greater Accra contains the

\textsuperscript{7}“Basic Metal Industries”, “Petroleum” and “Rubber” were the three most formalized manufacturing subsectors in 2000. The three least formalized subsectors were “Furniture and Fixtures”, “Footwear” and “Clothing”.

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capital city Accra, while the South contains Kumasi, the capital of the hinterland, and many medium-sized cities and small towns (see Fig. 12).

Figure 12: Provincial Sectoral Composition and Urbanization, 2000.

Notes: This set of maps shows the sectoral composition of each province in 2000 (N = 7), using the three aggregate sectors “agriculture”, “industry” and “services”. The last subfigure shows cities in 2000, i.e. settlements with more than 5,000 inhabitants. See Data Appendix for data sources.

Table 6 summarizes the employment shares of agriculture, industry and services from 1960 to 2010. In 1960, there was a clear spatial pattern of sectoral specialization, with agricultural employment representing 12.6% in Greater Accra, 60.0% in the South and 83.8% in the North. In 1970, this share did not change much in Accra and the South, but there has been some convergence in the North.
In 1970-1984, the employment share of industrial sectors decreased while the employment share of agriculture increased. The North kept converging despite the economic crisis. Between 1984 and 2000, there has been some structural change in the South, while shares have remained constant in the North. In 2000-2010, there has been further divergence between the South and the North, but most of it was due to services. Figure 13 plots the employment share of agriculture for each group of provinces in 1960-2010. Provinces diverged, except in 1970-84.

Figure 13: Employment Share of Agriculture (%) by Group of Provinces.

![Graph](image)

Notes: This figure displays the employment share of agriculture (%) for each group of provinces in 1960, 1970, 1984, 2000 and 2010. See Data Appendix for data sources.

The fact that provinces were “unequal” in 1960 in terms of sectoral composition is in line with the Kuznets inverse-U hypothesis that development is initially associated with increasing spatial inequality Kuznets 1973. When the economy declined in 1967-1983, there was provincial convergence, as structural change was going in the right direction in the North and in the wrong direction in the South and Greater Accra. When economic growth resumed after 1984, spatial inequality widened as the South and Greater Accra were experiencing some growth-enhancing structural change. To conclude, periods of economic growth have been mostly associated with rising spatial disparities, while periods of economic stagnation or economic decline have seen provincial convergence. These patterns have also been verified for other countries (Kanbur and Venables, 2005).
Table 6: Sectoral Composition of Employment (%) by Group of Provinces.

<table>
<thead>
<tr>
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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. Accra</td>
<td>12.6</td>
<td>9.5</td>
<td>15.4</td>
<td>11.7</td>
<td>5.2</td>
</tr>
<tr>
<td>South</td>
<td>60.0</td>
<td>58.7</td>
<td>64.8</td>
<td>55.0</td>
<td>40.8</td>
</tr>
<tr>
<td>North</td>
<td>83.8</td>
<td>73.2</td>
<td>70.6</td>
<td>71.9</td>
<td>65.5</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. Accra</td>
<td>27.3</td>
<td>29.6</td>
<td>23.5</td>
<td>25.5</td>
<td>21.6</td>
</tr>
<tr>
<td>South</td>
<td>16.3</td>
<td>15.6</td>
<td>11.4</td>
<td>15.6</td>
<td>16.2</td>
</tr>
<tr>
<td>North</td>
<td>7.0</td>
<td>10.6</td>
<td>11.7</td>
<td>10.4</td>
<td>10.7</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Gr. Accra</td>
<td>60.1</td>
<td>60.9</td>
<td>61.0</td>
<td>62.8</td>
<td>73.1</td>
</tr>
<tr>
<td>South</td>
<td>23.7</td>
<td>25.7</td>
<td>23.8</td>
<td>29.4</td>
<td>42.9</td>
</tr>
<tr>
<td>North</td>
<td>9.2</td>
<td>16.2</td>
<td>17.7</td>
<td>17.6</td>
<td>23.9</td>
</tr>
</tbody>
</table>

Notes: This table shows the sectoral composition of employment (%) for each group of province. Southern provinces include Western, Eastern, Volta and Ashanti. Northern provinces include Brong-Ahafo and Northern. See Data Appendix for data sources.

4.2 The Informalization of Employment in Ghana?

Most African countries have implemented structural adjustment programs in the 1980s and experienced positive economic growth in the 1990s and 2000s. Surprisingly, these economies have also seen a rise in informal or small-scale employment, while we could expect that a better business environment, and less policy distortions, would lead to formalization (see Kingdon, Sandefur and Teal (2006) for a survey of recent trends in several Sub-Saharan African countries). In the case of Ghana, Sandefur (2010) documents how the proportion of employment in small firms (fewer than 30 employees) has increased from 33% in 1987 to 52% in 2003, and this change was driven by massive new entry of small firms. What are the potential welfare consequences of this evolution? Gollin (1995) uses a structural model of the Ghanaian economy to show that this could be due to distortionary taxes that disfavor large firms. However, his results suggest that an uniform rate of taxation would not dramatically improve overall productivity as large firms are not necessarily more productive than small firms.

Two criteria are used to distinguish formal and informal employment. First, formal employment includes recorded employees of the public and private sectors, while informal employment consists of unrecorded employees, self-employed people, employers and unpaid family workers. This is the approach favored by Gollin (1995). Second, the literature has sometimes privileged a size criterion. In the case of Ghana, data often distinguishes small-scale employment (in establishments with
fewer than 30 employees) and large-scale employment (in establishments with more than 30 employees). Given it is much more difficult to “hide” large-scale establishments to government authorities, this threshold is likely to capture the difference between formal and informal employments. Yet there are many “formal” establishments with fewer than 30 people, and their employees are mistakenly defined as belonging to the informal sector. This is the approach favored by Sandefur (2010). This is the approach we have privileged to study formal and informal manufacturing sectors in Section 3.3. Unfortunately, we have no panel data on employment in large-scale establishments for the non-manufacturing sectors, so we privilege the first approach in the rest of the analysis.


<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Employment - Informal</td>
<td>87.0</td>
<td>87.6</td>
<td>91.7</td>
<td>97.1</td>
<td>89.1</td>
<td>90.5</td>
</tr>
<tr>
<td></td>
<td>Employment - Formal, Public Sector</td>
<td>7.2</td>
<td>8.7</td>
<td>7.1</td>
<td>2.1</td>
<td>6.6</td>
<td>5.6</td>
</tr>
<tr>
<td></td>
<td>Employment - Formal, Private Sector</td>
<td>5.8</td>
<td>3.7</td>
<td>1.2</td>
<td>0.8</td>
<td>4.3</td>
<td>3.9</td>
</tr>
</tbody>
</table>

|---------| Employment in Industry - Formal | 38.0 | 27.3 | 15 | 4.7 | 13.7 | 12.4 |
|         | Employment in Services - Formal | 32.6 | 23.9 | 20.5 | 5.7 | 23.7 | 22.9 |
|         | Employment in Agriculture - Formal, Public | 2.8 | 2.5 | 1.5 | 0.4 | 1.4 | 0.5 |
|         | Employment in Agriculture - Formal, Private | 0.8 | 0.4 | 0.2 | 0 | 0.9 | 0.8 |
|         | Employment in Industry - Formal, Public | 13.1 | 14.6 | 9.8 | 2.7 | 6.3 | 2.7 |
|         | Employment in Industry - Formal, Private | 24.8 | 12.7 | 5.2 | 2.1 | 7.5 | 9.7 |
|         | Employment in Services - Formal, Public | 15.2 | 18.4 | 19 | 5.4 | 16.8 | 16.1 |
|         | Employment in Services - Formal, Private | 17.5 | 5.6 | 1.5 | 0.2 | 6.9 | 6.8 |

Notes: This table shows trends in informal employment in 1960-2006. Formal employment includes recorded employees of the public and private sectors, while informal employment consists of unrecorded employees, self-employed people, employers and unpaid family workers. See Data Appendix for data sources.

Table 7 reports trends in informal employment from 1960 to 2006. Formal employment includes all wage and salary earners in formally registered establishments. First, in 2006, formal employment only accounted for 9.5% of total employment (see Panel A of Table 7). This is actually even less than in 1960, when the share of formal employment was 13%. Formal employment in the public sector accounts for more than half of it. This indicates how small the formal private sector is. Second, the share of formal employment has decreased to 2.9% between 1984 and 1992 (see Panel A), as a result of the 1983 and 1988 structural adjustment programmes. Between 1992 and 2000-2006, the share of formal employment...
has been increasing from 2.9% to around 10%. This result goes against the current belief that there is rising informality in Ghana. Third, Panel B of Table 7 shows that the industrial and service sectors have been more severely hit by the economic crisis and the structural adjustment programmes. For example, formal service employees in the private sector only represented 0.2% of total employment in services in 1992. Appendix Table A.3 reports the formalization rates for each of the 9 main sectors. It goes from 52.6% in “Community, Social, Personal and Government Services” to 2.2% in “Agriculture, Hunting, Forestry and Fishing”. We then decompose the aggregate evolution of the formalization rate between its “within” component when sectors become more informal and its “structural” component when labor moves from more formal to less formal sectors as follows:

\[ \Delta F_t = F_t - F_{t-1} = \sum_j E_{j,t} (f_{j,t} - f_{j,t-1}) + \sum_j (E_{j,t} - E_{j,t-1}) f_{j,t-1} \]

where \( f_t \) and \( f_{j,t} \) refer to economy-wide and sectoral formalization rates (for sector \( j \)), respectively, and \( E_{j,t} \) is the share of employment in sector \( j \). Results are reported in Table 8. First, the within component of formalization is far more important than its structural component. This suggests that national factors, and not sectoral factors, account for the evolution of the aggregate formalization rate. When the formalization rate collapsed after 1984, the contribution of the structural component was almost nil. It means that the formalization rate did not increase because people were moving to more informal sectors (i.e., informal sectors are employers of last resort) but because each sector was becoming more informal. However, we have seen in Section 3.3 that there have been significant changes within the informal manufacturing sector, as people have moved from the informal clothing and furniture sectors into the informal food and beverages sectors in 1970-1984. Second, except in the period 1984-1992 with the 1983 and 1988 structural adjustment programmes, the contribution of the within component has always been negative, which confirms that most sectors experience a decrease in their formalization rate. Yet this effect is almost nil in 2000-2006. Third, the structural component of formalization has been positive in 1960-1970, when public employment increased, and in 1992-2000, when the economy restructured.

4.3 The Role of Government Policies in Structural Change

The objective of this section is to discuss how government policies have played a role in promoting or inhibiting structural change in post-independence Ghana. At independence, Ghana was a democracy, it was one of the wealthiest African countries and it had a large surplus from the cocoa and mining sectors to finance the development of other sectors. Yet per capita income and labor productivity
Table 8: Decomposition of Formal Employment Growth, Ghana 1960-2006

<table>
<thead>
<tr>
<th>Period</th>
<th>Share of Formal Employment at starting year (%)</th>
<th>Share of Formal Employment growth (annual, %)</th>
<th>Component due to: within</th>
<th>Component due to: structural</th>
</tr>
</thead>
<tbody>
<tr>
<td>1960-1970</td>
<td>15.5</td>
<td>-2.2</td>
<td>-4.3</td>
<td>2.2</td>
</tr>
<tr>
<td>1970-1984</td>
<td>12.4</td>
<td>-2.8</td>
<td>-1.7</td>
<td>-1.1</td>
</tr>
<tr>
<td>1984-1992</td>
<td>8.3</td>
<td>-12.3</td>
<td>-12.4</td>
<td>0.0</td>
</tr>
<tr>
<td>1992-2000</td>
<td>2.9</td>
<td>18.0</td>
<td>15.1</td>
<td>2.9</td>
</tr>
<tr>
<td>2000-2006</td>
<td>10.9</td>
<td>-2.2</td>
<td>-0.6</td>
<td>-1.6</td>
</tr>
</tbody>
</table>

Notes: This table displays the share of formal employment in total employment at starting year (%) and the decomposition of the growth of this share (%) into its "within" and "structural change" components. See Data Appendix for data sources.

have not increased much between 1960 and 2010. In this regard, Ghana did not fare better than other African countries. The economic crisis in 1970-1984 decreased labor productivity and the formalization rate for all sectors. Economic recovery in 1984-2000 helped recover the “losses” of the previous period, while there have been significant gains in 2000-2010. For the first time in the history of Ghana, the agricultural sector employs less than half of the workforce. But Ghana is still twice and four times poorer than Indian and China respectively.

The results of Tables 2, 3 and 5 suggest that the contribution of the structural term remained small throughout the period and that changes in overall productivity were mostly driven by changes within sectors. The fact that all sectors were affected by the economic crisis and simultaneously recovered with economic growth confirms that poor economy-wide policies and not necessarily poor sectoral policies constrained economic development. If the structural term had been much stronger, this would have meant that economic development was driven by a few sectors only and that more efficient sectoral policies were needed. For example, the structural change literature has shown how an industrial revolution, a rise in manufacturing productivity could produce growth-enhancing structural change. As labor moves from a low-productivity agricultural sector to a high-productivity manufacturing sector, overall labor productivity increases. This is what happened in China, with the development of manufacturing exports. This is also what happened in India, with the development of service exports (e.g., in the information and communications technology sector). The fact that labor productivity is relatively lower across all sectors and not just in the traditional agricultural sector in Ghana compared to the rest of the world indicates that there is no economic duality (see Table 1). Ghanaian manufacturing is 19.4 times less productive than in the rest of the world, while Ghanaian agriculture is only 7.7 times less productive!
According to McKinsey (2011), Ghana now belongs to the group of Africa’s transition economies, that also includes countries like Senegal, Kenya or Mozambique: although its GDP is lower than the diversified North African economies and the African oil and gas exporters, its economy is growing rapidly, it increasingly exports manufactured goods and it could soon compete with low-cost emerging economies in Asia. Does the data support this analysis? The answer is yes. Labor productivity has continuously increased after the second SAP in 1987-1989. In 1992-2000, the country was transitioning into a more efficient and formalized economy. The goal of the SAP was to reform the economical structure of Ghana. The more formal sectors were “rationalized” in 1984-1992, as firms of the private, parastatal and public sectors got rid of excess labor. Productivity mechanically increased, as firms kept their best workers. In 1992-2000, these same sectors expanded and hired new workers, which mechanically decreased productivity.\footnote{If marginal labor productivity is decreasing within a sector, increasing the number of workers reduces average productivity in that sector. It would be different if there were external returns to scale, as marginal labor productivity would then increase within a sector.} That is why the within component was negative during that period when using a decomposition of 15 sectors (-1.00, see Table 3). But the structural component of productivity was positive (+2.03, see Table 3), which indicated a reallocation of labor towards the newly booming sectors, e.g. tourism and forestry. Similarly, the within and structural components of formalization were positive when using a decomposition of 9 sectors (+15.1 and +2.9 respectively, see Table 8). In 2000-2006 and 2006-2010, the economy has further consolidated. The within component was very high in 2000-2006 (+5.08, see Table 3), while both the within and structural change components were positive in 2006-2010 (+1.56 and +1.17 respectively, see Table 3). Another positive evolution is that the economy has diversified in terms of exports. While cocoa, timber and mining accounted for almost 100% of exports in 1960, Ghana now also exports crude oil, tourism services and manufactured goods. The improvement in the quality of institutions probably accounts for the positive long-term effects of the SAPs.

5 Conclusion

The results of this case study on Ghana suggest that: (i) structural change, i.e. the decline in agricultural employment, is both a factor and a consequence of development, as episodes of negative economic growth are associated with structural change in the wrong direction; (ii) there has not been much structural change in the past 50 years, which explains why Ghana’s economy remains significantly agricultural and relatively poor; (iii) evolutions in economy-wide labor productivity have
been mostly driven by its within component, the fact that all sectors were either
becoming more productive or less productive, (iv) if the GDP and employment
shares of agriculture have decreased over time, this was not the result of success-
ful industrialization but of a rise of the service economy; (v) development and
structural change accentuate spatial inequality in line with the Kuznets inverse-U
hypothesis; (vi) economic development in Ghana has not been associated with a
formalization of employment; and (vii) since 1992, Ghana is transitioning into a
more efficient and formalized economy, and this explains why per capita income
has been continuously rising. Whether the achievements of the last 20 years will
have long-lasting effects is difficult to say though. First, Ghana is still highly spe-
cialized in natural resource exports, and is subject to the volatility of commodity
prices. Second, there are fears that the recent oil boom could lead to a worsening
of institutions. In other words, will Ghana repeat the errors of the 1960s when the
cocoa boom led to detrimental economic policies that had enduring effects until
the 1990s? Or will the fact that Ghana is one of the most democratic African
countries protect it against the resource curse?
References


Data Appendix

This appendix describes in detail the data we use in our analysis. The methodology is inspired by Timmer and De Vries (2007) and McMillan and Rodrik (2011).

GDP data:

Total Employment data:
Employment data was reconstructed in 1960, 1970, 1984, 1992, 2000, 2006 and 2010 from various sources: Population and Housing Censuses 1960, 1970, 1984, 2000 and 2010 and Ghana Living Standard Survey (GLSS) in 1991-92 and 2005-2006. We have data for 9 and 15 aggregate sectors. The same sources were used to recreate provincial employment data for each province for various years using the decomposition of 9 aggregate sectors. As the number of provinces has increased over time, from 7 in 1960 to 10 in 2000, we had to reaggregate the data to obtain the same spatial boundaries across the whole period. The Central province belonged to the Western province in 1960, while the Upper West and Upper East belonged to the Northern province.

Formal and Informal Employment Data:
Democracy Data:
Data on political regimes in Ghana and Sub-Saharan African countries is obtained from the Polity IV Project, a well-known database on political regime characteristics and transitions. We use the Combined Polity Score which ranges in value from -10 (hereditary monarchy) to +10 (consolidated democracy). Polity IV recommends to follow this classification: autocracies (-10 to -6), anocracies (-5 to +5) and democracies (+6 to +10). The average combined policy score for Sub-Saharan Africa is calculated using individual polity scores and the population of each country as weights (obtained from World Bank 2010).

Macroeconomic Data:
Investment rates—the share of “gross fixed capital formation” in GDP (%)—for the whole economy, the public sector and the private sector were reconstructed for the period 1960-2010 using data from various sources: Statistical Yearbook of Ghana 1961, 1965-66, 1967-68, 1969-1970, Statistical Handbook of Ghana 1970, Ewusi (1986), Aryeetey and Fosu (2002), and WDI (2010). The same sources were used to calculate the respective shares of total government expenditure, government consumption only and government investment only in GDP (%) for the same period.

Trade Data:
Data on the composition of exports (cocoa, mining and timber) in 1960-2010 comes from the following sources: Ewusi (1986), Aryeetey, Osei and Twerefou (2004), GSS (2008) and FAO (2010). Mining includes gold, manganese, bauxite (and alumina) and diamonds.

Urban Data:
GIS data on the spatial allocation of towns and cities in 2000 was collected from the 2000 Population and Housing Census report (see Jedwab 2011 for a description of the data set). Any locality with more than 5,000 inhabitants is defined as a town or city.

Bibliography for the Appendix


# Appendix Tables and Figures

Appendix Table A.1: List of Sectors for the Main Analysis.

<table>
<thead>
<tr>
<th>SECTORS (9)</th>
<th>SECTORS (15)</th>
<th>SECTORS (20)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>AGRICULTURE</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Agriculture, hunting, forestry and fishing (agr)</td>
<td>- Agriculture and hunting</td>
<td>- Cocoa</td>
</tr>
<tr>
<td>- Fishing</td>
<td></td>
<td>- Forestry and logging</td>
</tr>
<tr>
<td>- Fishing</td>
<td></td>
<td>- Fishing</td>
</tr>
<tr>
<td><strong>INDUSTRY</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Mining and quarrying (min)</td>
<td>- Mining and quarrying</td>
<td>- Food manufacturing</td>
</tr>
<tr>
<td>- Manufacturing (man)</td>
<td>- Manufacturing</td>
<td>- Beverages</td>
</tr>
<tr>
<td>- Tobacco</td>
<td></td>
<td>- Tobacco</td>
</tr>
<tr>
<td>- Textiles</td>
<td></td>
<td>- Textiles</td>
</tr>
<tr>
<td>- Clothing</td>
<td></td>
<td>- Clothing</td>
</tr>
<tr>
<td>- Footwear</td>
<td></td>
<td>- Footwear</td>
</tr>
<tr>
<td>- Wood and cork</td>
<td></td>
<td>- Wood and cork</td>
</tr>
<tr>
<td>- Furniture and fixtures</td>
<td></td>
<td>- Furniture and fixtures</td>
</tr>
<tr>
<td>- Printing and paper products</td>
<td></td>
<td>- Printing and publishing</td>
</tr>
<tr>
<td>- Leather and fur</td>
<td></td>
<td>- Leather and fur</td>
</tr>
<tr>
<td>- Rubber</td>
<td></td>
<td>- Rubber</td>
</tr>
<tr>
<td>- Chemicals</td>
<td></td>
<td>- Chemicals</td>
</tr>
<tr>
<td>- Petroleum</td>
<td></td>
<td>- Petroleum</td>
</tr>
<tr>
<td>- Non-metallic mineral prod.</td>
<td></td>
<td>- Non-metallic mineral prod.</td>
</tr>
<tr>
<td>- Basic metal industries</td>
<td></td>
<td>- Basic metal industries</td>
</tr>
<tr>
<td>- Metal products, machinery</td>
<td></td>
<td>- Metal products, machinery</td>
</tr>
<tr>
<td>- Transport equipment</td>
<td></td>
<td>- Transport equipment</td>
</tr>
<tr>
<td>- Electrical machinery</td>
<td></td>
<td>- Electrical machinery</td>
</tr>
<tr>
<td>- Miscellaneous</td>
<td></td>
<td>- Miscellaneous</td>
</tr>
<tr>
<td><strong>SERVICES</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>- Wholesale and Retail Trade, Hotels and Restaurants (wrt)</td>
<td>- Wholesale and Retail Trade</td>
<td>- Hotels and Restaurants</td>
</tr>
<tr>
<td>- Transport, Storage and Communications (tsc)</td>
<td>- Transport, Storage</td>
<td>- Communications</td>
</tr>
<tr>
<td>- Finance, Insurance, Real Estate and Business Services (fire)</td>
<td>- Finance, Insurance, Real Estate and Business Services (fire)</td>
<td>- Finance, Insurance, Real Estate and Business Services (fire)</td>
</tr>
<tr>
<td>- Community, Social, Personal and Government Services (cspgs)</td>
<td>- Community, Social and Government Services (cspgs)</td>
<td>- Community, Social and Government Services (cspgs)</td>
</tr>
</tbody>
</table>

*Notes:* This table displays the decomposition of the 3 aggregate sectors and 9 main sectors into 15 sectors and 20 manufacturing subsectors. See Data Appendix for data sources.
Table A.2: Formalization Rates (%) for 20 Manufacturing Subsectors.

<table>
<thead>
<tr>
<th>Subsector</th>
<th>Formal (%)</th>
<th>Subsector</th>
<th>Formal (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic metal industries</td>
<td>30.2</td>
<td>Beverages</td>
<td>12.0</td>
</tr>
<tr>
<td>Petroleum</td>
<td>21.5</td>
<td>Printing and publishing</td>
<td>11.1</td>
</tr>
<tr>
<td>Rubber</td>
<td>21.2</td>
<td>Non-metallic mineral prod.</td>
<td>10.7</td>
</tr>
<tr>
<td>Tobacco</td>
<td>21.0</td>
<td>Metal products, machinery</td>
<td>4.5</td>
</tr>
<tr>
<td>Paper and paper products</td>
<td>20.8</td>
<td>Transport equipment</td>
<td>4.2</td>
</tr>
<tr>
<td>Chemicals</td>
<td>19.5</td>
<td>Leather and fur</td>
<td>4.0</td>
</tr>
<tr>
<td>Wood and cork</td>
<td>19.0</td>
<td>Miscellaneous</td>
<td>3.5</td>
</tr>
<tr>
<td>Electrical machinery</td>
<td>15.5</td>
<td>Furniture and fixtures</td>
<td>3.4</td>
</tr>
<tr>
<td>Textiles</td>
<td>15.2</td>
<td>Footwear</td>
<td>2.7</td>
</tr>
<tr>
<td>Food</td>
<td>12.4</td>
<td>Clothing</td>
<td>1.2</td>
</tr>
</tbody>
</table>

Notes: This table indicates the share of formal employment in total employment for the 20 manufacturing subsectors in 2000. See Data Appendix for data sources.

Table A.3: Formalization Rates (%) for 9 Aggregate Sectors.

<table>
<thead>
<tr>
<th>Sector</th>
<th>Formal Empl. (%)</th>
<th>Public</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Community, Social, Personal and Government Services (cspgs)</td>
<td>52.6</td>
<td>42</td>
</tr>
<tr>
<td>- Finance, Insurance, Real Estate and Business Services (fire)</td>
<td>45.6</td>
<td>27.7</td>
</tr>
<tr>
<td>- Public Utilities (pu)</td>
<td>32.4</td>
<td>21.8</td>
</tr>
<tr>
<td>- Mining and Quarrying (min)</td>
<td>28.4</td>
<td>15.9</td>
</tr>
<tr>
<td>- Transport, Storage and Communications (tsc)</td>
<td>23.7</td>
<td>12.8</td>
</tr>
<tr>
<td>- Construction (con)</td>
<td>17.6</td>
<td>7.5</td>
</tr>
<tr>
<td>- Manufacturing (man)</td>
<td>10.1</td>
<td>4.1</td>
</tr>
<tr>
<td>- Wholesale and Retail Trade, Hotels and Restaurants (wrt)</td>
<td>5.9</td>
<td>2.7</td>
</tr>
<tr>
<td>- Agriculture, Hunting, Forestry and Fishing (agr)</td>
<td>2.2</td>
<td>1.4</td>
</tr>
<tr>
<td>- Economy-wide</td>
<td>10.9</td>
<td>6.6</td>
</tr>
</tbody>
</table>

Notes: This table indicates the shares of formal employment and formal public employment in total employment for the 9 main sectors in 2000. See Data Appendix for data sources.
Appendix Figures A.1-A.7: Correlation Between Sectoral Productivity and Changes in Employment Shares in Ghana, 1960-2010

Correlation Between Sectoral Productivity and Change in Employment Shares in Ghana (1990-2005)

\[ \beta = 13.3193; t\text{-stat} = 0.74 \]

*Note: Size of circle represents employment share in 1990
**Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(\text{P}) = \alpha + \beta \times \text{Emp. Share} \]

Source: Authors’ calculations with data from Ghana Statistical Service and WDI 2010

Correlation Between Sectoral Productivity in 1970 and Change in Employment Shares in Ghana (1960-1970)

\[ \beta = -0.5715; t\text{-stat} = -0.05 \]

*Note: Size of circle represents employment share at time 1960
**Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(\text{P}) = \alpha + \beta \times \text{Emp. Share} \]

Notes: Authors’ calculations. See Data Appendix for sources.

\[ \beta = -1.1630; \text{ t-stat} = -0.08 \]

*Note: Size of circle represents employment share at time 1970
*Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(y/P) = \alpha + \beta (\Delta \text{Emp. Share}) \]

Notes: Authors' calculations. See Data Appendix for sources.


\[ \beta = -0.0423; \text{ t-stat} = -0.36 \]

*Note: Size of circle represents employment share at time 1984
*Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(y/P) = \alpha + \beta (\Delta \text{Emp. Share}) \]

Notes: Authors' calculations. See Data Appendix for sources.

\[ \beta = 2.8880; \ t\text{-stat} = 1.10 \]

*Note: Size of circle represents employment share at time 1992
**Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(\nu/P) = \alpha + \beta (\Delta \text{Emp. Share}) \]

Notes: Authors’ calculations. See Data Appendix for sources.

Correlation Between Sectoral Productivity in 2006 and Change in Employment Shares in Ghana (2000-2006)

\[ \beta = -29.5492; \ t\text{-stat} = -2.26 \]

*Note: Size of circle represents employment share at time 2000
**Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(\nu/P) = \alpha + \beta (\Delta \text{Emp. Share}) \]

Notes: Authors’ calculations. See Data Appendix for sources.
Correlation Between Sectoral Productivity in 2010 and Change in Employment Shares in Ghana (2006-2010)

\[ \beta = 0.2526; \text{t-stat} = 0.17 \]

*Note: Size of circle represents employment share at time 2006
**Note: \( \beta \) denotes coeff. of independent variable in regression equation:
\[ \ln(\beta) = \alpha + \beta \times \text{Emp. Share} \]

Notes: Authors' calculations. See Data Appendix for sources.