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WHAT IS DRIVING THE 'AFRICAN GROWTH MIRACLE'?

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ABSTRACT

We show that much of Africa's recent growth and poverty reduction can be traced to a substantive decline in the share of the labor force engaged in agriculture. This decline has been accompanied by a systematic increase in the productivity of the labor force, as it has moved from low productivity agriculture to higher productivity manufacturing and services. These declines have been more rapid in countries where the initial share of the labor force engaged in agriculture is the highest and where commodity price increases have been accompanied by improvements in the quality of governance.

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Even if you don't believe in miracles, it cannot be denied that Africa has come a long way over the past 15 years. As recently as 2000, the front cover of the Economist proclaimed Africa "the hopeless continent" (Economist, 2000). Yet recent evidence suggests that the continent is anything but hopeless. The share of the population living on less than $1.25 a day fell from 58 percent in 2000 to 48 percent in 2010, infant mortality rates declined significantly, and access to education generally improved (Page and Shimeles, 2014). Average growth rates have been positive for the first time in decades and, in some of the fastest growing economies, have exceeded 6 percent per annum; moreover, these growth rates are likely to be underestimated. Young (2012) finds that real consumption in Africa has been growing between 3.4 and 3.7 percent per year or three to four times the 0.9-1.1 percent growth reported using national accounts data; he dubs this an 'African Growth Miracle'.

The reasons behind this success are not well understood. The main contribution of this paper is to show, for the first time, that the 'African Growth Miracle' can be traced to a significant decline in the share of the labor force engaged in agriculture. Previous researchers have shown that agriculture is by far the least productive sector in Africa (McMillan and Rodrik (2011) and Gollin, Lagakos and Waugh (2014)) and that income and consumption are lower in agriculture than in any other sector (McMillan and Verduzco (2012) and Gollin, Lagakos and Waugh (2014)). Researchers have also noted that real consumption is growing in Africa (Young (2012)) and that poverty is falling (Shimeles and Page (2014)). To our knowledge, this paper is the first to connect these improvements in living standards to important occupational changes.

We show that, between 2000 and 2010, in Sub-Saharan Africa, the share of the labor forced employed in agriculture declined by roughly 10 percentage points.[1] The decline in the share of employment in agriculture has been matched by a 2 percentage point increase in the share of the labor force engaged in manufacturing and an 8 percentage point increase in services.

The results above are consistent with the early work by the prominent scholars Theodore Schultz and Arthur Lewis. In 1979, Schultz and Lewis received the Nobel Prize for their work explaining how and why agriculture often remains a relatively low-productivity sector, despite

[1] This estimate is based on a sample of more than 24 countries and is robust to the source of data. In particular, we verify estimates based on census and labor force surveys using data from the Demographic and Health Surveys (DHS).

growth in average national income and productivity levels. And although they differed in their prescriptions for developing countries, both viewed the persistence of low productivity in agriculture as a root cause of poverty. In Lewis' principal model, low farm productivity persists until non-farm employment expands enough to absorb rural population growth, while Schultz's main contributions address how to raise the productivity of those workers who remain in agriculture.

There has been very little evidence on how structural change — that is, the reallocation of economic activity away from agriculture to more productive sectors — has evolved in Africa since independence across the continent was achieved half a century ago. A major reason for this has been the quality and frequent absence of rigorous economic data for many African countries. A deeper reason is poverty itself. Until recently, few African countries have enjoyed the sustained economic growth needed to trace out the patterns of structural transformation achieved in earlier decades elsewhere.

The start of the 21st century saw the dawn of a new era in which African economies grew as fast, or faster, than the rest of the world. Examining the recent process of structural change in Africa, and its role in economic growth can yield enormous benefits. For one, the theory and stylized facts of structural change offer several predictions about the allocation of the factors of production for countries at different stages of development. As Sub-Saharan Africa is now by far the poorest region of the world, including African countries in the analysis can enrich the current understanding of how structural change has recently played out around the world. Perhaps more importantly, and most pertinent to this paper, is that such an analysis can offer insights into the distributional implications of the continent's recent economic performance.

We begin our analysis by asking whether it is reasonable to compare structural change in Africa to other regions during the same time period. Average incomes in Africa are significantly lower than in East Asia, Latin America and all other regions. If countries at different stages of development tend to exhibit different patterns of structural change, the differences between Africa and other developing regions may be a result of their different stages of development. Motivated by this possibility, we explore how the *level* of employment shares across sectors in African countries compare to those in other countries, controlling for levels of income. We find that African countries appear to fit seamlessly into the pattern observed in other countries. In other words, given current

levels of income per capita in Africa, the share of the labor force in agriculture, manufacturing, and industry is roughly what we would expect.

Having confirmed that African countries were characterized by very high employment shares in agriculture in 1990, we turn to an investigation of changes in agricultural employment shares. For a sample of 19 African countries, we find that for the period 2000-2010:

(i) the share of the labor force engaged in agriculture declined by an average of 10.61 percentage points;
(ii) the share of the labor force engaged in manufacturing expanded by an average of 2.15 percentage points;
(iii) the share of the labor force engaged in services increased by an average of 8.23 percentage points;
(iv) the share of the labor force engaged in mining did not change.

Combining these data on employment shares with data on value-added, we show that for the period 2000-2010, structural change accounted for roughly *half* of Africa's growth in output per worker.

The results above are encouraging, but how much can the estimates be trusted? Even if the quality of the surveys is strong, there are differences in methodology and definitions across surveys and across countries that can contaminate the estimates. Thus, an additional goal of this paper is to verify the robustness of our employment share estimates (and the changes in employment shares) using the Demographic and Health Surveys (DHS). The DHS are nationally representative surveys designed to collect detailed information on child mortality, health, and fertility, as well as on household's durables and quality of the dwelling. In addition, the DHS include information on gender, age, location, education, employment status and occupation of women and their partners between the ages of 15 and 49. Importantly, the design and coding of variables (especially on the type of occupation, educational achievements, households assets, and dwelling characteristics) are generally comparable across countries and over time. Finally, the sample includes considerable regional variation. 90 surveys are available for 31 African countries and, for most countries, multiple surveys (up to six) have been conducted between 1993 and 2012.

Using the DHS we find that the changes in employment shares are consistent with the results described above. In particular, we show that the share of the labor force in agriculture increased by around 2 percentage points between 1990 and 1999, and fell by a little under 10 percentage points from 2000 onward. We also show that there is a significant degree of cross-country heterogeneity in the changes in agricultural employment shares, with the most rapid decline occurring in Burkina Faso and the smallest decline occurring in Lesotho.

Having documented a meaningful decline in the share of the labor force engaged in agriculture over the past decade, we explore potential explanations for the decline. We find that:

(i) the agricultural employment share is falling faster in countries that started with a higher share of the labor force engaged in agriculture;
(ii) in countries with higher population growth rates, the share of the labor force is falling faster in agriculture, and this correlation is strongest for rural males;
(iii) in countries where the rise in commodity prices coincided with a relatively higher quality of governance, the female share of the labor force fell more rapidly;
(iv) countries that have achieved at least one of the Comprehensive African Agriculture Development Program (CAADP) targets have experienced more rapid declines in the agricultural employment share;
(v) and rural schooling is correlated with small declines in agricultural employment shares in the subsequent period.

Our work is related to work by Gollin, Lagakos and Waugh (2014). Using contemporary data for 151 developing countries including several from Africa, they confirm the persistence of a sizeable agricultural productivity gap as well as a gap in income and consumption. Based on these results they conclude that there should be large economic gains associated with a reduction in the share of employment in agriculture. Our paper differs in that we take as given the agricultural productivity gap and show that movement out of the agricultural sector has been responsible for growth and poverty reduction in Africa.

Our work is also related to work by Herrendorf et al (2012) and Duarte and Restuccia (2010), who find that structural change is a fundamental feature of economic growth (Herrendorf et

al (2012)), Duarte and Restuccia (2010))[2]. This structural transformation continues until farm and nonfarm productivity converge, which typically occurs only at very high levels of per-capita income; in the United States, for example, the exodus of labor from agriculture did not end until the mid-1990s. At lower levels of income, countries that pull themselves out of poverty also exhibit positive structural change.[3] The main difference relative to the present paper is that neither of these two studies include Africa in the analysis.

Most closely related to the present paper are recent studies by McMillan and Rodrik (2011) and McMillan, Rodrik and Verduzco (2014). Like Gollin, Lagaokos and Waugh (2014), these two studies document a significant gap in productivity between agriculture and other sectors of the economy. The latter study shows that structural change in Africa contributed negatively to growth during the 1990s and then positively to growth during the period 2000-2005. However, these studies have two important limitations. First, the sample of African countries used in these papers is not representative of the poorest African countries: the countries are on average richer and the populations are more educated and healthier when compared to the rest of SSA. Second, the data in these studies do not paint an accurate picture of the most recent economic activity in Africa, because the sample stops in 2005.

Finally, our research is also related to work by Young (2012), who points out the numerous problems associated with measuring progress in Africa using national accounts data. To get around this problem, he uses DHS data to construct a proxy for consumption growth based on growth in asset indices. He finds that real consumption has grown rapidly in Africa over the past two decades. Our paper provides the missing explanation for his important results.

In summary, we begin in Section 2 by documenting a number of stylized facts to situate Africa within the recent literature on structural change, and to show that countries in Africa are where we would expect them to be, given their current levels of income. Section 3 then outlines our methodology and the data we use for measuring structural change, and describes recent patterns

[2] See Herrendorf and Rogerson (2011) for an overview of and many references on this subject.
[3] The converse is not true, however: all countries with structural change do *not* also achieve poverty reduction. Structural change into protected or subsidized sectors comes at the expense of other activities, and is therefore not associated with sustained growth out of poverty for the population as a whole. Structural change is effective at reducing poverty only when people move from lower into higher productivity activities.

across regions and countries. Section 4 describes the DHS and goes on to use these data to explore the robustness of the results presented in Section 3. Section 5 is a discussion and empirical investigation into possible explanations for the decline in the agricultural employment share in SSA. Section 6 concludes.

2. Fitting Africa Into the Recent Literature on Structural Change

The process of structural change out of agriculture is integral to the ability of developing countries to pull themselves out of poverty, and was recognized as such by early development economists such as Lewis (1955). Lewis and others observed the historical reallocation of workers from traditional agriculture to "modern" industry in Europe, North America and East Asia, and predicted that other regions would follow the same development process. Duarte and Restuccia (2010) find that structural change has indeed played a substantial role in the productivity catch-up of developing countries in their sample – relative to the U.S. – over their sample period. As predicted, the gains are particularly dramatic in the sectors with international trade. They find in their sample that productivity differences in agriculture and industry between the rich and developing countries have narrowed substantially, while productivity in services has remained significantly lower in the developing countries relative to rich countries. Thus, developing countries with the most rapid growth rates have typically reallocated the most labor into high-productivity manufacturing, allowing aggregate productivity to catch up.[4] Duarte and Restuccia (2010) conclude that rising productivity in industry, combined with structural change out of agriculture and into industry, explains 50% of the catch-up in aggregate productivities among developing countries over their sample period of 1950-2006.

More recent work by Rodrik (2012) underscores the importance of this type of structural change. Using a large panel of countries, he finds that since 1960 manufacturing industries have exhibited *unconditional* convergence in labor productivity regardless of country- or regional-level factors. This finding is important because it suggests that the destination sector in which less

[4] Conversely, where the manufacturing sector stagnates and structural transformation involves primarily reallocation of workers into lower productivity sectors, aggregate productivity is slower, especially among developing countries whose productivity in services remains low—both relative to agriculture in other countries and to other sectors within the country.

developed countries eventually catch up with the productivity levels of developed countries is manufacturing.

Some stylized facts of the pattern of structural change over the course of development have emerged from this literature. As countries grow, the share of economic activity in agriculture monotonically decreases and the share in services monotonically increases. The share of activity in manufacturing follows an inverted U-shape: increasing during low stages of development as capital is accumulated, then decreasing for high stages of development where higher incomes drive demand for services and labor costs make manufacturing difficult. Herrendorf et al (2012) document this pattern for a panel of mostly developed countries over the past two centuries, and Duarte and Restuccia (2010) document a similar process of structural change among 29 countries over the period 1956-2004.

With this insight in mind, it may be instructive to look at the evolution of the distribution of employment between sectors across levels of income experienced in Africa and how it compares to the patterns seen historically in other regions over the course of development. If we use the patterns seen in other regions historically as a baseline, this exercise can help me to gauge the extent to which structural change in Africa compares to what we would "expect" based on its income levels. To this end, and following Duarte and Restuccia (2010) we start by aggregating the 9 sectors in my database into Agriculture, Industry and Services " by adding manufacturing, mining, construction, and public utilities to make "Industry", adding wholesale and retail trade, transport and communication, finance and business services, and finally community, social, personal, and government services to create "Services," and leaving "Agriculture" as-is.[5] Our measure of "development" is log GDP per capita in international dollars from Maddison (2010).

In Figure 1 we plot employment shares in agriculture, industry and services, respectively, on the y-axis and log GDP per capita on the x-axis for the 19 African countries in my sample for the years 1990 and 2005. The share of employment in agriculture decreases, and that in services increases, monotonically with income, and the share in manufacturing also monotonically increases. In other words, recent patterns of structural change in Africa fit into the stylized facts of other

[5] This aggregation is consistent with that used in Duarte and Restuccia (2010), who also use the GGDC database (along with other sources) to construct their dataset.

regions' historical development. Note that Industry does not follow the inverted-U shape documented in Herrendorf et al (2011) and Duarte and Restuccia (2010), but this is because each country's GDP per capita is below the threshold at which the rate of change of Industry's employment share changes from positive to negative.[6]

Though Figure 1 suggests the patterns of reallocation between agriculture, industry and services are qualitatively similar to the stylized facts based on the experience of other regions, it may be that they differ quantitatively. For instance, though Figure 1 confirms that the agricultural employment share and services employment share in Africa decrease and increase, respectively, with the level of income, it could be that the *level* of agricultural or services employment in Africa is higher than in other regions (the latter being argued in Badiane 2011), perhaps because of resource endowments or productivity levels. To investigate this question, we obtained data used in Duarte and Restuccia (2010) which contains shares of hours worked in the three broad sectors for a panel of 29 countries (none of which are in Africa) from 1950-2006.[7] [8] Again we obtained GDP per capita for these countries from Maddison (2010). By directly comparing the relationship between income levels and the distribution of employment in Africa in recent years with other regions over the last several decades, we can get an idea of whether the process of structural change in Africa is playing out differently than we would expect given current levels of income.

Figure 2 again plots employment shares in agriculture, industry and services, respectively, on the y-axis and log GDP per capita on the x-axis simultaneously for our sample of African countries and for those in Duarte and Restuccia (2010). Each country in my sample again has two data points (1990 and 2005) and each country in the Duarte and Restuccia (2010) sample has all available data points. Two things are immediately evident from the figure. First, per capita incomes in recent years in most African countries in my sample are lower than those seen in most of the world since 1950. Second, the distributions of employment among the African countries fit almost seamlessly into those seen over the past six decades in other regions. In other words, controlling for income, the

[6] Herrendorf et al (2011) note that this peak in Industry's employment share occurs at a log GDP per capita of about 9. Mauritius, whose GDP per capita is the highest in our sample and was about 9 in 1990, fits into this peak: its log GDP per capita increased to roughly 9.5 in 2005 and its share of employment in Industry decreased (second panel of Figure XXa).

[7] Data were downloaded from Margarida Duarte's website on 7/24/2012.

[8] Note that the Duarte and Restuccia (2010) data measure share of hours worked, whereas our data measure share of total employment.

quantitative patterns of structural change in Africa are roughly what we would expect based on what has transpired elsewhere.

Figure 3 illustrates that, among the 9 African countries in the original M&R (2011) sample, the productivity gaps are indeed enormous across sectors. In the figure, each bin corresponds to one of the 9 sectors in our dataset, with the width of the bin corresponding to the sector's share of total employment, and the height corresponding to the sector's labor productivity level as a fraction of average labor productivity. Agriculture—at 36 percent of average productivity—is by far the sector with the lowest productivity; manufacturing productivity is 6 times as high, and that in mining is nearly 60 times as high. Furthermore, the figure makes evident that the majority of employment in our African sample is in the most unproductive sectors, with roughly three-quarters of the population in the two sectors with below-average productivity (Agriculture and Wholesale and Retail Trade). Based on this figure, it appears that the potential for reallocation of labor from low to high productivity sectors to increase growth appears to be quite large.

The productivity gaps described here refer to differences in *average* labor productivity. When markets work well and structural constraints do not bind, it is productivities *at the margin* that should be equalized. Under a Cobb–Douglas production function specification, the marginal productivity of labor is the average productivity multiplied by the labor share. So, if labor shares differ greatly across economic activities, then comparing average labor productivities can be misleading. The fact that average productivity in mining is so high, for example, simply indicates that the labor share of value added in this capital-intensive sector is quite small. In the case of other sectors, however, there does not appear to be a clearly significant bias. Once the share of land is taken into account, for example, it is not obvious that the labor share in agriculture is significantly lower than in manufacturing (Mundlak, Butzer, and Larson 2008). So, the sixfold difference in average labor productivity between manufacturing and agriculture does point to large gaps in marginal productivity.

An additional concern with the data presented in Figure 3 is that the productivity gaps may be mis-measured. For example differences in hours worked or human capital per worker could be driving the observed productivity gaps. However, in a recent paper Gollin et al (2012) use micro data to take into account sectoral differences in hours worked and human capital as well as alternative measures of sectoral income and they still find large differences in productivity between

agriculture and other sectors of the economy. The agricultural productivity gaps for Sub-Saharan Africa are presented by country in Appendix 3 and range from a low of 1.14 in Lesotho all the way to 8.43 for Gabon.

Thus, our preliminary analysis reveals three important stylized facts about countries in Africa. First, when we compare the *levels* of employment in Africa alongside other regions across levels of development, the pattern among our sample of African countries appears to fit seamlessly into that experienced by other regions. Second, Africa is still by far the poorest region of the world. And third, structural change in Africa has not yet been a significant driver of growth.

There are a number of reasons to believe that structural change might have been delayed in much of Africa. And it is only relatively recently that much of Africa has begun to grow rapidly. Part of this has to do with the rise in commodity prices that began in the early 2000s. But it may also be that Africa is starting to reap the benefits of economic reforms and improved governance. To explore the nature of Africa's recent growth, we turn our attention to an investigation of structural change in Africa including the most recent period in history for which data are available: 2000-2010. This most recent period is important because this is the period over which Africa experienced the strongest growth in four decades. The key question is whether growth in this period was accompanied by structural change.

3. Patterns of Structural Change Across Regions and Countries

We begin this section by describing the data and methodology we use to measure structural change. This is followed by a description of patterns of structural change across the following regions for the periods 1990-1999 and 2000-2005: Africa, Asia, Latin America and the OECD countries. We conclude this section by expanding the Africa database to cover an additional 10 countries and report patterns of structural change for the expanded Africa sample for the period 2000 onward.

Data Used to Measure Structural Change

To further analyze the patterns of structural change in Africa in recent years, we employ data from several sources. Our initial analysis uses the sample of countries used by McMillan and Rodrik

(2011) and consists of sectoral and aggregate labor productivity statistics for nine African countries. The data for Africa were compiled by the authors and the details are available in the data appendix to their paper. Data for Ghana were updated and cross-checked by Jedwab and Osei (2012) and data for Nigeria were updated and cross-checked by Vollrath et al (2012).

We collected data on value added and employment shares for an additional 10 African countries to expand the Africa sample. In general, we follow the methodology used by researchers at the Groningen Growth and Development Center (GGDC), which provides employment and value-added statistics for 27 countries divided into 10 sectors[9]. Measures of sectoral and aggregate value-added came from national accounts from respective national statistics offices whenever possible and were complemented with the UN's national accounts whenever national sources were incomplete or found to be inconsistent. To measure sectoral-level employment, we relay primarily on population censuses, which Timmer and de Vries (2007, 2009) explain are the most reliable sources of sectoral employment for many developing countries, to get employment levels and distributions for census years. Following Timmer and de Vries, we use use labor force surveys and household surveys to when census data are not available. A detailed description of data sources by country is provided in Appendix 1.

As previously noted, we would of course like to have data for more African countries. In the absence of additional data for Africa, we report in Table 1 the characteristics of the African countries in our sample and compare them to the characteristics of all countries in SSA. Our sample includes 16 out of 47 countries from Sub-Saharan Africa and 3 out of 6 countries from North Africa. Overall, the countries in both our SSA and our NA sample are slightly poorer than average as measured by GDP per capita. The statistics in column (2) of Table 1 indicate that the 9 countries in the original M&R (2011) sample have significantly lower infant mortality rates and higher years of primary and secondary schooling. The statistics in column (4) of Table 1 indicate that once the additional countries are added to the M&R (2011) sample, there are no significant differences in income per capita, infant mortality rates, years of schooling, dependence on natural resource exports, exchange rate policy or share of the population engaged in agriculture. The sample

[9] Since writing this paper, I received a grant from the Economic and Social Research Council of the UK that helped fund the Africa Sector Database (ASD). The ASD contains value added and employment for 11 African countries for the period 1960-2010 and is publicly available on the GGDC's website.

described in column (4) accounts for 68 percent of the population of SSA. We postpone a discussion of the DHS sample to section 4 of the paper.

In Table 2, we report summary statistics for all of the countries used to compute measures of structural change. The top three panels report the statistics for the non-African countries used in the original M&R (2011) analysis. The bottom panel reports statistics for all of the African countries used in the analyses – the countries in the original M&R (2011) sample are marked with a triple asterisk. To the original sample of 9 used in M&R (2011) I added: Algeria, Egypt, Morocco, Angola, Cameroon, Kenya, Uganda, Tanzania, Rwanda, and Mali. Countries are ranked in terms of real value added per worker in 2000 ppp dollars and in the final year for which data were available. The last column on the right side of the table indicates the period for which we had survey data for the period 2000 onward. Almost without exception, labor productivity is the highest in mining and the lowest in agriculture.

In Table 3, we report sectoral coverage. For the additional African countries, we restrict our analysis to the following four sectors: (i) agriculture, hunting, forestry and fishing; (ii) mining and quarrying (note that mining includes all natural resource extraction); (iii) manufacturing and; (iv) tertiary (or services). The developed countries have the highest labor productivity across all four sectors and countries in SSA have the lowest productivity levels across all four sectors.

Measuring Structural Change

Labor productivity growth can be achieved in one of two ways. First, productivity can grow within existing economic activities through 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:

$$\Delta P_t = \sum_{i=n} \theta_{i,t-k} \Delta p_{i,t} + \sum_{i=n} p_{i,t} \Delta \theta_{i,t} \quad (1)$$

where P_t and $p_{i,t}$ refer to economy-wide and sectoral labor productivity levels, respectively, and $\theta_{i,t}$ is the share of employment in sector *i*. The ⊿ operator denotes the change in productivity or employment shares between *t-k* and *t*. 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. Following M&R (2011), 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. Also following M&R (2011), we call this second term the "structural change" term.

The second term in equation (1) could be further decomposed into a static and dynamic component of structural change as in de Vries et al (2014). Like in McMillan and Rodrik (2011), we choose not to do this for the following reason. The 'dynamic' structural change component of the structural change term is often negative but difficult to interpret. For example, when agricultural productivity growth is positive and the labor share in agriculture is falling, the term is negative even though on average the movement of workers out of agriculture to other more productive sectors of the economy makes a positive contribution to structural change and economywide labor productivity growth. Moreover, structural change is by its' very nature a dynamic phenomenon and so we find it counter-intuitive to label a part of structural change static.

This decomposition clarifies how partial analyses of productivity performance within individual sectors (e.g., manufacturing) can be misleading when there are large differences in labor productivities ($p_{i,t}$) across economic activities. In particular, a high rate of productivity growth within an industry can have quite ambiguous implications for overall economic performance if the industry's share of employment shrinks rather than expands. If the displaced labor ends up in activities with lower productivity, economy-wide growth will suffer and may even turn negative.

This decomposition can be used to study broad patterns of structural change within a country and across countries. An example of this type of analysis can be found in M&R (2011). Individual components of the decomposition such as labor shares and within sector changes in productivity can also be used at the country level to dig deeper into where structural change is or is not taking place and to gain a deeper understanding of the country specific factors that drive structural change. For example, if we know that the expansion of manufacturing is a characteristic of

structural change in a particular country, we could use more detailed data on manufacturing to pinpoint which specific industries expanded, how many people were employed, and whether or not specific events or policies contributed to the expansion or contraction of a particular sector.

Structural Change in Africa in Comparison to Latin America and Asia

The previous discussion indicated that the distribution of employment *levels* across sectors in our Africa sample is what we would "expect" based on current levels of income. In this section we investigate the *changes* in employment shares within African countries and their effect on economywide labor productivity. We begin our analysis using the original sample used byM&R (2011) but breaking the period into two: 1990-99 and 2000-2005. As previously noted, by looking at the period 1990-2005 as a whole, we may miss important changes in Africa. The early 1990s in Africa were still a period of adjustment. The period starting around 2000 marks the beginning of Africa's 'Growth Miracle'.

Figure 4 presents our central findings on patterns of structural change. Simple averages and employment weighted averages are presented for the periods 1990–1999 and 2000-2005 period for four groups of countries: Latin America, Sub-Saharan Africa, Asia, and high-income countries. For comparability with the results in M&R (2011) we restrict our sample of African countries here to the 9 countries in their original sample. The most striking result that jumps out from Figures 4.a-4.d is Africa's turnaround. Between 1990 and 1999, structural change was a drag on economy-wide productivity in Africa: in the unweighted sample overall growth in labor productivity was negative and largely a result of structural change. But from 2000 to 2005, structural change contributed around 1 percentage point to labor productivity growth in both the weighted and the unweighted sample. Moreover, overall labor productivity growth in Africa was second only to Asia where structural change continued to play an important positive role.

Like M&R (2011), we find that structural change has made very little contribution (positive or negative) to the overall growth in labor productivity in the high-income countries in my sample. This result is as expected, since intersectoral productivity gaps tend to diminish during the course of development. Even though many of these advanced economies have experienced significant structural change during this period, with labor moving predominantly from manufacturing to

service industries, this (on its own) has made little difference to productivity overall. What determines economywide performance in these economies is, by and large, how productivity fares in each individual sector.

Breaking the period into two also reveals something interesting about Latin America. It is only in the more recent period – 2000 to 2005 – that structural change has played a significant role in Latin America's overall productivity growth. In the unweighted sample, structural change reduces overall labor productivity growth by almost 1 percentage point. But when countries are weighted by employment, the contribution of structural change becomes minimal. Overall, it is Latin America's poor within sector productivity growth that seems to be a drag on the region's productivity in recent years.

We can gain further insight into our results by looking at the sectoral details for specific countries. We note that growth-reducing structural change indicates that the direction of labor flows is negatively correlated with (end-of-period) labor productivity in individual sectors. So, for each region, we plot the (end-of-period) relative productivity of sectors ($y_{i,t} / Y_t$) against the change in their employment share ($\Delta\theta_{i,t}$) between 2000 and 2005. The relative size of each sector (measured by employment) is indicated by the circles around each sector's label in the scatterplots. The four panels in Figure 5 show sectoral detail for each region in our sample: Latin America, Africa, Asia and high income countries.

The results indicate that in many ways, Latin America looks a lot like the high income countries in my sample. In both regions the share of labor in manufacturing and agriculture shrank while the share of labor in services expanded the major difference being the relatively larger share of the labor force in agriculture in Latin America. By contrast in both Africa and Asia, structural change was driven by increases in the share of employment in manufacturing and services. There is though an important difference between the two regions: the share of employment in manufacturing in Asia is roughly double the share of employment in manufacturing in Africa.

Expanding the Africa Sample

So far we have been working with data for only 9 African countries. To get a better sense for what is happening across the continent, we examine data for an additional 10 African countries leaving me with a sample of 19 African countries. For each of the additional countries, we use the most recent data available. Thus, the time horizon is country specific and spans 1995-2009. For this expanded sample, the contribution of structural change to growth in output per worker is .89 percent. Individual country results for this expanded sample are reported in Table 5.

Needless to say, there is heterogeneity across countries in Africa. To get a better handle on the heterogeneity in country experiences across Africa, we divide Africa's 54 countries into four distinct groups based on the level of development, structure of the economy and growth trajectory. Broadly: resource driven economies are economies where extractive resources such as oil and minerals represent at least 30 percent of GDP, diversified established economies have relatively high levels of per capita income, and low exposure to extractive resources and agriculture as a share of GDP, by contrast the emerging economies have relatively low levels of GDP per capita, rapid growth rates and a high share of GDP coming from agriculture, the pre-transition countries have the lowest per capita incomes and growth in these countries remains low. In Figure 6, we use the most recent survey data available to examine the nature of structural change in one African country from each of these four categories to illustrate the wide variety of country experiences across Africa.

Figure 6.a shows that structural change in Mauritius between 2000 and 2007 was growth enhancing and driven by the highly productive service sector. Mauritius is a well known African success story and its' economy is highly diversified. The size of the circles indicate that agriculture and mining are relatively unimportant compared to manufacturing and services in Mauritius. Like many of the developed countries in my sample, the manufacturing sector has contracted in Mauritius. However, unlike some of the other more advanced economies in Africa and elsewhere, Mauritius has managed to grow its tertiary sector based on high productivity activities that absorb significant amounts of labor. Thus, structural change in Mauritius has been growth enhancing and based on services but the story of Mauritius is atypical of Sub-Saharan Africa.

Figure 6.b shows that in the resource driven economy of Nigeria, structural change has played a positive but much less significant role in increasing economy-wide productivity: the changes in employment shares in Nigeria are tiny compared to the changes in Mauritius. The main driver of

this structural change has been a movement of labor out of agriculture and services into manufacturing. Notably though, the differences in productivity across these three sectors are not that large. This is probably due to the high degree of informality in all three sectors of the economy.

Figure 6.c shows remarkable changes in the emerging economy of Uganda. Between 1999 and 2009 the share of the labor force in agriculture fell by more than 10 percent while the share of the labor force in manufacturing and services increased by around the same amount. Unlike Nigeria, productivity in manufacturing and services is significantly higher than productivity in agriculture, Thus, the structural changes in Uganda contributed significantly to Uganda's overall growth in output per worker.

And finally, Figure 6.d shows limited but positive progress in the pre-transition economy of Malawi. In many ways the structure of the economy is similar to that of Uganda: the majority of workers are in the agricultural sector, services comes second, manufacturing third and mining last. The main difference is that there have been significant structural changes in the economy of Uganda while there has been very little movement in Malawi. The share of the labor force in agriculture fell by around 1.5 percent and the share of the labor force in services fell by around .002 percent. These reductions in employment shares in agriculture and services were matched by a tiny increase in the share of the labor force in manufacturing.

So far, our analysis has revealed that structural change has become growth enhancing in Africa for the latter period and that the analysis for the other three regions remains largely intact. For the 9 countries in the original M&R(2011) Africa sample, labor productivity grew by an (unweighted) average of 2.13 percent, and structural change contributed an (unweighted) average of 0.92 percentage points to overall labor productivity growth. For the expanded set of countries, labor productivity grew by an (unweighted) average of 2.18 percent, and structural change contributed an (unweighted) average of 0.87 percentage points to overall labor productivity growth. Moreover, the results in Table 5 indicate that structural change contributed positively to growth in 17 of the 19 African countries in the expanded sample. This positive contribution of structural change to economywide growth paints a somewhat more optimistic picture of growth in Africa than did the results in M&R(2011). In the remaining sections of this paper, we dig into the robustness of these

results using an alternative source of data for employment shares, the Demographic and Health Surveys (DHS). We then turn to exploring possible explanations for the turnaround in Africa.

4. Using the DHS to Understand Structural Change

This section of the paper is devoted to assessing the robustness of the changes in employment shares we uncovered in Section 4 to using an alternative source of data. We begin this section with a description of the DHS data. We then turn to describing trends in occupational shares.

The DHS Data

Although the DHS is not naturally designed as a labour force survey, it does contain a module on employment status and occupation for women and men between the ages of 15 and 49 (sometimes between 15 and 59). Information on men is not provided for all DHS countries and survey rounds. In total, our sample contains information for about 750,000 women and 250,000 men. Because the samples are nationally representative, they include employment in both formal and informal sectors. The data do not appear to be well suited to making this distinction since many of the questions that could be used to do this are left unanswered.

An advantage of the DHS for analysing determinants and trends of occupation types across countries and over time is that the design and coding of variables (especially on type of occupation, educational achievements, households assets and dwelling characteristics) are generally comparable across countries and survey rounds. At the household level, the DHS provides information on household socioeconomic characteristics, household structure and family composition, enabling analysis of the distribution and determinants of occupation types by socioeconomic characteristics and of changes in the distribution over time. Note that this does not mean there are not 'recode' errors in the original DHS files. These kinds of errors were corrected by me and details of this procedure are available upon request.

A second and important advantage of the DHS data is that in addition to an individual's occupation, the data contains information on the individual's gender, age, educational status and location. Thus, for example, it allows me to examine changes in occupational status for rural and urban youth separately and for men and women separately.

A disadvantage of DHS data is that household income and expenditures are not included, but available information on household assets can be used to construct an asset index to proxy for individual or household welfare. Additionally, measures of nutrition, health and education can be combined with information on assets to gain a more complete measure of wellbeing.

For the purposes of this paper, we restrict the sample to African countries for which at least two DHSs are available, allowing me to analyse trends over time. The large coverage of countries and survey years leaves us with a sample size of 24 African countries, capturing the period between 1993 and 2011. As we did for the analysis in Section 3, in Table 1, we compare the countries in the DHS sample to all countries in SSA to assess whether my sample is somehow biased towards, for example, towards richer countries. We find that our sample of African countries covers 76 percent of the population in Sub-Saharan Africa. When we compare average infant mortality rates and education levels, we find no statistical difference between the countries in the DHS sample and the rest of Sub-Saharan Africa. However, the countries in the DHS sample have an average level of GDP per capita which is significantly lower than the excluded countries and a slightly higher share of the labor force engaged in agriculture. These latter differences are not surprising given that the DHS are funded by the United States Agency for International Development and that the mandate is to focus on the poorest countries in the world.

As noted by Young (2012), the raw DHS files include coding errors and so the data need to be examined on a country by country basis to ensure accuracy. The most glaring coding error that we found was for Mali in 2006 when agricultural workers were accidentally classified as military workers. Coding errors like this indicate that it is not a good idea to take the aggregate statistics provided by DHS on the internet at face value. It also explains why, for example, some researchers have found the aggregate data on occupational shares published on the website unreliable. A detailed description of the way in which we arrived at our final sample is provided in Appendix 2.

To assign individuals to occupational categories, we rely on the question on occupation for women and men. The DHS provides a grouped occupation variable that relies on the question that asks what the respondent mainly does for work.[10] The respondent's response is grouped into one of nine categories: not working; professional/technical/managerial; clerical; sales; agricultural – self

[10] Variable v717: What is your occupation, that is, what kind of work do you mainly do?

employed; agricultural – employee; household and domestic services; skilled manual; and unskilled manual. We further combine the groups of clerical, sales and services into one group. As an additional category, we combine women and men from agricultural self-employment and agricultural employees into an overall group of agricultural occupation. Finally, we include a category 'in school', both to account for differences between the young and old and to establish trends in schooling over time. Thus, we are left with six 'occupational' categories for adults: agriculture; services; skilled manual labour; unskilled manual labour; professional; and not working. For youth – those aged 16-24 years – we add the category 'in school' to make it seven 'occupational' categories in total.

Table 6 lists the 24 countries from Sub-Saharan Africa for which we have at least two rounds of DHS surveys. The columns labelled DHS Survey Years identifies the years that surveys are available and in parentheses we note whether the survey includes both men and women – (f&m) – or whether it just includes women - (f). All of what is reported in the following analysis is based on the countries listed in Table 6. For some parts of the analysis, we restrict the sample to those countries for which data are available for both genders for the 1990s, 2000-2005 and 2006-2012.

Changes in Occupational Structures Over Time and Across Countries in Africa

Our first goal in this sub-section of the paper is to check whether the changes in employment shares reported in Section 4 are also apparent in the DHS data. Since the DHS occupational categories do not correspond directly to those reported in the survey data used in section 4, we start by focusing on the share of the population engaged in agriculture. Table 7 reports the percentage of the population who report that their primary occupation is agriculture by country, time period and gender. Since the surveys were done in waves but in different years for different countries, we break the time periods into three intervals that correspond roughly to Waves 1 and 2, 3 and 4, and 5 and 6 respectively. In the rare event that two surveys were conducted in one of the sub-periods, the employment shares represent a simple average across survey years. Results are broken out by gender because women very often report that they are not working. Also for this exercise, we focus on workers age 25 and above so as not to confound the results by children who may be in school.

We begin by drawing the reader's attention to the averages at the bottom of Table 7. Average One is the average for all countries for which data is available for all three periods. For these countries, the share of the labor force in agriculture rises by a little under 1 percentage point

between the 1990s and the early 2000s. The averages in columns (1) and (2) indicate that this trend is driven by an increase in the share of the female labor force who report that they work in agriculture. By contrast, the share of the labor force working in agriculture fell by a little under 10 percentage points between 2000-2005 and 2006-2012. These results are consistent with the results obtained using the M&R (2011) sample plus the additional 10 countries. These results are also remarkably consistent with work by de Vries et al (2014) who report for a subset of 11 Sub-Saharan African countries that the share of employent in agriculture fell from 61.6 percent in 1990 to 49.8 percent in 2010. Unfortunately, not enough DHS surveys were conducted over time in the same countries in the 1990s to say anything meaningful with the DHS about the trends between 1990 and 1999. Nevertheless, we can conclude with some degree of confidence, that there has been a sizable decline in the share of the labor force engaged in agriculture in Africa over the past decade.

The second thing that Table 7 makes clear is the enormous cross-country heterogeneity in employment shares in agriculture and in changes in employment shares in agriculture. For example, focusing on the most recent period 2006-2012, the share of females engaged in agriculture in Rwanda was 84% while the share of females engaged in agriculture in Senegal was only 20.6 percent. The differences are equally striking for males; the share of the male population working in agriculture was 74.8 percent in Ethiopia while it was only 25.7 percent in Senegal. And while in almost all countries the share of the labor force engaged in agriculture fell, in Madagascar the share of the labor for engaged in agriculture increased for both women and men. While not the central focus of this paper, it is worth noting that the cross-country heterogeneity has important policy implications some of which have been described in recent work by Dercon and Gollin (2014).

There is also a fair degree of heterogeneity across sub-groups of the population. In Table 8, we report shares for the following occupations: (i) agriculture, (ii) professional services, (iii) other services, (iv) unskilled manual labor, (v) skilled manual labor, (vi) not working and for the young, (vii) in school. The shares are reported for each country for the year in which the initial survey was conducted. The shares in columns (1) through (5) are calculated with respect to the total number of individuals in the sub-sample who are currently working and not in school. The shares in column (6) are calculated based on the total in the sub-sample who are currently not in school and shares in column (7) are calculated based on the total number of individuals in the sub-sample. The shares in columns (8) to (13) are calculated in a similar fashion.

Before going on to describe the trends, we make more explicit the types of jobs included in each occupation category. Agriculture includes subsistence farmers plus commercial farmers. Ideally we would like to separate these categories but the data do not permit such a disaggregation. Like agriculture, all other occupations include both formal and informal sector workers. Clerical, sales and services includes but is not limited to: secretaries and typists, sales clerks, street vendors, drivers and traditional healers. Unskilled manual labor includes but is not limited to: garbage collectors, construction workers and factory workers. Skilled manual labor includes but is not limited to: masons, mechanics, blacksmiths, telephone installers and tailors. Finally professional occupations include but are not limited to: business owners, engineers, financiers, teachers, doctors, health professionals, lawyers and civil servants. Unfortunately, details about occupations are not provided on a consistent enough basis to create more disaggregated occupation codes.

Figures 7.a-7.f describes decadal changes in the share of the population working in each occupation by population sub-group. Since the interval between countries varies, and because we are interested in describing general trends, we use the following procedure to obtain estimates of the 10 year change in employment shares. For each country, we run a country-specific regression of occupation on time dummies with the first survey year excluded; we then use the coefficient on the final year dummy to obtain average annual changes in occupational shares over time. These annualized changes are then multiplied by 10 to get the predicted 10 year change. The blue bars represent males, the pink bars represent females and the grey bars are for the total population and are a population weighted average of the results for males and females.

The patterns that emerge are generally consistent with the patterns described in Section 4 but with some additional nuances for population sub-groups. For example, we can see from Figures 7.a-7.c that the declines in the share of men and women working in agriculture are consistent with the changes in means reported in Table 7. However, we can also see that for the rural population (Figure 7.b) the declines in the share of the population engaged in agriculture are more pronounced while there are slight increases in the share of the population engaged in agriculture in urban areas and this is equally true for men and women.

A second pattern that emerges which is consistent with the patterns reported in Section 4 is the rise in services. However, the results in Figures 7.b and 7.c paint a more nuanced picture than

that which was described in Section 4. In particular, the rise in services is generally a rise in clerical, sales and other services in rural areas while in urban areas the occupation share in these types of services has declined. In urban areas, the share of the population engaged in professional services has risen.

The trends in occupational shares for skilled and unskilled manual labor cannot be neatly classified. In urban areas and for the old, the young, males and females alike, there is a decline in the share of the population engaged in skilled manual labor. On the other hand, there is a slight increase in the share of rural men – young and old - engaged in skilled manual labor. In urban areas for women only, there is an increase in the share of the population reporting that they work in unkilled manual labor while in rural areas and for men only, there is a similar increase in the share of the population working in unskilled manual labor.

Across all sub-groups, there was a decline in the share of the population who report that they are not working. In other words, labor force participation by men, women, the young and the old alike appears to have risen over the past decade. And finally, there is an increase in the share of the young (aged 15-24) in school. While it is fairly well known that more children in Africa are going to school, the less well known fact that we document here is that this is not just an urban phenomenon. The share of rural young women in school increased by almost 6 percentage points over the last decade and the share of rural young men in school increased by a little under 13 percentage points over this same decade.

5. Digging Deeper: Why the Reversal?

So far we have used data from at least two sources for each country to argue that (i) structural change in Africa was largely growth reducing between 1990 and 1999; (ii) structural change in Africa was largely growth enhancing from 2000 onward (with the exact cutoff date depending on the country in question) ; (iii) the reason that structural change in the most recent period was growth enhancing is largely on account of the decline in the share of the population working in agriculture and; (iv) although structural change has been growth enhancing, it cannot be characterized by a rapid expansion in labor intensive manufacturing. These stylized facts naturally lead one to wonder what is driving these changes. This section of the paper is devoted to a discussion of plausible explanations for the decline in the employment share in agriculture. The

discussion is followed by an empirical investigation into the correlates of changes in employment shares in agriculture.

Explanations for the Decline in the Agricultural Employment Share

A likely suspect is agricultural productivity growth. Although opinions vary on the extent of agricultural productivity growth in Africa, there does seem to be a consensus that it is finally growing. For example, Fuglie and Rada (2013) of The United States Department of Agriculture report that for the first time in decades, total factor productivity growth in African agriculture is rising. Progress is slow at roughly 1 percent per year but this is the first time in decades that agricultural productivity growth in Africa has been positive.

The relationship between agricultural productivity and the employment share in agriculture is the subject of a large literature. In one group of models that assume non-homothetic preferences and a closed economy (e.g., Matsuyama 1992, Gollin, Parente and Rogerson 2002, 2007), a rise in agricultural productivity releases labor for the modern sector. As people get richer, they spend more on manufactured goods and services. This pushes up wages in these sectors and attracts rural migrants. In a second group of models assuming homothetic preferences and a constant elasticity of substitution below one (e.g., Ngai and Pissarides 2007), any relative increase in the productivity of a sector leads to a relative decrease in its employment share because its relative price decreases. Thus, in a closed economy, the agricultural sector shrinks as productivity increases. In a third class of models that allow for countries to be open to international trade, a rise in agricultural productivity can increase the employment share in agriculture if the rise in productivity gives the country a comparative advantage in this sector. Taken together, these models certainly leave open the possibility that in Africa, the long period of decline in agricultural productivity was associated with increases in employment in agriculture and that the recent uptick in agricultural productivity could be part of what is driving the decline in the labor share in agriculture.

A second possibility is that demographic trends are driving some of the decline in the employment share in agriculture. During the 1980s and 1990s, African countries' rural population growth rates rose higher for a longer period of time than ever before in other regions, which means there were a lot of new young people in the rural sector at that time. Africa's towns and cities also grew at some of the fastest growth rates ever seen elsewhere in the world, but they started from a

small enough base that their growth could not absorb all of the children of farmers. As a result, many rural people had no choice but to remain in the agricultural sector, driving down the availability of land and other natural resources per worker. Other regions had similar growth in their agricultural populations during the early stages of urbanization and structural transformation. The main differences between Africa and other continents in this regard is the timing and magnitude of these demographic trends, which were more severe for Africa from the mid-1970s through the 1990s than in other regions where the rural demographic transition happened earlier. Only now are rural areas starting to experience declines in population growth rates relative to urban areas.

A third reason for the decline in the agricultural employment share may be the decline in the incidence of violence in SSA. Figure 9, reproduced with the permission of Strauss (2012), displays data from the Uppsala Armed Conflict Program and shows that major forms of large scale organized political violence are on the decline in Sub-Saharan Africa; African civil wars in the late 2000s were about half as common compared to the mid-1990s. The decline in violence could have a direct effect on the labor share in agriculture by making it safer for workers to move around the country. It could also have an indirect effect on the labor share in agriculture by making investments in labor intensive modern services and manufacturing more likely. For example, Asiedu (2006) finds that political instability has been a deterrent to foreign direct investment in Sub-Saharan Africa.

A fourth reason for the decline in the agricultural employment share might be increases in the quality of governance. Using the Polity IV database, we confirm in Figure 10 a general trend towards improved governance across Africa. Figure 10 plots the population weighted average Polity IV score for 46 countries in Sub-Saharan Africa between 1960 and 2011.[11] To determine whether the trend in the Polity IV score is driven by changes in the composition of the sample – depending on which countries have data for a particular year – we note that the scores for most countries appear in the dataset around the 1960s and 1970s and, as soon as a country shows up in the data, all observations for subsequent years are non-missing. Hence, the sample of countries for a particular year can change only if a new country is added to the dataset, possibly because that country gained independence in that year. Of the 46 Sub-Saharan Africa countries in the Polity IV dataset, 23 countries have data starting in 1960. An additional 9 have data starting between 1961 and 1965; 11

[11] Polity IV has a particular coding for certain variables. These special codes can take values such as -66, -77 or -88. In order to obtain scores that were not affected by these coding issues, we changed these to missing values when calculating the average scores.

have data starting between 1966 and 1975; and 3 start having data from 1990. The upward trend in the quality of governance is unmistakable regardless of the sample.

There are several mechanisms through which improvements in the quality of governance could reduce the share of the labor force in agriculture. First, Bates and Block (2012) find that increased political competition across Africa is a strong empirical predictor of increases in agricultural productivity. They argue that the emergence of electoral competition has altered political incentives resulting in both sectoral and macroeconomic reforms that benefit farmers. Second, increases in the quality of governance are typically associated with increases in educational attainment. Access to education has improved significantly in rural areas (McMillan, 2013); armed with a better education, folks in rural areas are better placed to move out of agriculture.

Finally, there is the recent surge in both agricultural and non-agricultural commodity prices (see Figure 11). The boom in commodity prices is likely to have both direct and indirect effects on the share of employment in agriculture. Directly, the increase in agricultural commodity prices makes farming more profitable. This alters the incentives to work in agriculture and the direction of the effect is unclear. On the one hand, the increase in prices makes farming more profitable creating an incentive to work in agriculture. On the other hand, the increase in income associated with the rise in agricultural prices increases family income making it easier to send children to school. Indirectly, the increase in commodity prices provides governments with more revenue to spend on education in rural areas.

Empirical Correlates of the Decline in the Agricultural Employment Share

In Table 10, we investigate these hypotheses empirically. These regressions are similar in spirit to those presented in Gollin et al (2014) and should not be interpreted causally. The idea is that these correlations can help us to begin to understand what is driving observed declines in the share of agricultural employment across Sub-Saharan Africa. An important next step will be to investigate these hypotheses in more detail at the country level using more detailed information about local labor markets, conditions in the agricultural sector and government policies to uncover causal relationships.

The first step in this empirical investigation into the correlates of the decline in the labor share in agriculture involves finding a way to quantify each of the potential explanations. Since agricultural productivity is a function of the number of workers engaged in agriculture and because agricultural productivity is notoriously difficult to measure, we construct a proxy for agricultural productivity using country compliance with the Comprehensive African Agricultural Development Program (CAADP). CAADP is an Africa led and owned agenda that serves to provide a common framework for policy and partnership renewal in the agricultural sector. CAADP's primary objectives are to increase investment in agriculture and improve agriculture policy and strategy design and implementation. Through these outcomes, CAADP is designed to help meet the goals of higher growth, poverty reduction, and food and nutrition security. Specific benchmarks for participating countries are to allocate at least 10 percent of the national budget to the agricultural sector and achieve an annual agricultural growth rate in the agricultural sector of 6 percent.

Since the Programme's implementation in 2003, 30 countries and one regional economic community, ECOWAS, have held round tables and signed CAADP compacts. Countries have demonstrated strong ownership and leadership through multi-level participation in CAADP processes. Diverse stakeholder participation and ministerial level commitment across most countries represents widespread commitment to the CAADP agenda. Fifteen countries have convened high-level business meetings in order to increase agricultural investments (Diao et al, 2012). Using this information, we constructed a measure of compliance with the CAADP compact by constructing a dummy variable that is equal to 1 if a country reached either the agricultural spending target or the agricultural growth target and 0 otherwise.

In order to get country-specific indicators of commodity price shocks we calculate country-specific price indices following Henderson, Roberts and Storeygard (2013). These indices summarize the individual commodity price environment each country faces by appropriately weighting the different prices of commodities exported by each country. The intuition behind this is that a country's geographic characteristics determine the long-term export bundles each country exports. In turn, the commodity price environment each country faces depends on the individual prices of each country's export bundle.

Following Bruckner and Ciccone (2010) and Collier and Goderis (2009), Henderson, Roberts, and Storeygard (2013) define the commodity price index as a geometrically weighted index:

$$PI_{it} = \left[\prod_{k=1}^{n} p_{kt}^{a_{ki,1962-69}}\right] CPI_{USA,t}^{-1}, \qquad with \sum_{k=1}^{n} a_{ki,1962-69} = 1$$

Where *k* indicates commodity (with a total of *n* commodities), *t* indicates year, and *i* indicates country. The weights $a_{ki,\ 1962\text{-}69}$ correspond to the share of commodity *k* in country's *i* total commodity exports in the 1962 to 1969 period calculated using data from Feenstra *et al* (2005). For each country, the commodity weights sum to unity. Commodity prices, p_{kt}, are normalized international prices in current US dollars. We deflated nominal commodity prices by the United States' CPI index to get real prices in 2005 US dollars. We first calculated country-specific price indices using all 37 agricultural and non-agricultural commodities in Henderson, Roberts, and Storeygard (2013). Using a similar methodology, we calculated two other indices: one for agricultural commodities and another for non-agricultural commodities.

We measure the quality of governance using data from the Polity IV database. To measure conflict, we follow Strauss (2012) and use data from the Uppsala Armed Conflict Data Program. As a proxy for demographic change, I use total population growth rates. Rural population growth rates would be more ideal but they are mechanically linked to the share of the labor force engaged in agriculture. And, total population growth rates and rural population growth rates are highly correlated.

We construct employment shares in agriculture using data from the DHS as follows. Using the micro data for individuals, we construct means by country, year, urban, rural and gender for employment in agriculture. We use the DHS because as mentioned previously, the DHS provide the largest coverage of countries in SSA for the most recent time period. Recall, the WDI only report employment shares by sector for 7 countries in SSA post-1999 and some of the data that does exist is inaccurate.

In Table 10, we report the results of regressing the change in the share of employment in agriculture on each of the following variables measured at the beginning of the period: the share of the labor force in agriculture, the share of the rural labor force enrolled in secondary school, the

quality of governance, population growth, a dummy equal to one if the country was in conflict, and a dummy equal to one if the country was in compliance with either CAADP target. For commodity prices, we use the contemporaneous changes since commodity prices vary considerably from year to year and because there is no concern about endogeneity with commodity prices. An interaction between commodity prices and the quality of governance is also included. The idea is that revenues from commodity prices are more likely to be spent on things that would raise productivity in agriculture such as education and rural infrastructure when the quality of governance is high. Finally, we include a dummies for gender and youth.

All specifications reported in Table 10 include year dummies to capture global trends such as the recent financial crisis. In columns (1) through (5) of Table 10, we include country fixed effects to capture country specific factors that could impact the labor share in agriculture such as climate and soil quality. Because of the biases that arise in fixed effects regressions with a lagged dependent variable, we also report in columns (6) through (10) the results without country fixed effects; the results are broadly similar. Standard errors are robust to heteroskedasticity and autocorrelation and are clustered at the country-year level.

The first important result which is consistent across specifications is that countries with a higher share of the labor force in agriculture have experienced more rapid declines in the share of the labor force engaged in agriculture. For example, the results in column (3) indicate that a one percentage point increase in the initial employment share in agriculture is associated with a .9 percentage point decline in the share of the male labor force engaged in agriculture in the subsequent period. This evidence is consistent with a large initial gap in productivity, and productivity growth within agriculture that helps to finance households' investment in both rural nonfarm work and migration to urban employment, as well as the rise of employment opportunities in the destination sector. In addition, since the share of the labor force in agriculture and the incidence of poverty are highly correlated, this is evidence that poorer countries are experiencing a more rapid decline in the share of the labor force in agriculture.

The estimates in row three indicate that rural schooling is correlated with small declines in the share of the labor force engaged in agriculture in the subsequent period. These effects are strongest for rural women. A one percentage point increase in the share of the rural female

population enrolled in secondary school is associated with a .08 percentage point decline in the share of the rural female population engaged in agriculture.

Increases in the commodity price index are positively correlated with male engagement in agriculture and negatively correlated with female engagement in agriculture although only the results for females remain significant once country fixed effects are eliminated. Improvements in the quality of governance are also negatively correlated with female engagement in agriculture. However, it is the combined effect of commodity price increases and improvements in the quality of governance that are most strongly negatively correlated with the employment share in agriculture. This correlation is strongest for females; females in countries where the rise in commodity prices coincided with an increase in the quality of governance are significantly less likely to be engaged in agriculture.

The results in row 8 indicate that in countries with higher population growth rates the share of the labor force engaged in agriculture is falling faster; this correlation is the strongest for rural males. This result combined with the negative coefficient on youth is consistent with a story in which the share of the population engaged in agriculture is falling at least in part because population growth reduces the average farm size making farming an increasingly less attractive option for the young. Conversely, reductions in rural population growth increase the availability of land and make farming more profitable thus increasing the share of the workforce engaged in agriculture.

The coefficient on the conflict dummy is negative and is driven by rural men. This is inconsistent with the hypothesis that reductions in conflict might reduce the labor share in agriculture. A story consistent with the negative coefficient is that men in countries in conflict spend less time in agriculture and more time in combat.

Finally, countries that achieve at least one of their CAADP targets experience more rapid declines in the share of the labor force engaged in agriculture. This correlation is consistent with theories that emphasize a negative relationship between agricultural productivity growth and the share of the labor force engaged in agriculture.

6. Conclusion

Africa has been largely absent from empirical work on structural change. This paper aims to fill that gap. We begin by documenting a number of stylized facts. First, recent patterns of employment shares in Africa fit the stylized facts of other regions' historical development. In other words, controlling for income, the quantitative patterns of employment shares in Africa are roughly what we would expect based on what has transpired elsewhere. Second, between 2000 and 2010, structural change contributed around 1 percentage point to labor productivity growth in Africa. Moreover, overall labor productivity growth in Africa was second only to Asia where structural change continued to play an important positive role. There is however an important difference between the two regions: the share of employment in manufacturing in Asia is roughly double the share of employment in manufacturing in Africa.

Like other developing regions, structural change in Sub-Saharan Africa has been characterized by a significant decline in the share of the labor force engaged in agriculture. This is a positive development because agriculture is the least productive sector in the economies of Sub-Saharan Africa. However, unlike other developing regions, structural change in SSA has not yet been accompanied by a significant expansion in the share of the labor force employed in manufacturing. Instead, the reduction in the employment share in agriculture has been matched by a sizeable increase in the share of the labor force engaged in services. These stylized facts are robust to alternative data sources. In particular, we use data from the Demographic and Health Surveys (DHS) to check our estimates of changes in employment shares and find similar patterns.

These results are encouraging and point to reasons for the real consumption growth in Sub-Saharan Africa documented by Young (2012). However, they also underscore the fragility of Sub-Saharan Africa's recent growth. This is because the services sector in Sub-Saharan Africa is unlikely to be an engine of sustained productivity growth over the long run. Nevertheless, several recent trends in the global economy provide the countries of Sub-Saharan Africa with unprecedented opportunities for the kinds of activities that could sustain productivity growth in the long run. Increasing agricultural productivity in Africa and rising global food and commodity prices coupled with stable macro and political trends have made foreign and local entrepreneurs more willing to

invest in Africa,[12]. Rising wages in China make Africa a more attractive destination for labor intensive manufacturing. The global search for natural resources leaves African governments with unprecedented bargaining power and financial resources. And the spread of democracy in Africa makes it more likely that these resources will be used to invest in human capital and infrastructure.

[12] Steven Radelet (2010), *Emerging Africa*: *How 17 Countries Are Leading the Way*. Baltimore: Brookings Institution Press.

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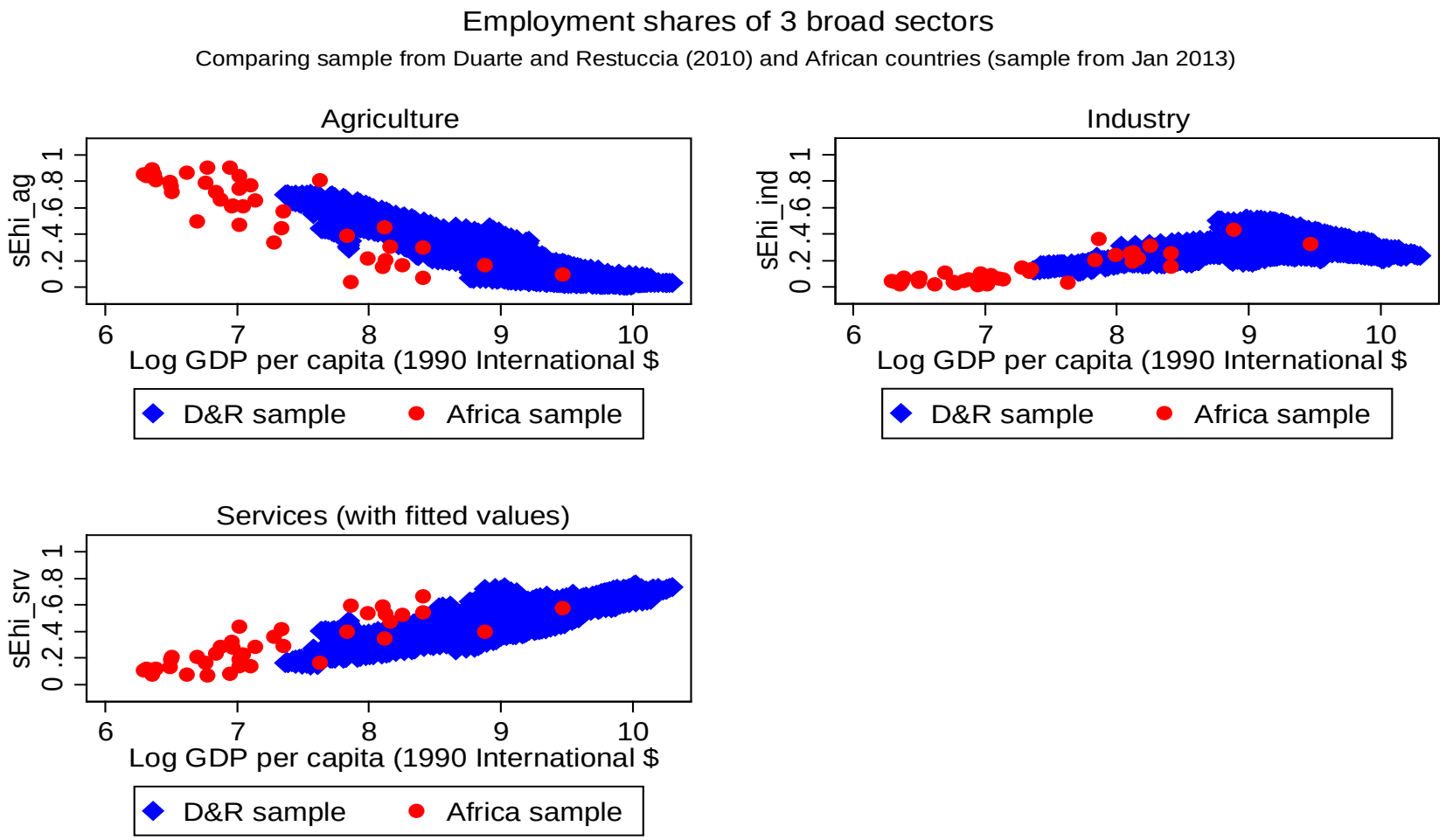
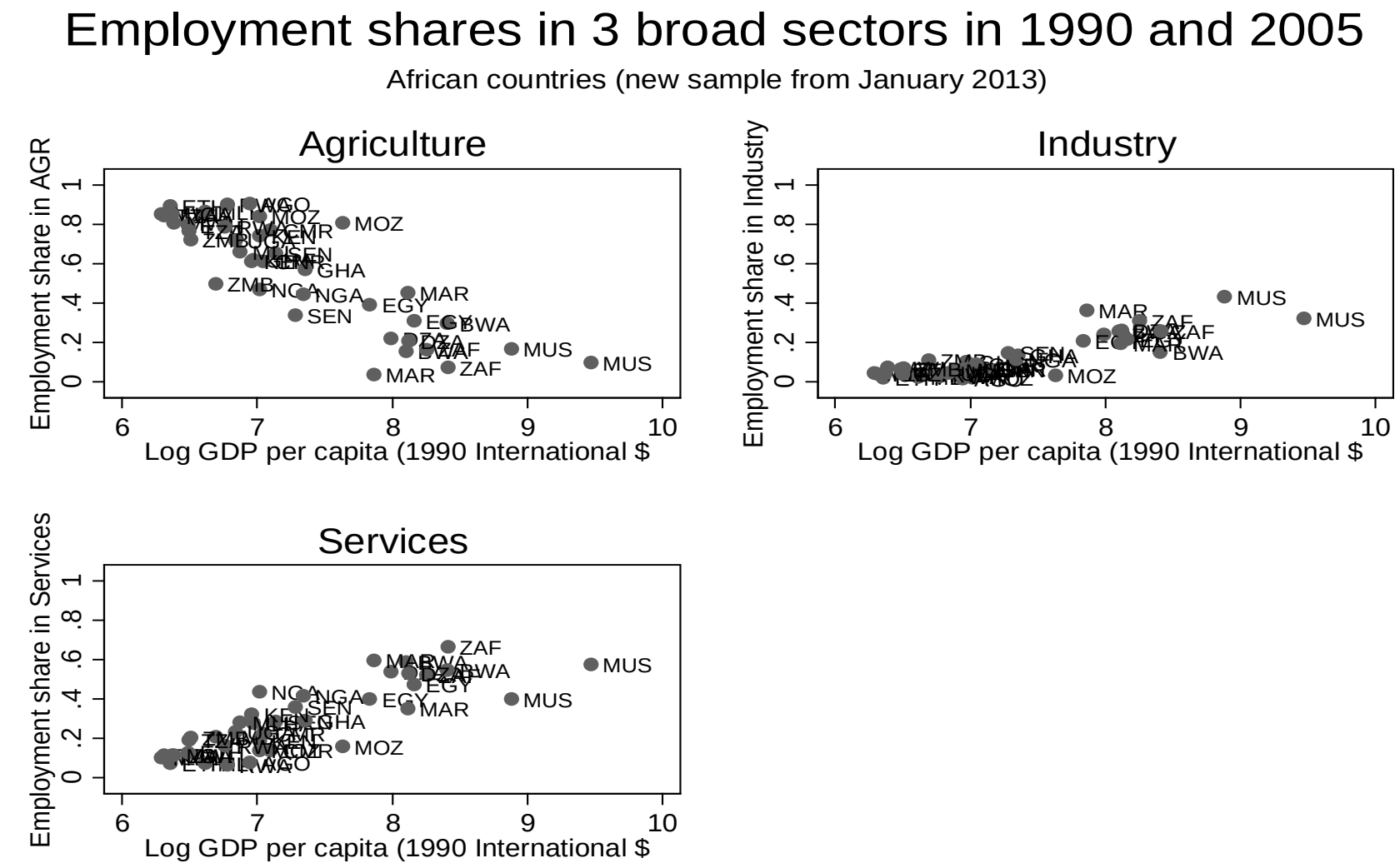
Figure 1: Employment Shares by Main Economic Sector



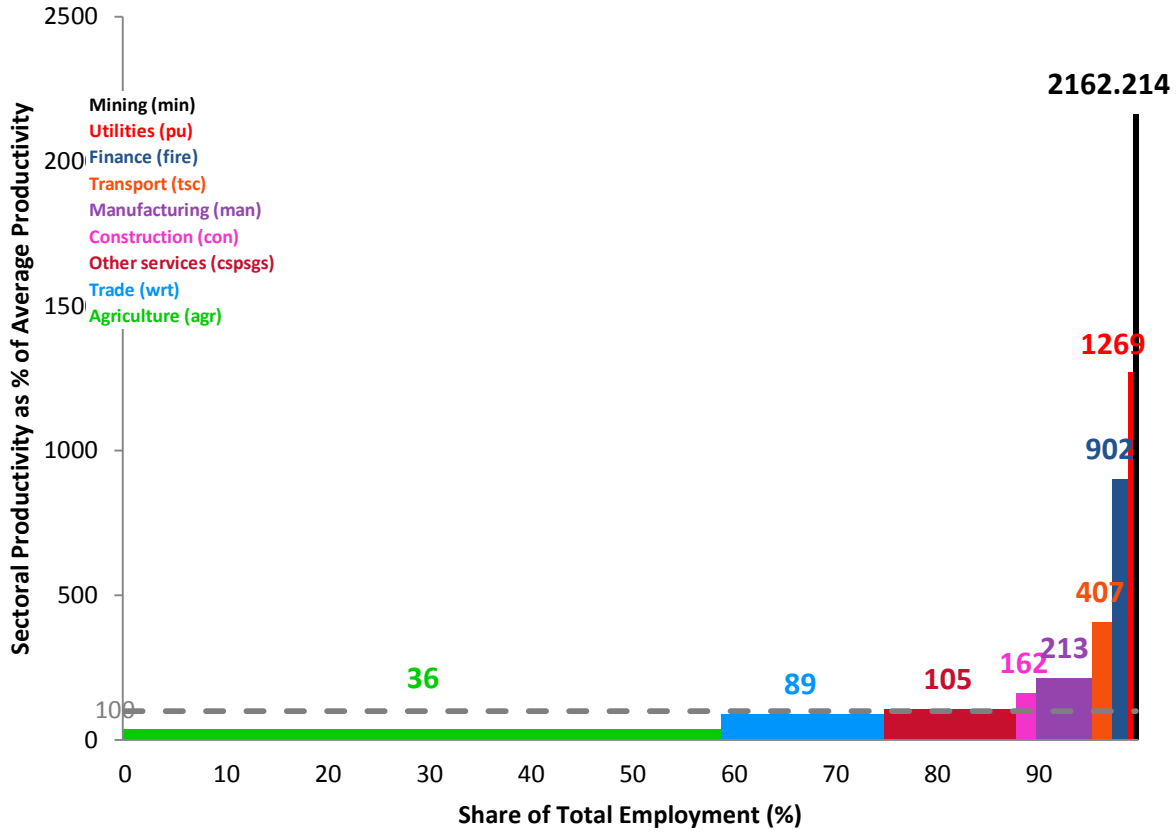
Note that Africa data measure sectoral share of total employment whereas D&R data measure share of total hours.
Hours shares from Duarte and Restuccia (2010) cover 29 countries from 1950-2006
Their data were accessed 07/24/2012 from Duarte's website
GDP from Maddison (2010)

Figure 2: Employment Shares by Main Economic Sector, Africa.



GDP from Maddison (2010)

Figure 3: Labor Productivity Gaps in Africa in 2005



Source: Own calculations using data from McMillan and Rodrik (2011)

Figure 4.a. Decomposition of Productivity Growth by Country Group, 1990-1999 (unweighted)

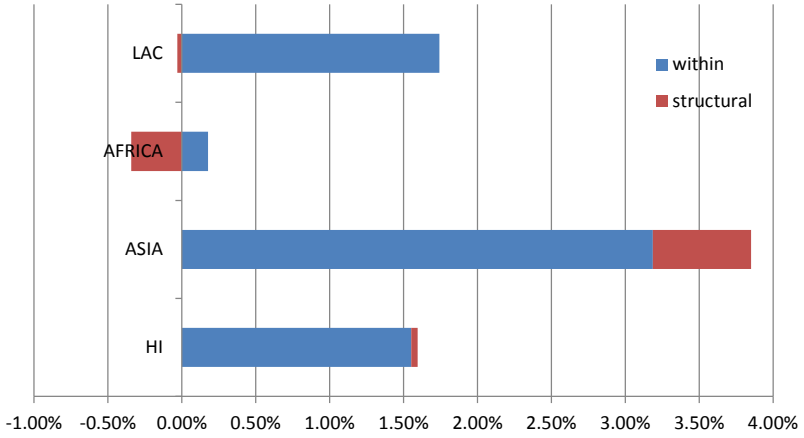


Figure 4.b. Decomposition of Productivity Growth by Country Group, 1990-1999 (weighted)

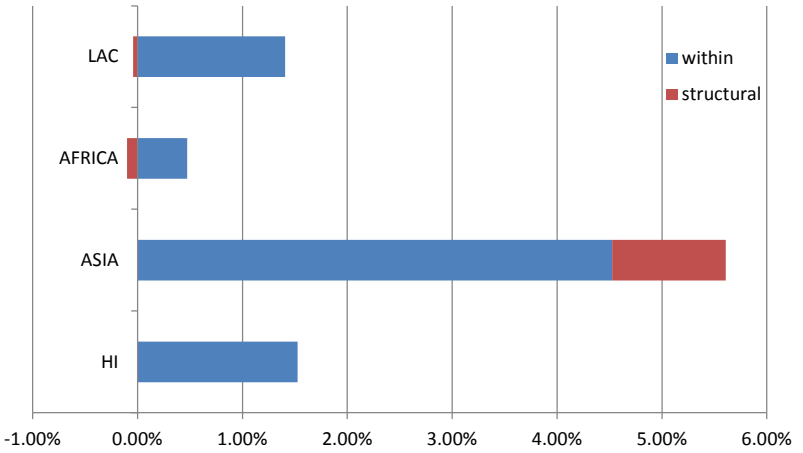


Figure 4.c. Decomposition of Productivity Growth by Country Group. Post 2000 (unweighted)

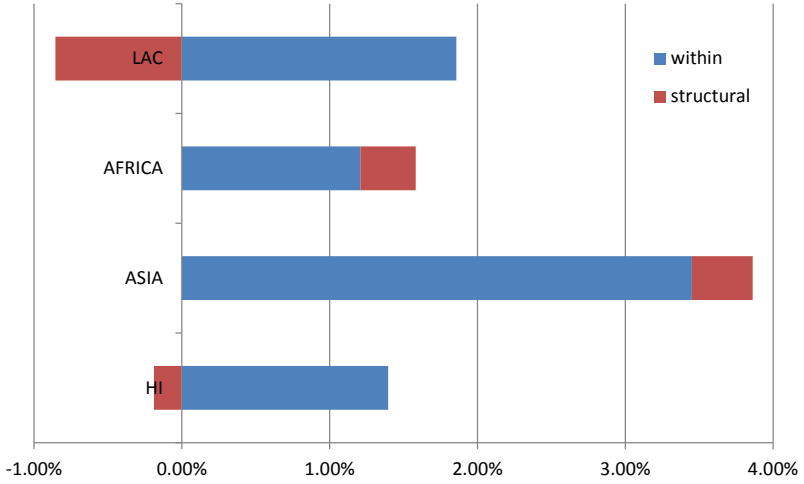
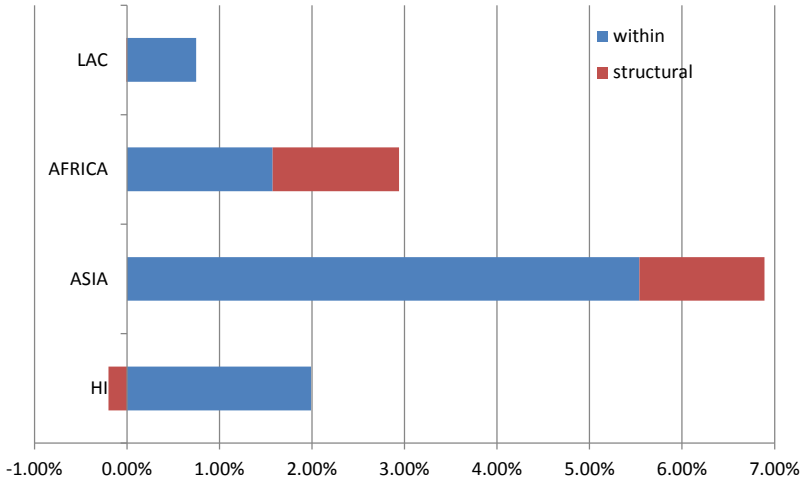
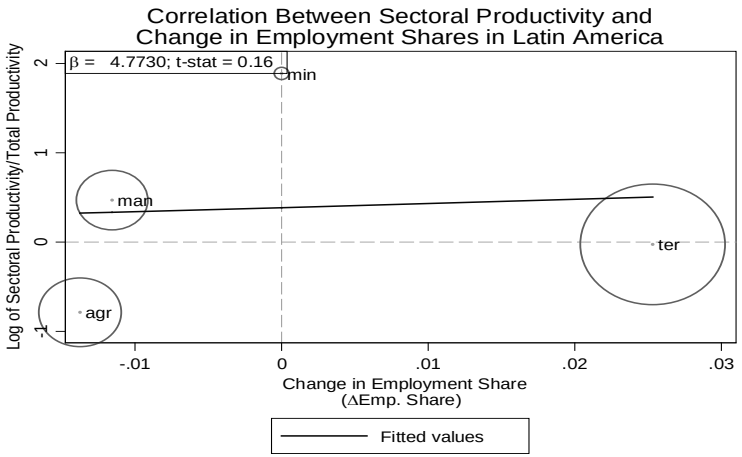


Figure 4.d. Decomposition of Productivity Growth by Country Group. Post 2000 (weighted)



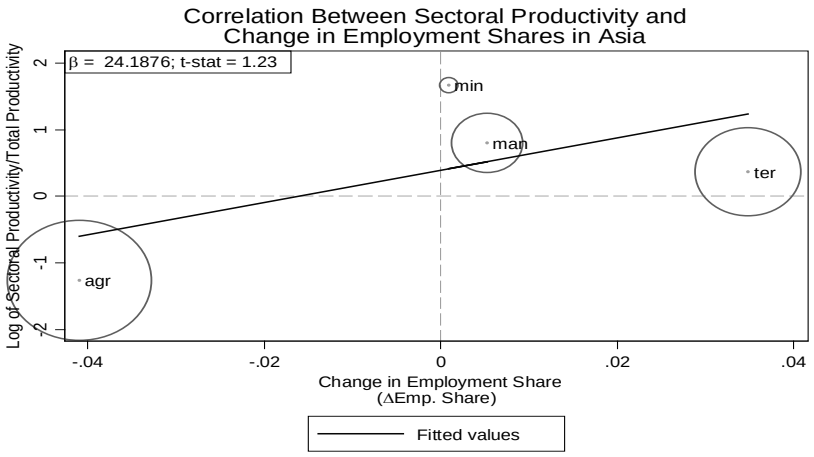
Source: McMillan et.al. (2013)

Figure 5.a: Latin American Countries



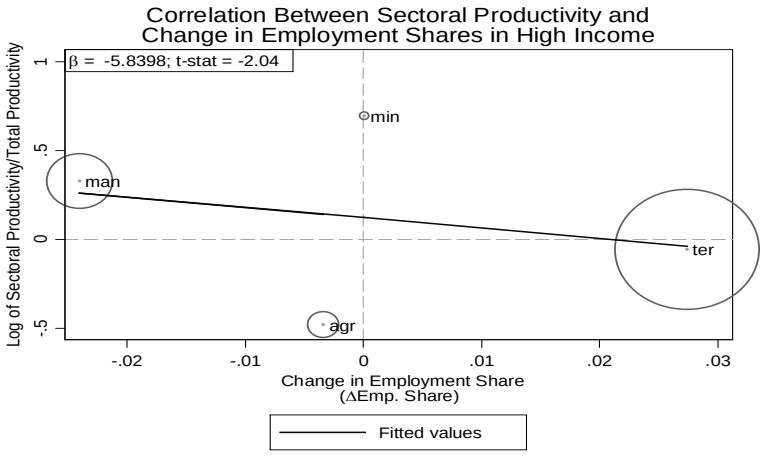
*Note: Size of circle represents employment share at beginning of period
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Timmer and de Vries (2009)

Figure 5.b: Asian Countries



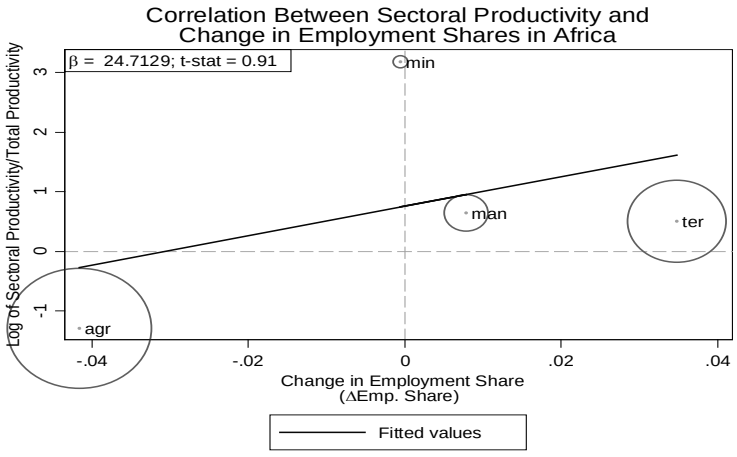
*Note: Size of circle represents employment share at beginning of period
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Timmer and de Vries (2009) and China's National Bureau of Statistics

Figure 5.c: High Income Countries



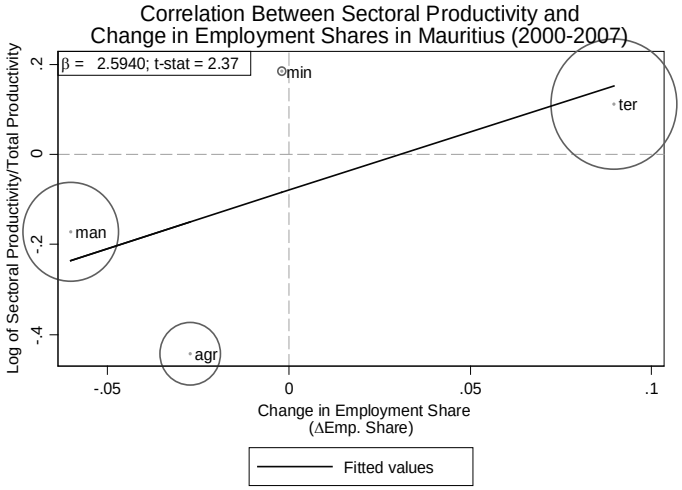
*Note: Size of circle represents employment share at beginning of period
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Timmer and de Vries (2009)

Figure 5.d: African Countries



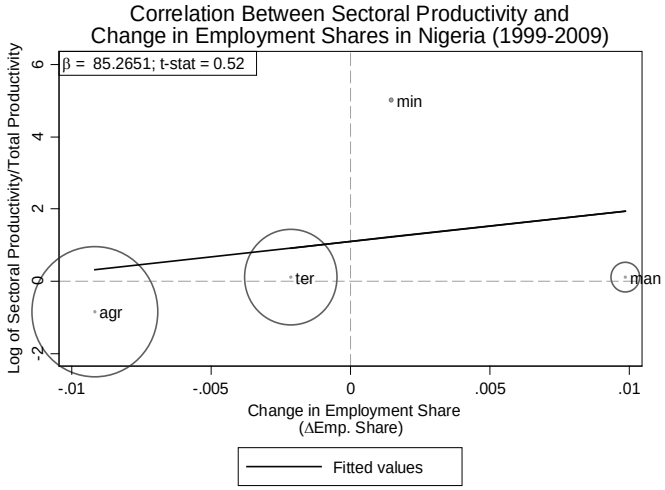
*Note: Size of circle represents employment share at beginning of period
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations.

Figure 6a. Mauritius



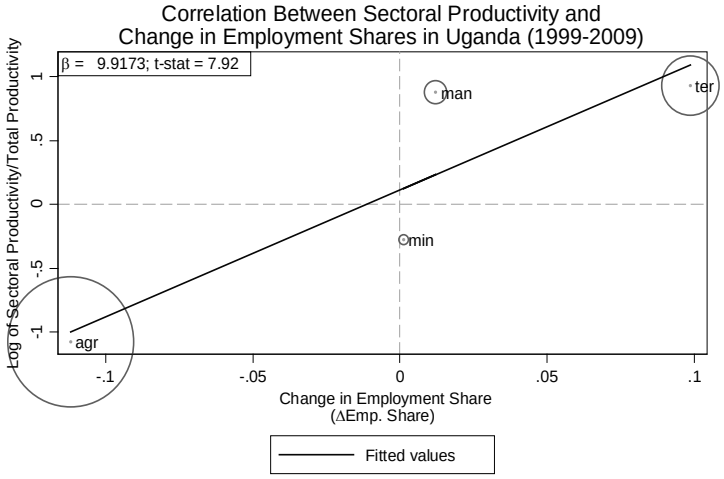
*Note: Size of circle represents employment share in 2000
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Mauritius' CSO and UN National Accounts Statistics

Figure 6b. Nigeria



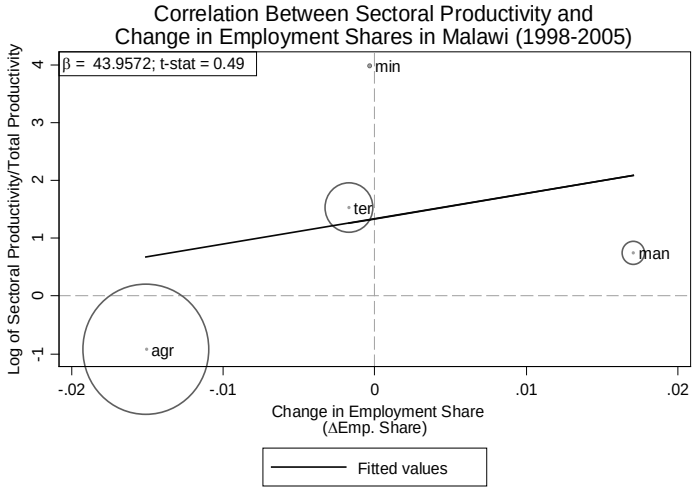
*Note: Size of circle represents employment share in 1999
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Adeyinka, Salau and Vollrath (2012)

Figure 6c. Uganda



*Note: Size of circle represents employment share in 1999
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Uganda's Bureau of Statistics, IMF,
and UN National Accounts Statistics

Figure 6d. Malawi



*Note: Size of circle represents employment share in 1998
**Note: β denotes coeff. of independent variable in regression equation:
ln(p/P) =α + βΔEmp. Share
Source: Authors' calculations with data from Malawi's National Statistical Office, WDI 2010, and ILO's LABORSTA

Figure 7.a: Avg. change in probability of working in occupation, all population

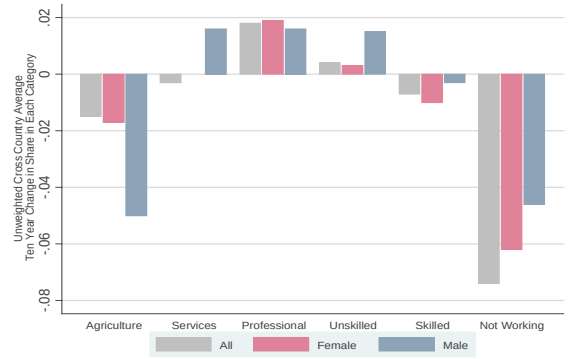


Figure 7.b: Avg. change in probability of working in occupation, All rural population

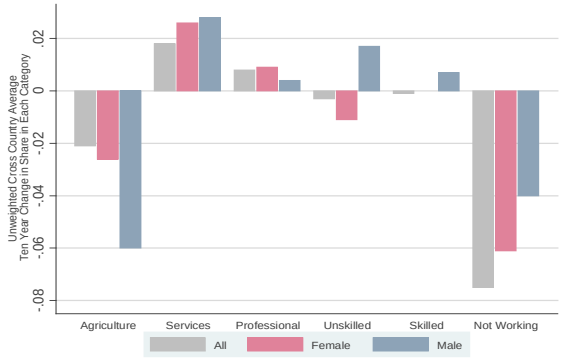


Figure 7.c: Avg. change in probability of working in occupation, All urban population

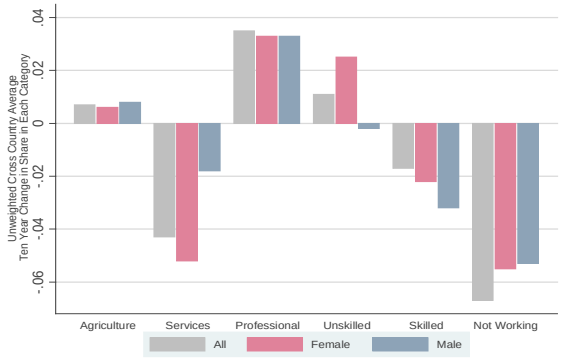


Figure 7.d: Avg. change in probability of participating in occupation, All young individuals (age 16 to 24)

Figure 7.e: Avg. change in probability of participating in occupation, All young rural individuals (age 16 to 24)

Figure 7.f: Avg. change in probability of participating in occupation, All young urban individuals (age 16 to 24)

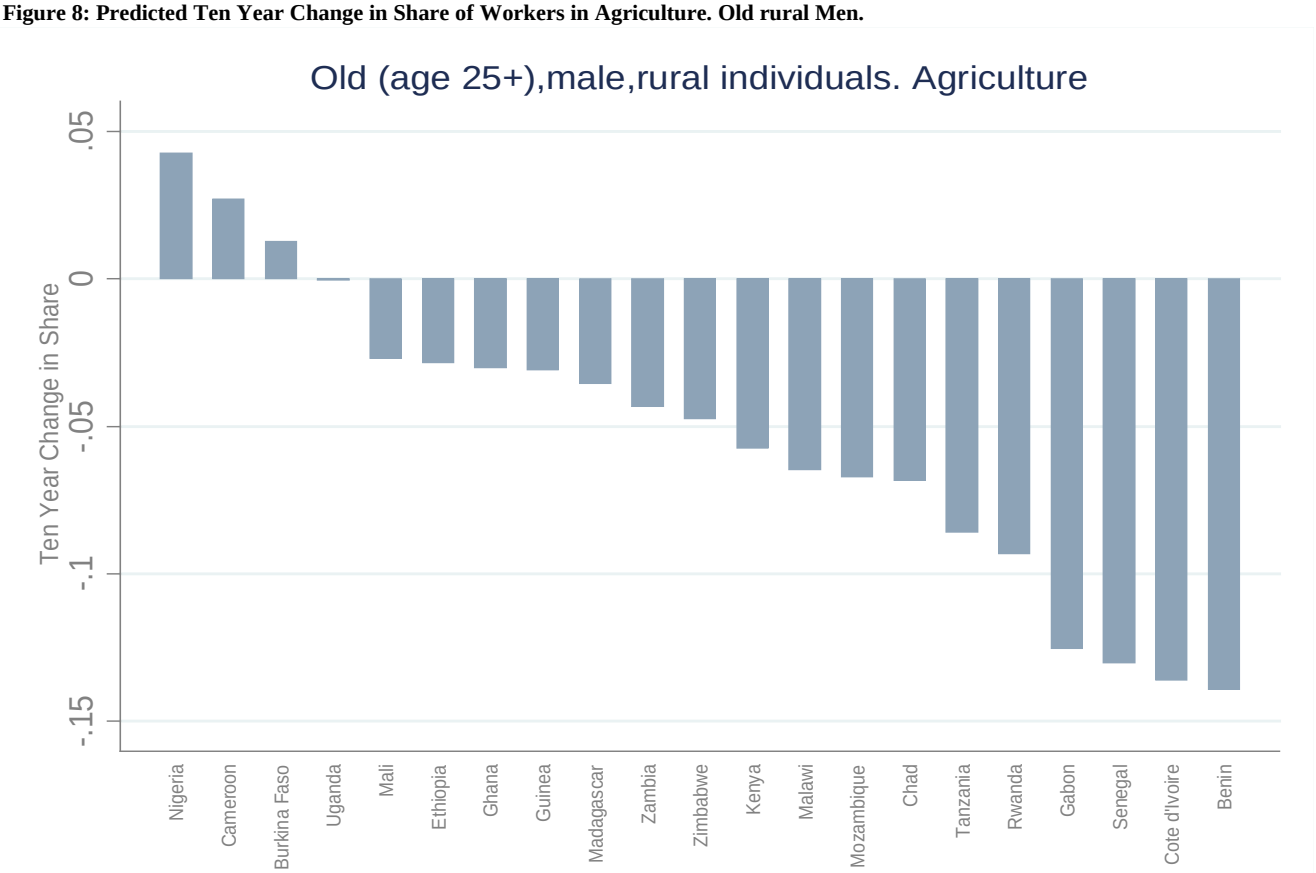
Source: Author's calculation using DHS data.

Notes:

1. Average predicted 10-year changes are computed as a simple unweighted mean of country specific 10-year changes. Country specific 10-year changes correspond to the coefficient on the final year dummy of a country specific regression of occupation on time dummies with the first year excluded; these changes were then annualized and multiplied times ten to get the predicted 10-year change.

2. Countries in sample include: Benin, Burkina Faso, Chad, Cote d'Ivoire, Cameroon, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Madagascar, Mali, Mozambique, Malawi, Namibia, Niger, Nigeria, Rwanda, Senegal, Tanzania, Uganda, Zambia, Zimbabwe.

Figure 8: Predicted Ten Year Change in Share of Workers in Agriculture. Old rural Men.



Source: Own calculations using data from DHS.

Notes:

1. Sub-sample of all old (age 25+), rural, male agricultural workers not currently attending school.

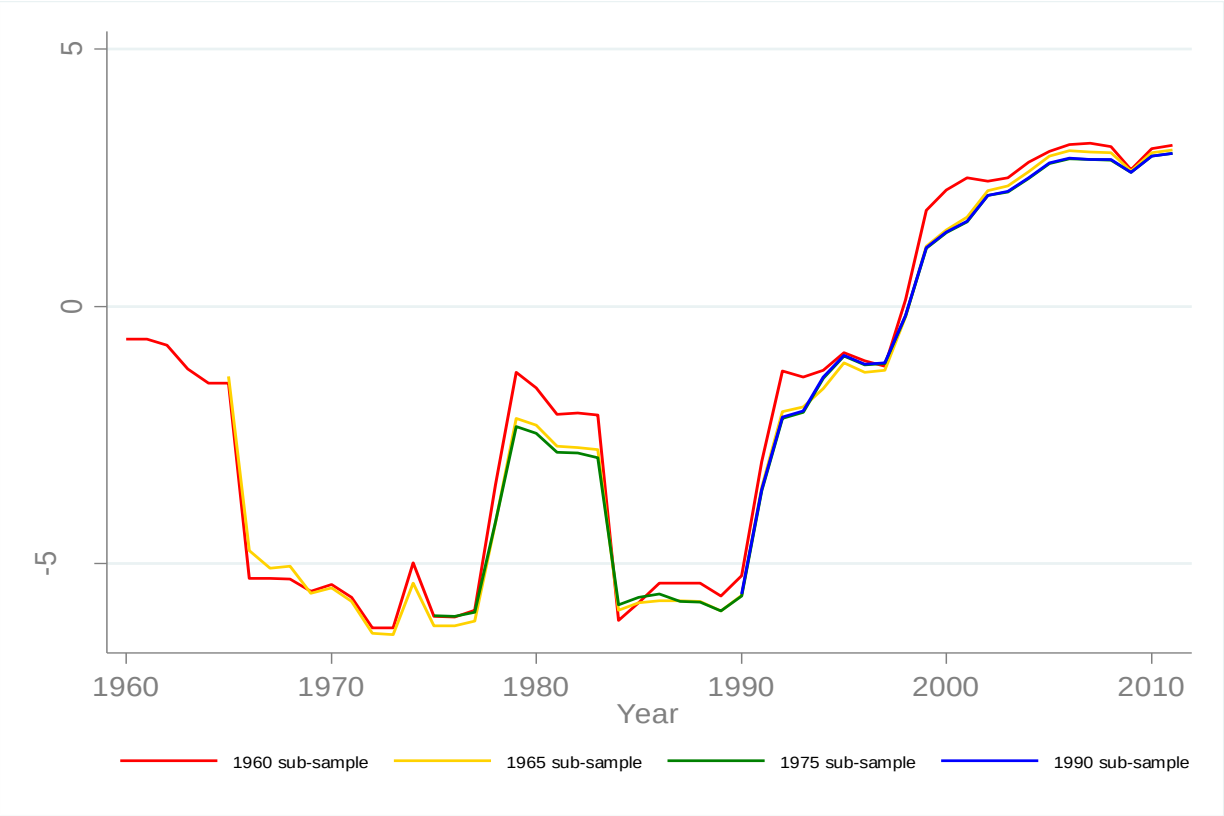
2. Exlcudes Lesotho and Niger.

3. Results based on results of country-specific regression of dummy indicating whether individual works in agriculture or not against a constant and year dummies for each available survey year. To get ten year changes, the coefficient on dummy for latest available year was divided by total number of years between first and last years with survey data for each country and multiplied times ten.

Figure 9: Armed Conflict in Sub-Saharan Africa, 1960-2008

Source: Straus (2012)

Figure 10: Average polity2 score for Sub-Saharan Africa



Source: Author's calculations using data from the Polity IV Project and The World Bank's WDI dataset.

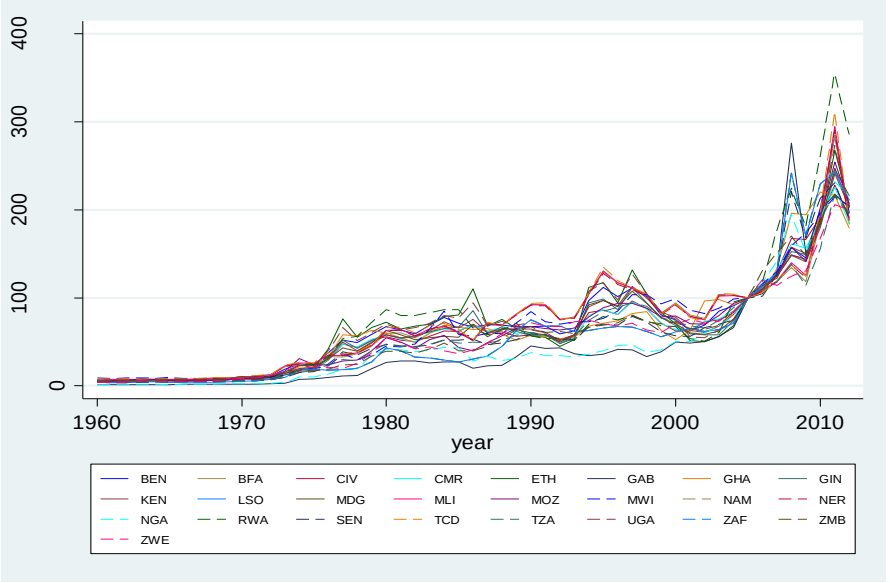
Notes:

1. Graph shows a weighted average of the polity2 score (weighted by population) in the Polity IV dataset. The polity2 score is the revised combined polity score which, is the result of substracting the "autoc" score from the "democ" score. It scores how democratic or autocratic a regime is and ranges from -10 (strongly autocratic) to +10 (strongly democratic).

2. Solid bright lines are population-weighted averages of the individual country scores for each cohort: the 1960 cohort (red), 1965 cohort (yellow), 1975 cohort (green), and the 1990 cohort (blue).

3. Countries included are: Benin, Burkina Faso, Cameroon, Central African Republic, Chad, Congo Brazzaville, Congo Kinshasa, Ethiopia, Gabon, Ghana, Guinea, Ivory Coast, Liberia, Madagascar, Mali, Mauritania, Niger, Nigeria, Senegal, Somalia, South Africa, Sudan, Togo, Rwanda, Sierra Leone, Tanzania, Burundi, Uganda, Kenya, Malawi, Zambia, Gambia, Botswana, Lesotho, Equatorial Guinea, Mauritius, Swaziland, Zimbabwe, Guinea-Bissau, Angola, Cape Verde, Comoros, Mozambique, Namibia, Eritrea, and South Sudan.

Figure 11: Commodity Price Indices by Country



Source: Authors' calculations following Henderson, Roberts and Storeygard (2013) using data from several sources. Commodity prices come from UNCTAD except for maize, natural gas, rubber, silver, tea, tobacco, logs, and sawnwood wich come from The World Bank's Pink Sheet dataset (Sept. 2013 update). Export shares were calculated from Freenstra (2005) data. Consumer price index for the US comes from US Bureau of Labor Statistics and GDP data in current dollars comes from the Penn World Tables version 7.

Notes:

Included commodities are: Aluminium, bananas, beef, cattle hides, coconut oil, cocoa beans, coffee, copper, copra, cotton, crude petroleum, cottonseed oil, groundnut oil, iron ore, jute, lead, linseed oil, manganese ore, pepper, palm oil, rice, sisal, sunflower, soybeans, sugar, soybean oil, tin, wheat, zinc, maize, natural gas, rubber, silver, tea, tobacco, logs, sawnwood.

Table 1: Comparing the Africa Samples to All of Sub-Saharan Africa

	All SSA (1)	M&R (2011) Sample (2)	DHS' sample (3)	M&R (2011) Plus 10 (4)
GDP per capita, PPP (constant 2005 international $)	3,189	3,617	1,829*	2,817
	5,048	*4,229*	*2,609*	*3,674*
Mortality rate, infant (per 1,000 live births)	74.34	58.85**	74.89	66.99
	26.18	*22.67*	*17*	*23.77*
Years of Schooling	5.03	6.59***	4.88	5.45
	2.05	*1.64*	*2*	*2.32*
Years of Primary Schooling	3.66	4.85***	3.72	4.1
	1.43	*0.92*	*1.47*	*1.52*
Years of Secondary Schooling	1.3	1.66	1.1	1.28
	.82	*1.06*	*.8*	*1.03*
Years of Tertiary Schooling	.07	.07	.07	.06
	.07	*.04*	*.07*	*.04*
Raw materials exports as prop. of total exports; WDI period average	.15	.12	.17	.13
	.11	*.05*	*.12*	*.06*
Share of NRX in GDP (%) in 2000	21.16	20.17	18.14	17.81
	19.44	*14.59*	*12.51*	*13.09*
Undervaluation Index; average during period (PWT7)	-.08	-.01	-.05	.02
	.3	*.18*	*.36*	*.19*
Employment in agriculture (% of total employment)	53.24	43.33	67.7***	51.3
	28.15	*31.68*	*18.71*	*30.63*
Total population (in millions)	716.62	395.65	542.11	484.78
				68%
Number of countries	46	11	24	16

Notes: All estimates are for 2005 with the exception of Share of NRX in GDP (2000). Standard deviations in italics. For colums (2) to (4), asterisks next to a variable indicate that two-sided test of difference in means shows that difference is statistically significant from mean value for SSA countries not in the respective sample: *** p<0.01, ** p<0.05, * p<0.1. For a list of countries in each sample see Appendix.

Table 2. Summary Statistics

Country	Code	Economywide Labor Productivity*	Coef. of Variation of Log of Sectoral Productivity	Sector with Highest Labor Productivity		Sector with Lowest Labor Productivity		Compound Annual Growth Rate of Economywide Productivity **	Period
				Sector	Labor Productivity*	Sector	Labor Productivity*		
High Income									
United States	USA	71,021	0.026	man	114,566	ter	65,236	2.34%	(2000-2005)
France	FRA	56,526	0.015	man	70,223	agr	47,528	0.97%	(2000-2005)
Italy	ITA	51,638	0.051	min	140,037	agr	39,472	-0.61%	(2000-2005)
Netherlands	NLD	51,588	0.123	min	930,958	agr	47,084	1.05%	(2000-2005)
Sweden	SWE	50,765	0.028	man	87,719	ter	42,579	2.67%	(2000-2005)
Japan	JPN	49,419	0.069	man	72,900	agr	13,758	2.22%	(2000-2005)
United Kingdom	UKM	47,472	0.077	min	287,454	ter	43,730	1.42%	(2000-2005)
Spain	ESP	47,019	0.016	min	55,314	agr	36,811	-0.25%	(2000-2005)
Denmark	DNK	45,447	0.114	min	622,759	ter	44,582	1.04%	(2000-2005)
Asia									
Hong Kong	HKG	67,758	0.068	ter	70,624	agr	14,861	3.47%	(2000-2005)
Singapore	SGP	65,352	0.063	man	81,563	agr	18,324	1.51%	(2000-2005)
Taiwan	TWN	48,069	0.100	min	171,853	agr	12,440	2.26%	(2000-2005)
Malaysia	MYS	33,852	0.131	min	469,892	agr	18,425	3.64%	(2000-2005)
South Korea	KOR	32,121	0.082	min	118,103	agr	20,652	3.16%	(2000-2005)
Thailand	THA	13,856	0.143	min	110,836	agr	3,754	2.50%	(2000-2005)
Indonesia	IDN	11,276	0.129	min	85,836	agr	4,307	3.81%	(2000-2005)
Philippines	PHL	9,892	0.104	min	50,414	agr	5,498	2.53%	(2000-2005)
China	CHN	9,317	0.135	min	55,879	agr	2,594	8.77%	(2000-2005)
India	IND	7,318	0.108	min	23,825	agr	2,510	6.96%	(2000-2005)
Latin America									
Argentina	ARG	29,363	0.096	min	239,645	ter	24,742	0.01%	(2000-2005)
Chile	CHL	28,257	0.098	min	194,745	agr	19,008	1.29%	(2000-2005)
Mexico	MEX	24,252	0.085	min	75,702	agr	9,002	2.38%	(2000-2005)
Costa Rica	CRI	20,956	0.054	man	35,230	min	10,575	1.55%	(2000-2005)
Venezuela	VEN	20,854	0.146	min	297,975	agr	10,130	1.33%	(2000-2005)
Colombia	COL	13,887	0.081	min	57,984	agr	9,029	0.12%	(2000-2005)
Peru	PER	12,894	0.128	min	84,817	agr	4,052	2.78%	(2000-2005)
Brazil	BRA	11,830	0.114	min	78,214	agr	5,660	0.09%	(2000-2005)
Bolivia	BOL	7,002	0.159	min	121,264	agr	4,162	-0.53%	(2000-2005)
Africa									
South Africa***	ZAF	39,908	0.076	min	73,982	agr	11,442	2.47%	(2000-2005)
Mauritius***	MUS	38,434	0.027	min	46,248	agr	24,698	2.29%	(2000-2005)
Algeria	DZA	21,128	0.163	min	304,257	man	7,187	0.62%	(2001-2009)
Egypt	EGY	13,354	0.211	min	770,347	agr	4,903	1.73%	(2000-2007)
Morocco	MAR	8,065	0.120	min	39,977	agr	2,615	4.18%	(2000-2007)
Angola	AGO	7,771	0.284	min	568,823	agr	604	5.68%	(2005-2009)
Nigeria***	NGA	4,340	0.281	min	666,121	agr	1,858	3.77%	(2000-2005)
Senegal	SEN	4,224	0.144	min	27,948	agr	1,271	0.79%	(2000-2005)
Cameroon	CMR	3,786	0.212	min	157,258	agr	1,503	-2.61%	(2001-2007)
Kenya***	KEN	3,550	0.154	min	49,226	agr	2,391	-0.42%	(2000-2005)
Ghana***	GHA	3,044	0.053	min	3,393	man	1,422	3.63%	(2000-2005)
Zambia***	ZMB	2,395	0.174	min	15,120	agr	535	1.30%	(2000-2005)
Uganda	UGA	2,161	0.124	ter	5,467	agr	738	1.78%	(1999-2009)
Tanzania	TZA	2,101	0.142	man	16,315	agr	923	3.17%	(2000-2007)
Ethiopia***	ETH	1,993	0.088	ter	6,352	agr	1,250	2.09%	(2000-2005)
Rwanda	RWA	1,490	0.143	ter	6,086	agr	683	3.96%	(1996-2005)
Malawi***	MWI	1,314	0.240	min	70,846	agr	521	-1.73%	(2000-2005)
Mozambique***	MOZ	1,285	0.143	man	5,130	agr	436	4.91%	(2003-2009)
Mali	MLI	1,178	0.141	min	9,526	agr	760	2.81%	(2001-2009)

Note: All numbers are for final year in period unless otherwise stated.
* 2000 PPP dollars. All numbers are for final year in period.
** During period. *** Part of original M&R (2011) sample.

Table 3. Sector Coverage

Sector	Abbreviation	Average Sectoral Labor Productivity*	Maximum Sectoral Labor Productivity		Minimum Sectoral Labor Productivity	
			Country	Labor Productivity*	Country	Labor Productivity*
Agriculture, Hunting, Forestry, and Fishing	agr	14,435	USA	65,306	MOZ	436
Mining and Quarrying	min	156,577	NLD	930,958	RWA	994
Manufacturing	man	33,051	USA	114,566	GHA	1,422
Tertiary	ter	23,662	HKG	70,624	MLI	1,687
Economy-wide	sum	23,454	USA	71,021	MLI	1,178

Note: All numbers are for final year in period for all countries.
* 2000 PPP dollars. All numbers are for final year in period for all countries.

Table 4: Decomposition of productivity growth, 2000 -2005.

	Labor Productivity Growth	Of which:	
		"Within"	"Structural"
Latin America	1.00%	1.86%	-0.86%
Africa	2.13%	1.21%	0.92%
Asia	3.86%	3.45%	0.41%
High Income	1.21%	1.40%	-0.19%

Notes: Regional unweighted averages.

Table 5 : Decomposition of productivity growth in Africa (post 2000)

	Labor Productivity Growth	Of which:	
		"Within"	"Structural"
Algeria	0.62%	0.43%	0.19%
Angola	5.68%	5.29%	0.39%
Cameroon	-2.61%	-3.08%	0.46%
Egypt	1.73%	3.20%	-1.47%
Ethiopia	2.09%	2.06%	0.03%
Ghana	3.63%	3.66%	-0.03%
Kenya	0.57%	0.29%	0.27%
Malawi	-1.73%	-1.80%	0.08%
Mali	2.81%	2.29%	0.52%
Mauritius	2.29%	1.82%	0.46%
Morocco	4.18%	3.16%	1.02%
Mozambique	4.91%	3.98%	0.94%
Nigeria	3.77%	0.96%	2.81%
Rwanda	3.96%	-0.16%	4.12%
Senegal	0.79%	-0.37%	1.16%
South Africa	2.47%	2.10%	0.38%
Tanzania	3.17%	0.76%	2.41%
Uganda	1.78%	-0.88%	2.65%
Zambia	1.30%	1.23%	0.57%
Africa Unweighted	2.18%	1.31%	0.87%
Africa Weighted	2.87%	2.07%	0.80%

Source: Author's calculations based on data described in the data appendix.

Table 6: DHS Survey Countries and Years in Sample, SSA

Country Name	DHS Survey Years
Benin	1996(f&m), 2001(f&m), 2006(f&m)
Burkina Faso	1992(f&m), 1998(f&m), 2003(f&m), 2010(f)
Cameroon	1991(f&m), 1998(f&m), 2004(f&m), 2011(f)
Chad	1996(f&m), 2004(f&m)
Cote d'Ivoire	1994(f&m), 1998(f&m), 2005(f), 2011(f&m)
Ethiopia	2000(f&m), 2005(f&m), 2011(f&m)
Gabon	2000(f&m), 2012(f&m)
Ghana	1993(f&m), 1998(f&m), 2003(f&m), 2008(f&m)
Guinea	1999(f&m), 2005(f&m)
Kenya	1993(f&m), 1998(f&m), 2003(f&m), 2009(f&m)
Lesotho	2004(f&m), 2009(f&m)
Madagascar	1992(f), 1997(f), 2004(f&m), 2009(f&m)
Malawi	1992(f&m), 2000(f&m), 2004(f&m), 2010(f&m)
Mali	1995(f&m), 2001(f&m), 2006(f&m)
Mozambique	1997(f&m), 2003(f&m), 2009(f), 2011(f&m)
Namibia	1992(f), 2000(f&m), 2007(f)
Niger	1992(f&m), 1998(f&m), 2006(f&m)
Nigeria	1990(f), 1999(f&m), 2003(f&m), 2008(f&m)
Rwanda	1992(f&m), 2000(f&m), 2005(f&m), 2010(f&m)
Senegal	1992(f&m), 1997(f&m), 2005(f&m), 2011(f&m)
Tanzania	1992(f&m), 1996(f&m), 1999(f&m), 2004(f&m), 2008(f), 2010(f&m)
Uganda	1995(f&m), 2000(f&m), 2006(f&m), 2011(f&m)
Zambia	1992(f), 1996(f&m), 2001(f&m), 2007(f&m)
Zimbabwe	1994(f&m), 1999(f&m), 2006(f&m), 2011(f&m)

Note: "f" indicates survey collects data only on women; "f&m" indicates survey collected data on women and men.

Table 7: Percentage of Workers (age 25+) in Agriculture, DHS Africa Sample.

Country name	Female			Male			Combined		
	1990s	2000 - 2005	2006 - 2012	1990s	2000 - 2005	2006 - 2012	1990s	2000 - 2005	2006 - 2012
Benin	29.6	34.7	38.4	67.1	61.4	55.4	48.3	48.1	46.9
Burkina Faso	32.4	76.6	60.4	77.7	76.2		55.0	76.4	30.2
Cameroon	62.0	53.6	40.9	54.2	47.5		58.1	50.5	20.5
Chad	47.4	75.4		79.1	71.8		63.3	73.6	
Cote d'Ivoire	49.8	44.4	35.9	51.6		51.7	50.7		43.8
Ethiopia		57.9	46.9		84.5	74.8		71.2	60.9
Gabon		23.5	9.7		19.2	7.4		21.4	8.5
Ghana	41.4	39.7	32.9	55.4	52.2	44.4	48.4	46.0	38.7
Guinea	64.4	60.3		62.3	60.7		63.4	60.5	
Kenya	48.2	53.6	42.3	44.3	44.1	36.1	46.2	48.8	39.2
Lesotho		35.2	22.3		30.1	43.0		32.7	32.6
Madagascar	63.6	69.5	71.6		66.8	73.9		68.2	72.8
Malawi	23.8	67.6	55.9	60.0	57.0	46.8	41.9	62.3	51.4
Mali	40.1	45.1	0.0	64.8	66.2	56.1	52.5	55.6	28.0
Mozambique	78.0	80.9	66.8	56.2	65.2	45.2	67.1	73.0	56.0
Namibia	1.9	11.1	16.9		17.0			14.1	8.4
Niger	34.8		38.1	76.1		51.6	55.4		44.8
Nigeria	21.7	20.8	24.0	43.2	39.2	39.9	32.5	30.0	32.0
Rwanda	94.5	89.6	84.4	88.8	68.6	68.8	91.7	79.1	76.6
Senegal	37.4	25.4	20.6	43.1	29.7	25.7	40.3	27.6	23.2
Tanzania	78.5	78.8	69.9	72.1	70.5	61.3	75.3	74.7	65.6
Uganda	73.3	77.6	71.0	71.6	66.9	63.2	72.5	72.3	67.1
Zambia	56.0	63.0	47.7	49.1	58.1	50.4	52.5	60.5	49.1
Zimbabwe	40.9		32.6	26.2		32.9	33.5		32.8
Average One	**51.9**	**56.4**	**46.2**	**59.6**	**56.6**	**50.0**	**55.8**	**56.5**	**47.7**
Average Two	49.1	53.8	42.2	60.2	54.9	49.3	54.6	54.6	49.3

Source: Own calculations using DHS data.

Notes:

1. Sample includes all African countries in DHS (excludes D. R. Congo).

2. Numbers shown are for sub-sample of people who reported to be currently working and not attending school.

3. Average One is the average for countries that have data for both genders for all three periods.

4. Average Two is the column average for all countries.

Table 8.A: Shares of Individuals by Sectors at Initial Year. Men.

Panel A: Rural

	Young							Old					
	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working	In school	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Benin	79.19	0	4.03	4.7	12.08	7.45	7.95	86.58	2.07	2.84	4	4.52	1.65
Burkina Faso	88.23	0.71	6.24	0.43	4.4	4.34	2.9	89.05	1.61	5.39	0.39	3.56	0.66
Cameroon	75.17	0.93	19.84	1.74	2.32	20.04	24.57	71.37	2.7	22.05	1.73	2.15	2.11
Chad	95.91	0.22	2.65	0.07	1	15.4	12.61	92.76	1.33	2.51	0.33	2.33	1.02
Cote d'Ivoire	83.78	1.5	2.7	3.9	6.61	3.76	18.84	76.73	5.11	7.26	3.63	7.26	0.56
Ethiopia	92.89	2.21	1.72	1.72	1.47	3.32	29.92	91.2	1.59	3.94	1.17	2.1	2.37
Gabon	59.09	6.06	13.64	0	21.21	29.79	45.81	56.22	13.18	10.7	0	19.9	13.73
Ghana	80.29	3.65	2.92	2.92	10.22	23.89	23.08	77.9	7.31	5.7	3.21	5.88	2.43
Guinea	78.87	0	4.7	3.29	13.15	12.7	15.6	81.25	0.96	5.29	4.81	7.09	1.65
Kenya	66.36	2.47	12.35	9.88	8.02	6.36	15.63	57.81	8.83	11.87	10.32	10.88	0.98
Lesotho	74.54	2.21	3.69	7.38	11.44	51.26	36.17	43.11	4.6	10.46	5.7	35.82	43.86
Madagascar	86.6	1.46	3.11	4.38	4.45	4.78	15.6	86.47	4.16	3.13	0.86	5.38	0.33
Malawi	65.63	2.6	14.24	1.91	13.89	9.86	37.57	63.63	5.67	11.28	1.29	15.65	5.7
Mali	86.18	0	6.23	2.17	5.15	10.22	6.16	79.63	0.52	11.45	0	7.81	1.9
Mozambique	67.24	6.03	17.67	6.9	2.15	33.52	24.25	66.74	11.47	8.94	8.03	4.82	10.93
Namibia	60.71	4.76	7.14	15.48	11.9	55.08	42.13	49.03	13.71	8.44	10.72	18.1	35.27
Niger	91.45	0.11	6.03	0.11	2.19	2.25	1.99	85.1	0.33	8.01	1.26	5.29	0.33
Nigeria	59.16	1.05	18.85	4.19	16.75	35.69	34.06	56.07	6.57	22.65	0.37	14.34	5.36
Rwanda	89.45	0.87	3.46	2.77	3.46	11.62	9.89	86.46	3.01	2.74	1.37	6.02	3.24
Senegal	68.82	1.46	9.98	0	19.75	10.09	0.92	70.84	3.84	11.14	0	14.19	2.17
Tanzania	86.16	0.48	3.1	6.68	3.58	5.52	18.95	87.15	3.86	2.27	3.61	3.11	0.34
Uganda	84.42	0.97	8.12	0	6.49	6.95	25.88	80.2	5.41	7.75	0	6.4	0.73
Zambia	82.93	1.02	9.9	3.75	1.71	22.49	20.88	77.82	3.75	7.17	4.1	6.31	5.18
Zimbabwe	57.43	3.96	19.8	13.53	5.28	30.34	33.28	49.76	14.43	13.13	13.29	9.4	12.61

Panel B: Urban

	Young							Old					
	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working	In school	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Benin	39.06	1.56	6.25	28.13	25	26.44	21.93	29.17	14.74	20.83	15.06	19.87	11.61
Burkina Faso	15.41	1.03	43.49	17.12	22.94	20	33.39	14.32	17.9	36.37	12.24	19.17	6.78
Cameroon	10.11	0.45	75.96	8.09	5.39	51.47	41.1	10.49	20.2	56.33	5.97	6.94	8.55
Chad	33.96	0.7	29.27	18.5	17.33	49.53	33.28	20.91	14.12	29.58	15	15.17	10.3
Cote d'Ivoire	10.5	2.28	25.57	8.22	53.42	22.34	33.33	12.69	12.08	39.6	6.57	28.75	4.25
Ethiopia	8.85	8.85	44.25	11.5	26.55	10.32	51.33	6.43	22.91	34.08	6.43	30.17	8.2
Gabon	13.27	8.16	34.69	1.02	42.86	39.51	61.49	8.93	30.46	29.51	0	31.1	13.64
Ghana	19.15	10.64	17.02	14.89	38.3	47.19	29.69	19.33	14.33	28.67	14	23.67	5.96
Guinea	6.93	0.99	25.74	14.85	49.51	38.04	40.14	11.67	8.61	29.17	15	34.72	13.46
Kenya	0	4.17	31.94	31.94	25	23.4	10	3.17	10.66	39.48	14.12	29.4	3.88
Lesotho	15	5	35	11.67	31.67	47.37	55.47	8.82	12.74	34.31	4.25	39.22	25.73
Madagascar	28.62	5.59	23.68	9.54	32.57	17.84	48.91	18.52	17.22	25.52	4.61	34.13	2.84
Malawi	9.19	8.65	43.78	1.62	27.57	7.96	42.78	7.14	12.5	36.31	3.72	33.48	1.9
Mali	10.91	0.91	58.18	14.55	13.64	29.94	42.07	16.4	1.96	66.85	1.43	9.98	6.97
Mozambique	8.42	12.63	36.84	23.16	18.95	33.57	39.44	9.31	26.33	26.06	10.9	27.39	13.36
Namibia	4.49	8.33	31.41	14.1	41.67	43.48	33.89	3.77	18.3	20.39	21.23	36.31	17.23
Niger	26.6	0	34.29	16.99	18.91	23.34	23.92	21.35	8.31	34.49	9.41	24.5	3.01
Nigeria	16.98	5.66	28.3	0	49.06	57.94	47.98	11.94	10.37	49.12	0.98	27.59	8.09
Rwanda	11.11	4.23	20.64	23.28	40.74	19.57	26.98	14.02	18.69	22.2	5.61	37.38	8.74
Senegal	7.94	5.08	22.22	0	64.76	31.67	5.48	6.72	14.85	30.7	0	47.72	10.01
Tanzania	20.57	3.63	18.55	33.87	23.39	15.65	19.47	26.7	12.41	16.84	27.89	16.16	2.81
Uganda	7.44	2.48	45.46	0	42.15	13.57	33.48	12.4	14.32	38.02	0	34.44	1.36
Zambia	9.32	4.24	44.92	6.78	16.1	36.9	35.84	8.21	17.01	30.2	6.45	32.55	9.79
Zimbabwe	0.87	9.56	26.96	38.26	24.35	33.53	27.92	1.01	16.88	33.75	17.88	30.48	5.02

Notes:

1. Numbers in the table correspond to percentages of men in each sector for the corresponding sub-sample and country in the first-available survey year for each particular country.

2. Shares in columns (1) to (5) were calculated with respect to the total number of men in sub-sample who are currently not in school and working. Shares in colum (6) were calculated with respect to the total numberof men in sub-sample who are currently not in school. Shares in column (7) were calculated with respect to the total number of men in sub-sample.

3. Shares in columns (8) to (12) were calculated with respect to the total number of men in sub-sample who are currently not in school and working. Shares in colum (13) were calculated with respect to the total numberof men in sub-sample who are currently not in school.

Table 8.B: Shares of Individuals by Sectors at Initial Year. Women.

Panel A: Rural

	Young							Old					
	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working	In school	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Benin	38.37	0.1	52.54	3.06	4.88	9.13	2.71	41.63	0.22	53.65	3.25	1.11	3.85
Burkina Faso	43.09	0.1	46.09	4.66	6.05	15.11	0.61	41.69	0.13	42.81	7.13	8.24	11.47
Cameroon	77.2	0.11	21.37	0.83	0.44	34.2	22.56	74.84	0.6	23.67	0.41	0.49	13.47
Chad	52.8	0	46.15	0.11	0.94	39.44	12.06	54.55	0.05	43.82	0.03	1.55	36.12
Cote d'Ivoire	64.88	0.1	29.25	0.3	3.48	28.06	4.71	71.07	0.46	27.05	0.18	0.92	14.6
Ethiopia	66.36	0.64	18.68	2.2	12.12	34.41	10.46	73.66	0.62	13.34	1.52	10.86	33.21
Gabon	63.39	0	34.43	2.19	0	58.97	33.73	69.54	2.5	26.29	1.25	0.42	36.93
Ghana	59.96	0.8	23.11	0.2	15.94	33.95	11.63	66.65	2.27	19.01	0.52	11.49	9.69
Guinea	76.9	0	17.35	2.16	3.39	17.67	1.17	83.26	0.15	13.44	1.67	1.33	10.22
Kenya	51.29	2.82	29.58	3.87	6.81	0	6.89	53.32	8.13	31.31	2.83	3.76	0
Lesotho	46.89	3.85	15.57	2.93	14.84	64.96	28.53	50.29	7.32	16.33	3.73	15.3	50.09
Madagascar	78.01	0.24	8.92	3.12	9.71	18.94	3.61	76.17	1.62	8.19	1.92	12.09	14.67
Malawi	71.36	0.88	19.85	3.93	3.32	47.02	18.36	67.07	2.03	19.49	5.79	5.36	40.14
Mali	55.44	0.09	31.52	0	11.69	43.87	1.8	54.68	0.31	30.09	0	14.64	42.18
Mozambique	87.19	1.49	8.01	1.4	1.61	24.01	7.25	84.39	2.41	8.75	2.37	1.93	13.2
Namibia	8.61	10.63	25.57	34.18	4.05	76.05	39.93	8.61	20.65	16.99	39.55	3.03	64.63
Niger	51.15	0.04	28.7	0.39	19.58	57.41	2.61	41.3	0.32	36.22	0.07	22.07	46.21
Nigeria	26.54	2.55	56.26	0.43	14.23	67.02	24.88	30.02	3.6	57.47	0.11	8.81	41.7
Rwanda	95.69	0.79	1.71	0	0.94	1.63	4.27	96.47	1.48	1.32	0	0.58	0.67
Senegal	67.39	0.27	25.63	0	6.71	53.25	0.5	61.53	0.72	33.31	0	4.43	34.63
Tanzania	88.2	0.42	0.57	9.74	1.07	40.28	8.73	87.83	1.22	0.53	9.77	0.65	33.94
Uganda	82.56	0.98	10.14	0	5.34	33.33	6.13	81.75	2.24	9.56	0	6.34	29.64
Zambia	59.41	1.18	26.27	0.78	12.03	53.71	8.4	59.74	2.3	21.96	1.05	14.69	43.2
Zimbabwe	51.81	3.63	30.77	1.6	12.19	50.5	16.85	58.86	6.36	18.4	1.96	14.41	39.65

Panel B: Urban

	Young							Old					
	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working	In school	All agricultural workers	Professional workers	Clerical, sales, and services workers	Unskilled workers	Skilled workers	Not working
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
Benin	10.96	1.37	63.47	2.06	18.26	25.51	12.37	10.3	1.82	77.15	1.39	8.8	7.72
Burkina Faso	4.21	1.76	81	6.65	6.38	23.23	15.49	4.9	9.92	71.02	5.2	8.95	9.43
Cameroon	16.75	0.68	78.09	3.7	0.29	60.62	32.77	18.39	7.31	70.82	2.45	0.46	29.06
Chad	9.24	0	88.2	0.74	1.81	57.23	26.67	13.77	1.98	80.47	0.66	3.13	36.96
Cote d'Ivoire	3.97	0.5	78.91	0.99	7.57	43.36	14.17	6.96	3.27	84.41	0.28	3.97	26.19
Ethiopia	2.42	3.03	78.67	5.14	10.74	41.5	39.54	2.46	7.63	62.55	7.31	20.05	35.5
Gabon	7.93	3.96	81.06	6.17	0.88	71.73	53.64	14.35	15.02	65.96	3.06	1.61	39.96
Ghana	6.01	4.14	54.51	0.75	32.33	48.35	16.67	9.1	7.45	61.11	1.65	20.45	17.3
Guinea	5.29	0	62.98	0.72	29.57	41.57	17.78	7.53	2.97	81.76	0.1	6.64	19.73
Kenya	2.21	3.87	48.07	2.76	11.6	0	4.74	3.64	15.06	59.22	2.86	8.83	0
Lesotho	5.91	1.58	29.92	3.15	35.83	46.07	35.39	4.99	12.53	36.38	2.8	35.77	27.9
Madagascar	21.21	0.71	31.64	23.7	22.75	34.42	27.21	16.72	9.97	38.43	13.22	21.66	23.13
Malawi	16.34	7.53	55.7	6.67	5.59	64.29	28.03	13.12	13.78	55.03	9.32	6.11	43.21
Mali	3.21	0.71	65.06	0.36	12.83	50.04	16.57	3.75	1.79	77.15	0.17	12.45	41.5
Mozambique	26.42	5.81	41.12	9.87	11.73	36.36	25.01	30.7	11.21	35.45	7.86	11.18	15.96
Namibia	3.55	8.65	48.78	22.62	3.99	61.49	32.51	3.51	20.2	34.5	24.3	4.36	35.93
Niger	2.11	2.54	60.47	4.86	26.11	68.69	19.31	2.08	5	73.96	4.16	13.86	45.22
Nigeria	4.09	5.91	69.09	0.46	20.45	65.94	31.13	6.39	8.63	72.84	0.09	12.05	28.49
Rwanda	34.13	5.59	24.48	0.28	5.03	15.28	14.4	40.14	14.15	35.89	0.08	4.72	8.94
Senegal	2.57	1.43	76.46	0	19.54	66.09	7.76	3.82	5.29	78.37	0	12.52	43.56
Tanzania	41.83	3.58	7.16	42.95	4.47	62.69	12.87	48.22	7.13	5.14	35.22	4.3	40
Uganda	20.29	5.25	51.55	0	13.13	50.35	13.52	19.63	14.18	55.07	0	9.81	25.87
Zambia	4.82	4.35	70.71	3.41	13.06	61.9	20.52	4.85	11.82	67.29	2.5	11.29	34.61
Zimbabwe	3.52	1.76	71.83	3.17	19.72	52.59	17.38	6.47	11.71	52.39	2.62	26.81	32.26

Notes:

1. Numbers in the table correspond to percentages of women in each sector for the corresponding sub-sample and country in the first-available survey year for each particular country.

2. Shares in columns (1) to (5) were calculated with respect to the total number of women in sub-sample who are currently not in school and working. Shares in colum (6) were calculated with respect to the total numberof women in sub-sample who are currently not in school. Shares in column (7) were calculated with respect to the total number of women in sub-sample.

3. Shares in columns (8) to (12) were calculated with respect to the total number of women in sub-sample who are currently not in school and working. Shares in colum (13) were calculated with respect to the total numberof women in sub-sample who are currently not in school.

Table 9: Summary Statistics for Selected Variables

Variables	Mean	Standard Dev.	No. of obs.
Works in agriculure (self-employed or employed)	0.38	0.49	1,094,581
Professional	0.03	0.18	1,094,581
Works either in clerical, sales, services	0.19	0.39	1,094,581
Skilled manual	0.06	0.25	1,094,581
Unskilled manual	0.03	0.17	1,094,581
Not working	0.29	0.45	1,094,581
Youth	0.38	0.48	1,094,581
Female (1 if female)	0.74	0.44	1,094,581
Urban (1 if living in urban area)	0.30	0.46	1,094,581
Individual has no education level completed	0.38	0.48	1,094,581
Incomplete primary	0.26	0.44	1,094,581
Complete primary	0.12	0.32	1,094,581
Incomplete secondary	0.18	0.38	1,094,581
Complete secondary	0.04	0.20	1,094,581
Higher	0.03	0.17	1,094,581
Log of Total population	16.63	0.97	1,094,581
Country experienced any kind of conflict	0.39	0.49	1,094,581
Revised Combined Polity Score from Polity IV	1.56	4.52	1,094,581
Log of Agricultural Commodity price index	5.11	1.47	1,094,581
Interaction between Log of Non-agric. Comm. Price index and re-scaled polity score	2.87	1.27	1,094,581

Source: Own calculations using data from several rounds of DHS surveys and the Polity IV Project dataset.

Table 10: Correlates of Changes in Agricultural Employment Shares 1990s and 2000s

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Full Sample	Urban	Rural	Rural Men	Rural Women	Full Sample	Urban	Rural	Rural Men	Rural Women
Agricultural Employment Share Previous Period	-0.1112***	-0.512***	-0.546***	-0.915***	-0.787***	-0.104***	-0.321***	-0.326***	-0.361***	-0.228***
	(0.02205)	(0.0689)	(0.0673)	(0.0578)	(0.0762)	(0.0222)	(0.0550)	(0.0689)	(0.1003)	(0.0578)
Female (= 1 for Female Population)	-0.0748***	0.0028	-0.0398***			-0.0291***	0.0084	-0.0054		
	(0.0150)	(0.1150)	(0.0150)			(0.0100)	(0.0060)	(0.0180)		
Youth (= 1 for Population Ages 15-24)	-0.0248***	-0.0241***	-0.0858***	-0.165***	-0.088***	-0.0211***	-0.0167***	-0.0648***	-0.0811***	-0.0322
	(0.0105)	(0.0064)	(0.0105)	(0.0251)	(0.0251)	(0.0103)	(0.0065)	(0.0103)	(0.0203)	-0.0227
Beginning of Period Share Rural Population in Secondary School	-0.032***	-0.043	-0.047**	-0.045	-0.116***	-0.017***	-0.011	-0.251*	-0.054	-0.0861***
	(0.011)	(0.327)	(0.018)	(0.035)	(0.043)	(0.008)	(0.327)	(0.128)	(0.055)	(0.034)
Change in Agricultural Commodity Price Index	0.0237	-0.0019	0.0522	0.1654***	-0.131***	0.0017	0.0144	0.0041	0.0592	-0.091***
	(0.0441)	(0.0447)	(0.0490)	(0.0697)	(0.0521)	(0.0675)	(0.0121)	(0.0071)	(0.0793)	(0.0321)
Beginning of Period Revised Combined Polity Score from Polity IV	0.0075	0.0101	0.0061	0.0161	0.00265	-0.0025	-0.0003	-0.0127***	-0.006	-0.0181***
	(0.0030)	(0.0120)	(0.0048)	(0.0146)	(0.0159)	(0.0064)	(0.0010)	(0.0030)	(0.0068)	(0.004)
Interaction between Change in Price Index and Beginning of Period Polity Score	-0.0135	-0.0068	-0.0226***	-0.042***	-0.123***	-0.014	0.0022	-0.0268***	-0.0116	-0.0282***
	(0.0063)	(0.0443)	(0.0060)	(0.0134)	(0.0375)	(0.0515)	(0.0036)	(0.0107)	(0.0141)	(0.0119)
Current Period Population Growth	-0.716***	-0.0448	-0.828***	-0.096	-0.467	-0.187**	-0.0561	-0.0831***	-0.058***	-0.327
	(0.211)	(0.1150)	(0.306)	(0.387)	(0.378)	(0.098)	(0.081)	(0.038)	(0.017)	(0.318)
Country in Conflict at Beginning of Period	0.0379	0.0318	0.0712	-0.1399***	0.0457	-0.00317	0.0235	-0.0195	-0.0657***	0.0657***
	(0.0234)	(0.0275)	(0.0606)	(0.0337)	(0.0375)	(0.0041)	(0.0174)	(0.0155)	(0.109)	(0.195)
CAADP=1 if Country Reached Either CAADP Target at Beginning of Period	-0.0399**	-0.0121	-0.0516**	-0.0278	-0.0321	-0.0112*	-0.0399**	-0.0321*	-0.0516**	-0.0341
	(0.0195)	(0.0192)	(0.0217)	(0.0251)	(0.0262)	(0.0052)	(0.0195)	(0.0192)	(0.0217)	-0.0122
Constant	0.111	0.068	0.431	0.564	0.497	0.021	0.039	0.149***	0.191	0.407
	(0.038)	(0.018)	(0.060)	(0.089)	(0.059)	(0.046)	(0.024)	(0.065)	(0.117)	(0.059)
Observations	368	183	185	83	102	368	183	185	83	102
R-squared	0.149	0.414	0.455	0.672	0.609	0.239	0.386	0.435	0.546	0.852
Number of countries	24	24	24	22	24	24	24	24	22	24
Country fixed effects	YES	YES	YES	YES	YES	NO	NO	NO	NO	NO
Year fixed effects	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Source: Own calculations using data from several rounds of DHS surveys, WDI dataset, Polity IV Project dataset.

Notes:

1. Standard errors in parentheses. Significance: *** p<0.01, ** p<0.05, * p<0.1

2. Young: age 15-24; old: age 25+

3. Change in Agricultural Employment Share.

Appendix 1

Due to limited data availability for most African economies, we used a broad set of sources. This appendix describes in detail the data and data sources used in our analysis. In the first section of this appendix we document the main methodology and sources used in our estimates of labor productivity for our analysis on structural transformation. Gathering and organizing this data was the most consuming part of the data work given the lack of sources on labor productivity for African countries and the limited primary data sources on sectoral employment and sectoral value added. We then describe the other variables used in our analysis as well as their sources.

To construct our estimates of sectoral employment and value added, we draw from, and broadly follow, the data and methodology used in Timmer and de Vries (2009) and McMillan and Rodrik (2011). However, there are some differences between our approach and that of the studies mentioned above. First, we focus on 4 instead of 9 broad economic sectors. Similarly, our Africa sub-sample includes more countries and draws from a broader set of data sources. Finally, our Africa sub-sample covers a longer period of time (roughly from 1995 to 2010).

Our estimates of sectoral employment and value added for non-African economies are drawn directly from Timmer and de Vries (2009) following McMillan and Rodrik (2011). However, our estimates for these variables in our Africa sub-sample vary slightly from those presented in McMillan and Rodrik (2011). These authors mostly use primary data sources for a smaller set of African countries in their analysis. Moreover, given the more narrow set of African countries they focus on and the larger availability of data for those countries relative to other African countries, they are able to closely follow Timmer and de Vries' (2009) methodology. In contrast, in order to get a broader picture of structural transformation in Africa in more recent years, and due to the lack of sufficient primary data for a number of African economies, we had to resort to a broader set of data sources and a higher level of aggregation for our sectoral breakdown. As a result, while we draw from Timmer and de Vries (2009) and McMillan and Rodrik (2011), our sectoral employment and value added estimates for our Africa sub-sample differ slightly from those in the above mentioned studies. However, our methodology remains broadly consistent with those in Timmer and de Vries (2009) and McMillan and Rodrik (2011).

As mentioned above, given the limited availability of sectoral employment and value added data for a large number of African countries, and in order to broaden our coverage of African economies, we had to aggregate sectors into 4 broad sectors rather than 9 sectors (as in McMillan and Rodrik, 2011). Our sectoral classification follows the ISIC rev. 2 main categories but, differs in the level of aggregation as shown in Table A1.

Table A1. Sector Coverage

Sector	Abbreviation	Categories Included in Sector		
		Category Name	ISIC rev. 2	ISIC rev. 3 Equivalent
Agriculture	agr	**Agriculture, Hunting, Forestry and Fishing**	Major division 1	A+B
Mining	min	**Mining and Quarrying**	Major division 2	C
Manufacturing	man	**Manufacturing**	Major division 3	D
Tertiary	ter	**Wholesale and Retail Trade, Hotels and Restaurants**	Major division 6	G+H
		Transport, Storage and Communications	Major division 7	I
		Finance, Insurance, Real Estate and Business Services	Major division 8	J+K
		Community, Social, Personal and Government Services	Major division 9	O+P+Q+L+M+N

Two things are worth noting. First, our classification is at a more aggregate level than that of the ISIC. Second, we were not able to gather data for the public utilities and construction sectors for a number of African economies and thus, we excluded these sectors. We were careful to make sure that, for countries where this data was available, our estimates excluded these sectors to maintain consistency across countries. Hence, we were forced to use a sectoral disaggregation that would be compatible with all of the countries in our sample (i.e. 4 sectors). While we acknowledge that having data for the utilities and construction sectors and that at a broader disaggregation for services is desirable, the lack of data for Africa makes this virtually impossible. Furthermore, we still manage to include in our sample the most dynamic sectors of the economy and those sectors which employ the vast majority of people, particularly in Africa.

Data sources for sectoral employment and value added

As mentioned above, our sectoral employment and value added estimates come from a variety of sources. For non-African economies, we used data from Timmer and de Vries (2009) and McMillan and Rodrik (2011). We refer the reader to the above mentioned papers for details on the methodology and sources they use. On the other hand, we gathered sectoral employment and value added data for a number of African economies not included in McMillan and Rodrik (2011).[1] Below

[1] We also updated data for 3 African countries in McMillan and Rodrik (2011): Ghana, Nigeria, and Zambia.

we give a detailed description of the sources and methodology for constructing the Africa sub-sample on sectoral employment and value added used in this paper.

Algeria

Years: 2001 and 2009

Employment: Employment by sector for 2001, 2003, and 2004 comes from ILO's LABORSTA. We also used employment by sector for 2010 and 2011 from Algeria's Office National des Statistiques (ONS). Given that employment data for 2010 and 2011 for manufacturing and utilities from the ONS was aggregated together, we used average shares of employment in each of these sectors for 2001, 2003, and 2004 to get estimates of manufacturing employment excluding employment in utilities for 2010 and 2011. Since we do not have data on employment by sector for 2009, we interpolated sectoral employment between 2004 and 2010. While this is not ideal we think that any potential bias in our estimates of sectoral employment for 2009 is small enough that its effect would be minimal; particularly in the long-term trends of these estimates.

Value Added: We used data for value added by sector from "Les Comptes Economiques de 2000 a 2011" from the Office National des Statistiques (ONS) as well as from the UN's National Accounts Main Aggregates online database.[2] Since we only had data for PPP conversion factor from the Penn World Tables version 7.0 (PWT7) for up to 2009, we used value added and employment in 2009. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Angola

Years: Given the long civil conflict in Angola, there are few sources of data for Angola and there is data for only a few years in the recent past. Hence, our data for Angola includes data for 2005 and 2009.

Employment: Employment estimates for Angola come from CEIC-UCAN's "Relatorio Economico Anual" for 2007, 2008, and 2009. To get employment estimates at our 4 aggregate sectors of interest, we aggregated employment in oil and refining, diamonds and other extractive industries to get an estimate of employment in Mining and Quarrying.

Value Added: We used data for value added by sector from CEIC-UCAN's "Relatorio Economico Anual" for 2007, 2008, and 2009 as well as from the UN's National Accounts Main Aggregates Database. Since the UN's data aggregates value added in manufacturing, mining and quarrying, and utilities, we used data on sectoral shares from CEIC-UCAN to separate value added in mining and quarrying. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

[2] http://unstats.un.org/unsd/snaama/introduction.asp

Cameroon

Years: 2001 and 2007

Employment: Our sectoral employment data for Cameroon comes from the IMF's Regional Economic Outlook for Sub-Saharan Africa (2012).[3]

Value added: To get our sectoral value added estimates we used data form UN's National Accounts Main Aggregates Database. Value added in agriculture and manufacturing are already presented as separate series, and we used those for our estimates of value added in agriculture and manufacturing, respectively. On the other hand, we constructed our value added series for the tertiary sector by aggregating value added in all services sectors.[4] Constructing the value added series for mining and quarrying was a bit more cumbersome. The UN's data does not disaggregate value added in mining and quarrying; it is presented within an aggregate series which includes value added in manufacturing, mining and quarrying, and utilities.[5] To get estimates of value added in mining and quarrying we did the following. First, we subtracted value added in manufacturing from total value added in manufacturing, mining and quarrying, and utilities to get an estimate of total value added in the latter sectors. Then, we calculated the share of total value added in mining and quarrying, and utilities that the mining and quarrying sector represents using data from the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007." Finally, using these shares, we estimated value added levels for mining and quarrying from total value added in mining and quarrying, and utilities. Since we only had data for these shares up to 2006, we used the 2006 shares to get the estimate of value added in mining and quarrying for 2007. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Egypt

Years: 2000 and 2007

Employment: Our sectoral employment data for Egypt come from the ILO's LABORSTA database which includes data from several labor force surveys. LABORSTA has employment data disaggregated by main ISIC sector, and we aggregated employment to our 4 sectors of interest.

Value Added: To get our sectoral value added estimates we used data form UN's National Accounts Main Aggregates Database. Value added in agriculture and manufacturing are already presented as separate series, and we used those for our estimates of value added in agriculture and manufacturing, respectively. On the other hand, we constructed our value added series for the tertiary sector by

[3] We thank Rodrigo García-Verdú, Alun Thomas and John Wakeman-Linn for sharing their data. Their data comes from calculations from several IMF's Regional Economic Outlook for Sub-Saharan Africa, mainly the reports for October 2011 and October 2012.

[4] Following the classification shown in Table A1 above.

[5] However, as mentioned previously, it does offer a separate value added series for manufacturing.

aggregating value added in all services sectors.[6] Constructing the value added series for mining and quarrying was a bit more cumbersome. The UN's data does not disaggregate value added in mining and quarrying; it is presented within an aggregate series which includes value added in manufacturing, mining and quarrying, and utilities.[7] To get estimates of value added in mining and quarrying we did the following. First, we subtracted value added in manufacturing from total value added in manufacturing, mining and quarrying, and utilities to get an estimate of total value added in the latter sectors. Then, we calculated the share of total value added in mining and quarrying, and utilities that the mining and quarrying sector represents using data from several "Annual Reports" by the Central Bank of Egypt. Finally, using these shares, we estimated value added levels for mining and quarrying from total value added in mining and quarrying, and utilities. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Ethiopia

Years: 1999 and 2004.

Employment: Our sectoral employment data comes from McMillan and Rodrik (2011). We aggregated employment to our 4 sectors of interest.

Value Added: Our sectoral value added data comes from McMillan and Rodrik (2011). We aggregated employment to our 4 sectors of interest.

Ghana

Years: 2000 and 2010.

Employment: Our sectoral employment data for 2000 comes from Jedwab and Osei (2012),[8] and our data on employment in 2010 comes from Ghana's Population and Household Census 2010.[9] [10] Jedwab and Osei (2012) calculate sectoral employment using various sources, mainly: Population and Housing Censuses 1960, 1970, 1984, 2000 and Ghana Living Standard Survey (GLSS) 1991/92 and 2005/06. We use their employment estimates for 2000. We aggregated employment to our 4 sectors of interest.

Value Added: Our sectoral value added data comes from Jedwab and Osei (2012). They use data from several sources: Maddison (2008) and World Bank (2010) for per capita GDP data and various other sources (see Jedwab and Osei, 2012 for details) to get estimates of sectoral GDP shares. Using these numbers, they then estimate sectoral GDP (in constant 2000 dollars, PPP) for 9 sectors (as

[6] Following the classification shown in Table A1 above.
[7] However, as mentioned previously, it does offer a separate value added series for manufacturing.
[8] Jedwab, Remi, and Osei, Robert D. 2012. "Structural Change in Ghana 1960-2010," September 2012. Mimeo. We thank the authors for making their data available.
[9] While Jedwab and Osei's (2012) value added includes data for 2010, their sectoral employment series only covers up to 2009.
[10] Ghana Statistical Service "2010 Population & Housing Census Summary Report of Final Results" (May 2012).

defined in Timmer and de Vries, 2009; and McMillan and Rodrik, 2011). Their data is for value added in 2000 PPP dollars already. We aggregated value added to our 4 sectors of interest.

Kenya
Years: 1998 and 2009.

Employment: Our sectoral employment estimates come from several sources. Using data on sectoral shares of employment from the Demographic and Health Surveys, we calculated employment shares for agriculture, manufacturing, and services. To get an estimate of the share of employment in mining in 1998 we use data from McMillan and Rodrik (2011) for that year. To get an estimate of the share of employment in mining in 2009 we use the average share of employment from McMillan and Rodrik (2011).[11] Using these numbers, we calculated sectoral shares for our 4 sectors of interest and, using these, we calculated sectoral employment using data on total employment for persons aged 15+ from ILO's KILMnet dataset.[12]

Value Added: To get our sectoral value added estimates we used data form UN's National Accounts Main Aggregates Database and national accounts data from Kenya's National Bureau of Statistics (KNBS).[13] Value added in agriculture and manufacturing in the UN's National Accounts Main Aggregates Database are already presented as separate series, and we used those for our estimates of value added in agriculture and manufacturing, respectively. On the other hand, we constructed our value added series for the tertiary sector by aggregating value added in all services sectors.[14] Constructing the value added series for mining and quarrying was a bit more cumbersome. The UN's data does not disaggregate value added in mining and quarrying; it is presented within an aggregate series which includes value added in manufacturing, mining and quarrying, and utilities.[15] To get estimates of value added in mining and quarrying we did the following. First, we subtracted value added in manufacturing from total value added in manufacturing, mining and quarrying, and utilities to get an estimate of total value added in the latter sectors. Then, we calculated the share of total value added in mining and quarrying, and utilities that the mining and quarrying sector represents using data from the KNBS' national accounts statistics. Finally, using these shares, we estimated value added levels for mining and quarrying from total value added in mining and quarrying, and utilities. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Mali

Years: 2001 and 2009.

[11] We do this since their data does not cover 2009 and since the share of employment in mining is relatively stable, being approximately 0.4% of total employment for the 1990 to 2005 period.
[12] http://kilm.ilo.org/kilmnet/
[13] Kenya Bureau of Statistics "Gross Domestic Product. First Quarter 2010."
[14] Following the classification shown in Table A1 above.
[15] However, as mentioned previously, it does offer a separate value added series for manufacturing.

Employment: Our sectoral employment comes from the IMF's Regional Economic Outlook for Sub-Saharan Africa (2012).

Value Added: To get our sectoral value added estimates we used data from the UN's National Accounts Main Aggregates Database, the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007" and national accounts data from Mali's Institut National de la Statistique (INSTAT).[16] Value added in agriculture and manufacturing in the UN's National Accounts Main Aggregates Database are already presented as separate series, and we used those for our estimates of value added in agriculture and manufacturing, respectively. On the other hand, we constructed our value added series for the tertiary sector by aggregating value added in all services sectors.[17] Constructing the value added series for mining and quarrying was a bit more cumbersome. The UN's data does not disaggregate value added in mining and quarrying; it is presented within an aggregate series which includes value added in manufacturing, mining and quarrying, and utilities.[18] To get estimates of value added in mining and quarrying we did the following. First, we subtracted value added in manufacturing from total value added in manufacturing, mining and quarrying, and utilities to get an estimate of total value added in the latter sectors. Then, we calculated the share of total value added in mining and quarrying, and utilities that the mining and quarrying sector represents using data from the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007" and national accounts data from Mali's national accounts statistics from INSTAT. Finally, using these shares, we estimated value added levels for mining and quarrying from total value added in mining and quarrying, and utilities. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Malawi

Years: 1998 and 2005.

Employment: Our sectoral employment data comes from McMillan and Rodrik (2011). We aggregated employment to our 4 sectors of interest.

Value Added: Our sectoral value added data comes from McMillan and Rodrik (2011). We aggregated employment to our 4 sectors of interest.

Mauritius

Years: 2000 and 2007.

[16] INSTAT "Comptes Economiques Serie 2003-2010."
(http://instat.gov.ml/documentation/comptes_economiques_serie_2003_2010.pdf)
[17] Following the classification shown in Table A1 above.
[18] However, as mentioned previously, it does offer a separate value added series for manufacturing.

Employment: Our sectoral employment data comes from McMillan and Rodrik (2011). Using their same sources, we extended the dataset to 2007.[19] We aggregated employment to our 4 sectors of interest.

Value Added: Our sectoral value added data comes from McMillan and Rodrik (2011). Using their same sources, we extended the dataset to 2007.[20] We aggregated employment to our 4 sectors of interest.

Morocco

Years: 2000 and 2007.

Employment: Our sectoral employment data comes from Morocco's Haut-Commissariat au Plan's (HCP) Enquête Nationale sur l'Emploi. These results are published by the HCP in its annual "Activité, Emploi et Chômage. Resultats Detailles" and are available for: 1999 to 2011. Table 2.4 of the report offers employment by activity. We aggregated employment into our 4 sectors as follows. First, we aggregated employment in extractive industries, food, beverages and tobacco industries, textile industry, and other manufacturing industries into the manufacturing sector ("man"). Similarly, we classified employment in extractive industries as employment in the mining and quarrying sector ("min"). Likewise, we classified employment in agriculture, forestry, and fishing as employment in agriculture ("agr"). Finally, we aggregated employment in all other sectors – excluding electricity, water, and gas and construction and public works – to get an estimate of employment in the services or tertiary sector ("ter"). While the trend in employment in agriculture for people aged 15 and over from 2003-2011 is consistent, prior to 2003 employment in agriculture for people aged 15 and over is significantly lower (almost 10% lower). However, if we include persons under 15 years old in agricultural employment prior to 2003, the big drop in agricultural employment is greatly reduced. Hence, for years prior to 2003 we use total employment in agriculture (including those under 15 years of age). For the rest of the sectors, we use employment for persons aged 15 and over.

Value Added: Our value added data comes from the HCP's national accounts data.[21] We aggregated sectoral value added to our 4 sectors of interest. Similarly, we rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Mozambique

Years: 2003 and 2009.

Employment: Our sectoral employment data comes from the IMF's Regional Economic Outlook for Sub-Saharan Africa (2012).

[19] See McMillan and Rodrik (2011) for details.
[20] *Idem.*
[21] Haut-Commissariat au Plan "Comptes Nationaux 1980-2008." April 2010.

Value Added: Our value added data comes from Instituto Nacional de Estatística's (INE) national accounts report[22] aggregated to our 4 sectors of interest. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Nigeria

Years: 1999 and 2009.

Employment: Our sectoral employment data comes from Adeyinka, Salau and Vollrath (2012).[23] Their estimates are based on several rounds of Nigeria's National Bureau of Statistics (NBS) General Household Surveys (GHS): 1996 to 1999, and 2005 to 2009. To estimate employment, they use answers from the GHS based on main job in the last week. The authors point to issues with industry classifications in the 2008 GHS which do not correspond to ISIC definitions. They also point to an anomalous increase in manufacturing employment in 2010 when compared to this variable's long-term trend. For these reasons, and following Adeyinka, Salau and Vollrath (2012) we use estimates for 2009. We aggregated sectoral employment to our 4 sectors of interest.

Value Added: We used estimates of sectoral value added from Adeyinka, Salau and Vollrath (2012) aggregated to our 4 sectors of interest. These authors find anomalies in value added for crop production (which accounts for a large share of total value added in agriculture). The original series shows a big jump in 2002, which persists from 2002 onwards, and is inconsistent with the trends observed for FAO's crop production index and total production of cereals. They correct this issue by eliminating the jump in 2002 while maintaining the observed growth in real crop value added from 2002 on (see Adeyinka, Salau and Vollrath, 2012 for details). Similarly Adeyinka, Salau and Vollrath (2012) find an unusual jump in 2001 in the trend for value added in electricity that does not correspond with data on electricity production. They correct this series in a similar manner to the methodology they used for correcting value added in crop production. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Rwanda

Years: 1996 and 2005.

Employment: Our sectoral employment comes from the IMF's Regional Economic Outlook for Sub-Saharan Africa (2012).

Value Added: To get our sectoral value added estimates we used data form UN's National Accounts Main Aggregates Database. Value added in agriculture and manufacturing are already presented as separate series, and we used those for our estimates of value added in agriculture and manufacturing, respectively. On the other hand, we constructed our value added series for the tertiary sector by

[22] Instituto Nacional de Estatística (INE) "Contas Nacionais Preliminares IV Trimestre 2011."
[23] We thank the authors for sharing their data with us.

aggregating value added in all services sectors.[24] Constructing the value added series for mining and quarrying was a bit more cumbersome. The UN's data does not disaggregate value added in mining and quarrying; it is presented within an aggregate series which includes value added in manufacturing, mining and quarrying, and utilities.[25] To get estimates of value added in mining and quarrying we did the following. First, we subtracted value added in manufacturing from total value added in manufacturing, mining and quarrying, and utilities to get an estimate of total value added in the latter sectors. Then, we calculated the share of total value added in mining and quarrying, and utilities that the mining and quarrying sector represents using data from the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007" (for 1996) and Rwanda's National Institute of Statistics (NIS) "GDP National Accounts 2011" (for 2005). Finally, using these shares, we estimated value added levels for mining and quarrying from total value added in mining and quarrying, and utilities. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Tanzania

Years: 2000 and 2007.

Employment: Our sectoral employment comes from the IMF's Regional Economic Outlook for Sub-Saharan Africa (2012).

Value Added: Our value added data for Tanzania comes from Tanzania's National Bureau of Statistics (NBS) national accounts data.[26] The NBS offers estimates of sectoral value added for 15 sectors, following ISIC Rev. 3. We aggregated value added into our 4 sectors of interest as follows. We aggregated value added in Agriculture, Hunting, and Forestry (ISIC Rev. 3 category A) and value added in Fishing (category B) into a single category: agriculture ("agr"). For value added in the tertiary sector ("ter") we aggregated value added in categories G-O. For value added in mining and quarrying ("min") and manufacturing ("man") we used data on value added for the corresponding sectors in the NBS' data (categories C and D, respectively). We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7.

Uganda

Years: 1999 and 2009.

Employment: We calculate employment by sector from Uganda's National Household Survey data for the 1999/2000, and from Uganda's National Panel Survey 2009/2010. We kept only those 15 years old and older who reporting being employed and who reported employment sector for their main activity. We aggregated employment to our 4 sectors of interest.

[24] Following the classification shown in Table A1 above.
[25] However, as mentioned previously, it does offer a separate value added series for manufacturing.
[26] "National Accounts of Tanzania Mainland 2000-2010" published by the National Bureau of Statistics; September 2011.

Value Added: Our value added data for Uganda comes from Uganda's Bureau of Statistics (UBOS) Statistical Abstracts for 2008 and 2010, as well as from the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007." We start by using sectoral value added from the Statistical Abstracts (from 2003 to 2009). We use data from the UN's "National Accounts Statistics: Main Aggregates and Detailed Tables, 2007." to calculate sectoral value added growth rates prior to 2003. Using this data, we get estimates of sectoral value added based on the latest available sectoral estimates published by the UBOS in their Statistical Abstracts going back to 1997. We rebased all sectoral series to 2000 constant prices using implicit price deflators and converted values to PPP dollars using conversion factors from the PWT7 and aggregated value added to our 4 sectors of interest.

Zambia

Years: 2000 and 2006.

Employment: Our sectoral employment data comes from our own estimates of sectoral employment from various rounds of Zambia's Living Conditions Monitoring Survey (LCMS). In particular, we calculated sectoral employment for three rounds of the survey: 1998 (round II), 2002-2003 (round III), and 2006 (round V). For each round of the survey rounds we calculated sectoral employment at the 9 sector level[27] for individuals aged 15 and over.[28] We also calculated sectoral employment from the Zambia's 2000 Population and Housing Census microdata. However, employment levels (total and by sector) from the 2000 Population and Housing Census data seem to be too low[29] compared to the trends in sectoral and total employment from our LCMS estimates as well as those published in reports for other LCMS survey rounds and other household surveys for Zambia. Given this discrepancy in the 2000 census data, we interpolated sectoral employment between 1998 and 2002-2003 using our LCMS estimates for those years to get estimates of sectoral employment for 2000. Finally, we aggregated employment to our 4 sectors of interest.

Value Added: Our sectoral value added data comes from McMillan and Rodrik (2011).[30] Using their sources, we incorporated value added data for 2006 and aggregated employment to our 4 sectors of interest.

[27] As defined in McMillan and Rodrik (2011).
[28] We kept only those who reported sector of employment and held the same job for the past 12 months to capture workers' "main" or "usual" employment.
[29] About 500,000 workers lower than the numbers reported in the 1998 and 2002-2003 LCMS surveys. Moreover, the 2000 census estimates (even those reported on the census report) of sectoral and total employment seem to be at odds with trends and levels from a number of household surveys (which tend to be quite consistent between each other).
[30] We refer the reader to the original paper for further details.

Appendix 2: Occupation information from Demographic and Health Surveys

The DHS data sets provide comprehensive information on employment and occupation for women and men. The procedure used to determine whether individuals are working and if so, in what occupation is described in this appendix.

Women and men aged 15 to 49 (sometimes 15-59) respond to the questions on employment and occupation. Questions on occupation and employment are asked in the main questionnaire. The respective variables are then included in the "woman's" recode and in the "man's" recode, respectively. First, each woman or man is asked about her/his current working status. The questions asked are as follows: 1) "aside from your own housework, have you done any work in the last seven days? 2) "As you know, some women take up jobs for which they are paid in cash or in kind. Others sell things, have a small business or work on the family farm or in the family business. In the last seven days, have you done any of these things or any other work?" 3) Although you did no work in the last seven days, do you have any job or business from which you were absent for leave, illness, vacation, maternity leave, or any other reason?" 4) Have you worked at all within the past 12 months. The combination of these four questions builds the foundation for the variable "respondent is currently working" (v714) in the DHS data set. This means that respondents are considered as "employed" or "working" if they reported that they were working within the last seven days or if they worked at any time within the last 12 months.

The employment status of the respondent (v714) determines whether information is collected about the respondent's occupation. If the answer to question v714 is yes, the woman/man is then asked: "What is your occupation, that is, what kind of work do you mainly do?" (v716). Answers to this question are directly typed into the questionnaire resulting in a large number of reported occupations. Differences occur mainly as a result of different wordings and different languages of reported occupations. In our pooled data set around 3,000 different answers have been recorded. To standardize occupation types across countries, surveys, and over time, V716 is recoded into a second variable, v717, which groups the answers from variable v716 into 11 different occupation categories. These categories are: "not working", "professional/technical/managerial", "clerical", "sales", "agricultural - self employed", "agricultural – employed", "household & domestic", "services", "skilled manual", "unskilled manual", and "army".

The variable v717 - occupation of women and men - is the foundation for our analysis. Hence, we restrict our sample to surveys where information on v717 is available. However, prior to analysis, coding errors in the variable v717 have been corrected. In most cases this was not necessary but there were some blatant errors that were obvious such as coding all agricultural workers as military workers such that a country had no workers in agriculture. For example, v717=10 is categorized as "army" or "armed forces" in most of the surveys where this category exists (Gabon 2012, Guinea 2005, Niger 2006, and Rwanda 2005), however in Mali 2006 v717=10 is categorized as "agriculture, breeding, fishing, forest". In cases like this, we recoded the variable to be consistent with the coding for other countries by coding these workers as agricultural workers.

Table A1 shows how we arrive at our final sample after having taken into account these issues. First, we drop all single-survey countries allowing us to analyze changes in occupation by socioeconomic subgroups over time. This leaves us with a sample 87 women's recodes and 76 men's recodes from 25 countries. Second, we dropped missing values and miscoded values from the sample. All "Don't know" answers or "missing" for variable v717 are considered as missing and are dropped from the sample (v717=95, 96, 97, 98, or 99).

Finally, after dropping countries for which the variable v17 was missing and countries for which only one survey round of data was available, we are left with a total of 25 countries and a sample size of 819,419 women and 275,162 men. Table A2 shows the mean shares and frequencies of the occupation types for women and men for the final sample. For our analysis we further aggregate the information on occupation. Clerical, sales and services are grouped into on category. The same is done for agricultural –self employed and agricultural – employee, which are groups to one category "agriculture". Note that the share of men and women not working appears high in Table A2 because it includes individuals who are not working because they are in school.

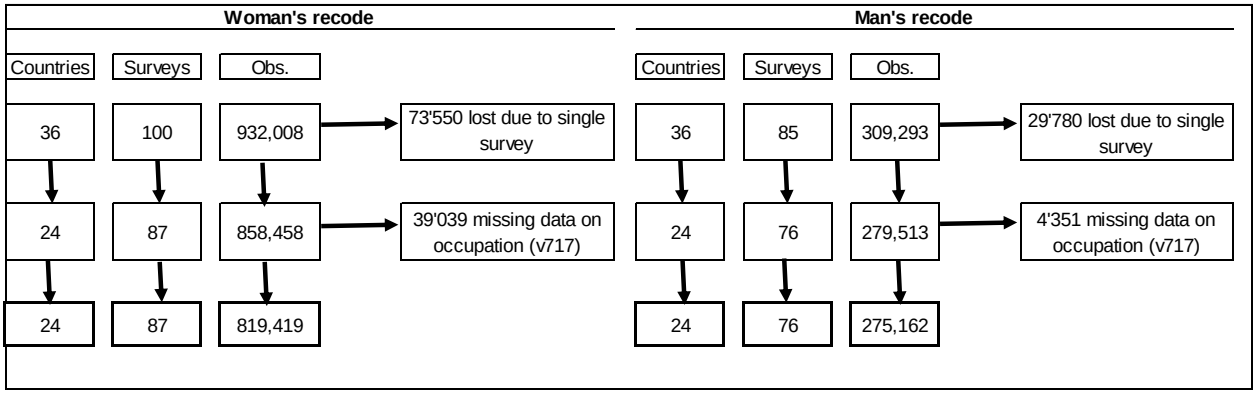


Table A2: Number of Observations by V717 in Final Sample

	Men		Women	
Respondent's occupation (grouped)	Freq.	Percent	Freq.	Percent
Not working	281,044	34.3	45,021	16.36
Professional/technical/managerial	21,373	2.61	16,902	6.14
Clerical	9,208	1.12	5,086	1.85
Sales	139,902	17.07	21,800	7.92
Agricultural - self employed	239,943	29.28	94,247	34.25
Agricultural - employee	33,035	4.03	30,254	10.99
Household and domestic	9,237	1.13	2,183	0.79
Services	25,892	3.16	12,774	4.64
Skilled manual	37,706	4.6	32,026	11.64
Unskilled manual	21,927	2.68	14,586	5.3
Armed forces	152	0.02	283	0.1
Total	819,419	100	275,162	100

Source: Demographic and Health Surveys; calculations by the authors.

Appendix 3: Changes in Sectoral Employment Shares 2000-2010

Table A.3: Change in Sectoral Employment Shares 2000-2010

	Agriculture	Mining	Manufacturing	Tertiary
Algeria	-10.81	0.20	1.29	9.32
Angola	-12.55	-0.28	0.15	12.69
Cameroon	-5.23	-0.11	5.49	-0.15
Egypt	4.74	-0.17	-0.81	-3.75
Ethiopia	-8.59	0.34	2.67	5.58
Ghana	-11.02	-0.41	-0.19	11.62
Kenya	-21.56	0.00	7.19	14.37
Malawi	-10.90	-0.04	1.44	9.50
Mali	-3.76	0.01	1.41	2.34
Mauritius	-3.91	-0.28	-8.62	12.80
Morocco	-7.06	-0.13	0.40	6.79
Mozambique	-0.92	-0.69	3.94	-2.34
Nigeria	-6.92	0.15	0.99	5.78
Rwanda	-10.55	0.48	2.48	7.58
Senegal	-6.54	0.14	2.97	3.43
South Africa	-7.84	-2.47	-0.12	10.42
Tanzania	-11.54	0.20	1.49	9.85
Uganda	-11.19	0.12	1.22	9.86
Zambia	-0.03	0.12	0.33	-0.43
Average (all countries)				
Simple Average	-7.69	-0.15	1.25	6.59
Weighted Average	-6.30	-0.07	1.14	5.27
Average (excluding N. Africa, Mauritius and S. Africa)				
Simple Average	-8.61	-0.16	2.10	6.67
Weighted Average	-8.35	-0.06	1.87	6.54

Source: Own calculations using data described in the data appendix.

Notes:

1. Table shows 10-year changes in sectoral employment shares (in percentage points). Due to data availability, initial and final years are not the same for some countires so direct comparisons are not possible. In order to make results comparable, changes were first annualized and then multiplied times 10 to get percentage point changes in shares in a 10 year period.
2. Weighted averages use total employment in 2000 as weights. If employment in 2000 was not available, value was estimated using a linear projection.
3. Changes in shares might not add up to zero due to rounding.