

Patterns of Structural Change in Developing Countries

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Abstract

This paper introduces the updated and extended Groningen Growth and Development Centre (GGDC) 10-Sector database. The database includes annual time series of value added and persons employed for ten broad sectors of the economy from 1950 onwards. It now includes eleven countries in Asia (China has been added compared to the previous release), nine in Latin America and eleven in Sub-Saharan Africa. We use the GGDC 10-Sector database to document patterns of structural change in developing countries. We find that the expansion of manufacturing activities during the early post World War II period was related to a growth-enhancing reallocation of resources in most countries in Asia, Africa and Latin America. This process of structural change stalled in many African and Latin American countries during the mid-1970s and 1980s. When growth rebounded in the 1990s, workers mainly relocated to market services industries, such as retail trade and distribution. Though such services have higher productivity than much of agriculture, they are not technologically dynamic and have been falling behind the world frontier.

1. Introduction

A central concept in development economics is the notion of structural change. Structural change, which we narrowly define in this paper as the reallocation of labour across sectors with different productivity levels, featured prominently in the early literature on economic development by Kuznets (1966). Technological change typically takes place at the detailed industry level and thereby induces differential patterns of sector productivity growth. At the same time, changes in demand and international trade drive a process of structural transformation in which production factors such as capital, labour, and intermediate inputs are continuously relocated across locations and economic activities.¹

The long-run pattern of structural transformation has been carefully documented for advanced economies (see e.g. Jorgenson and Timmer, 2011). One of the best known patterns of structural change for this set of currently mature economies is the shift of capital and labour away from the production of primary goods and towards manufacturing and services. This development pattern featured prominently in explanations of divergent growth across Europe, Japan and the United States in the post WW II period (Denison, 1967; Maddison, 1987). More recently, differential productivity growth rates in market services sectors such as retail trade, distribution, and financial services between the U.S. and Europe have been emphasized (Timmer et al., 2010; Jorgenson and Timmer, 2011). While the process of structural change in advanced economies is well documented, we know much less about the nature of structural transformation in today's developing economies. The absence of long-term and detailed sector data for developing economies since the seminal work by Chenery et al. (1986) has obscured a proper quantitative assessment of the role of structural transformation in accounting for aggregate productivity growth.

In this paper we aim to partially fill that gap by describing similarities and differences in the patterns of structural change across developing countries in Asia, Africa, and Latin America since the 1950s. To this end, we introduce the updated and extended Groningen Growth and Development Centre (GGDC) Sector database in section 2. The database includes annual time series of value added and persons employed for ten broad sectors of the economy. It now includes eleven countries in Asia (China has been added compared to the previous release), nine in Latin America and eleven in Sub-Saharan Africa (referred to as Africa in the remainder of this paper). Data on the number of workers is based on the broadest employment concept, including self-employed, family-workers and other informal workers. The dataset is based on a critical assessment of the coverage and consistency of

concepts and definitions used in various primary data sources. Data and documentation are freely and publicly available online.¹

Section 3 uses the GGDC sector database to document patterns of structural change. We show that the expansion of manufacturing activities during the early post World War II period led to a growth-enhancing reallocation of resources in Asia, Africa and Latin America. This process of structural change stalled in Africa and Latin America during the mid-1970s and 1980s. When growth rebounded in the 1990s, workers mainly relocated to market services industries, such as retail trade and distribution. Though such services have higher productivity than much of agriculture, they are not technologically dynamic and have been falling behind the world frontier.

This development pattern has important ramifications for the role of structural change in accounting for productivity growth in developing countries currently. In section 3 we use a method that splits structural change into the contribution from the reallocation of workers to above average productivity *level* sectors (static reallocation effect) and the contribution from the reallocation to above average productivity *growth* sectors (dynamic reallocation effect). A key finding is that in Africa and Latin America, workers moved from below-average productivity to above-average productivity sectors (static gains). However, sectors with above-average productivity levels that expanded in terms of employment shares experienced below-average productivity growth (dynamic losses). This development pattern in Africa and Latin America contrasts to that observed in Asia where dynamic losses are hardly observed. A key role for these static gains and dynamic losses is the missing contribution from manufacturing nowadays in Africa and Latin America. In section 4 we provide concluding remarks and outline promising areas for future research.

2. The GGDC Sector Database

Comparative studies of growth have been hampered by the lack of a large-scale international database on output and productivity trends by sector in developing countries. In this section we present the updated and extended GGDC Sector database which is the first database to provide long-term series on sectoral developments.² The database is constructed on the basis of an in-depth study of available statistical sources on a country-by-country basis. This section discusses the contents of the database, the selection procedure of the sources used, as well as the methods employed to ensure intertemporal, international and internal consistency. Compliance with consistency requirements is important to ensure the usefulness of the database in long-term analyses of growth and productivity. Readers

¹ The Groningen Growth and Development Centre 10 Sector Database (release June 2014). Available from: <http://www.ggdc.net/dseries/10-sector.html>.

more interested in the patterns of structural change across developing countries can skip this session and continue reading in section 3.

2.1 Contents of the data set

Below, Table 1 gives an overview of the contents of the GGDC Sector database. The data set currently includes eleven Asian, nine Latin American, and eleven African countries. It includes annual data on gross value added at current, constant, and international prices from 1950 onwards. In addition, annual data on persons employed is available, which allows the derivation of labour productivity (value added per worker) trends. The database covers the ten main sectors of the economy as defined in the International Standard Industrial Classification, Revision 3.1 (ISIC rev. 3.1). These ten sectors cover the total economy. The dataset has been updated to 2010 and now includes China.

Table 1. Overview of the GGDC Sector Database

Economic distinguished (ISIC rev. 3.1 code):	activities	1. Agriculture, hunting, forestry and fishing (AtB); 2. Mining and quarrying (C); 3. Manufacturing (D); 4. Electricity, gas and water supply (E); 5. Construction (F); 6. Wholesale and retail trade, hotels and restaurants (GtH); 7. Transport, storage, and communication (I); 8. Finance, insurance, real estate and business services (JtK); 9. Government services (LtN); 10. Community, social and personal services (OtP)
Variables included:		Persons engaged; Gross value added at current national prices; Gross value added at constant 2005 national prices; Gross value added at international 2005 prices (PPPs)
Countries included:		Africa: Botswana, Ethiopia, Ghana, Kenya, Malawi, Mauritius, Nigeria, Senegal, South Africa, Tanzania, and Zambia Asia: China, Hong Kong (China), India, Indonesia, Japan, Korea (Rep. of), Malaysia, Philippines, Singapore, Taiwan, Thailand Latin America: Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Mexico, Peru, Venezuela
Time period:		1950 – 2010

Notes: starting date of time series varies across variables and countries depending on data availability. Typically, for Latin American countries the series start in 1950, for Africa in the 1960s, while for many Asian countries series start in the 1970s.

2.2 Construction of variables

Gross value added in current and constant prices is taken from the National Accounts of the various countries. As these have all been compiled according to the UN System of National Accounts, international comparability is high, in principle. However, national statistical institutes frequently change their methodologies. Within the National Accounts, GDP series are periodically revised which includes changes in the coverage of activities (for example after a full economic census has been carried out and “new” activities have been discovered), changes in the methods of calculation (for example the inclusion of software expenditures as investment rather than intermediate consumption), and changes in base year of the prices used for calculating volume growth rates.³ For sectoral GDP our general approach is to start with GDP levels for the most recent available benchmark year, expressed in that year’s prices, from the National Accounts provided by the National Statistical Institute or Central Bank. Historical national accounts series were subsequently linked to this benchmark year.⁴ This linking procedure ensures that growth rates of individual series are retained although absolute levels are adjusted according to the most recent information and methods.

Employment in our data set is defined as ‘all persons employed’, thus including all paid employees, but also self-employed and family workers. Labour input is normally not available from a country’s national accounts as they are not part of the System of National Accounts. Two different primary sources of employment data exist, namely labour force surveys (LFS) with data collected at the household level, and business surveys which are based on firm-level questionnaires. Both have their advantages and disadvantages as a source for annual sectoral employment trends.

The LFS are a comprehensive and well-established source with substantive international harmonization of concepts because they use definitions set out by the International Labour Organization (ILO), although sampling size and techniques may still differ substantially between countries. The LFS cover employees as well as self-employed and family-labour. The main problem with LFS is the limited consistency with output data from the national accounts, especially at the sectoral level due the relatively small sample size. In addition, the sample is sometimes restricted to particular regional areas, such as urban areas.

Information from business surveys is often more consistent with value added measures in the national accounts, because output series for the national accounts are also based on this source. However, while the coverage by business surveys is reasonably

accurate for goods producing industries, this is not always the case for services. Moreover business surveys typically only cover firms who surpass a certain threshold (for example, >20 employees or above a certain turnover level). This excludes smaller firms, which are especially abundant in developing countries. Another limitation is that data on self-employed and unpaid family members are usually not collected. This is problematic for sectors like agriculture and informal parts of the economy, where these categories make up a significant share of total employment. Business surveys are therefore not well suited to provide employment statistics by sectors that cover the total economy.

Therefore we often use an alternative source based on household questionnaires but with a much larger coverage than the samples of the LFS: the population census. This ensures full coverage of the working population and a much more reliable sectoral breakdown than from the LFS.⁵ However, typically population censuses are quinquennial or decennial and cannot be used to derive annual trends. Therefore we use the population census to indicate absolute levels of employment, and use LFS and business surveys to indicate trends in between. This is the general strategy followed for most countries, but not for all.⁶

2.3 Consistency

In constructing the database, we paid careful attention to three checks on consistency, namely intertemporal consistency, international consistency, and internal consistency. Our time series of gross value added and employment are consistent over time (that is, intertemporal consistency). Through the linking procedure described above, major breaks in the series have been repaired. International consistency of the cross-country sectoral data is ensured through the system of national accounts for value added, the employment concept of persons engaged and the use of a harmonized sectoral classification. We classify activities into ten sectors, using the International Standard Industrial Classification (ISIC), Revision 3.1. The industrial classification used in the national primary data sources is based on this classification or is directly related to it.

Finally, for the derivation of meaningful productivity measures, the labour input and output measures should cover the same activities (i.e. being internally consistent). As we use persons employed as our employment concept rather than employees, and base our employment numbers on large-scale surveys, overlap in coverage of the employment statistics and value added from the National Accounts is maximized. However, a notable exception is the own-account production of housing services by owner-occupiers. For this an imputation of rent is made and added to GDP in many countries, according to the System of National Accounts. This imputed production does not have an employment equivalent and

should preferably not be included in output for the purposes of labour productivity comparisons.⁷ Therefore, the GGDC Sector database presents separate series for imputed rents. In our decomposition analysis we exclude imputed rents.

2.4 Reliability

A note of caution on the data is warranted. Recently, scholars have pointed out anew that the statistical foundations underlying GDP and employment estimates in many developing countries, notably but not exclusively Africa and China, are subject to substantial measurement error (Devarajan, 2013; Jerven, 2013). The low quality of statistics is related to a weak capacity to collect, manage, and disseminate data; inadequate funding of statistical offices; diffuse responsibilities on who is collecting what; and fragmentation in surveys and gathering exercises. Young (2012) argues that many African countries do not have a well-established statistical system, not even reporting national accounts data on a consistent basis. He therefore explores alternative sources of information on national income using demographic and health survey data. Likewise, GDP and employment estimates in large developing countries such as India and China might have substantial measurement errors (de Vries et al. 2012). However, most countries included in the Sector database do have a considerable history of collecting national accounts data and in conducting labour and household surveys. The quantity and quality of the data varies between countries, reflected in the list of countries included in the Appendix tables.

3. Patterns of Structural Change in Developing Countries

In this section we first document the main shifts in value added and employment across sectors and countries using the GGDC Sector database. We document the declining manufacturing employment share in Africa and Latin America since the mid 1970s. Production and employment increasingly originates in services activities. In particular, the share of trade and distribution services in developing economies has expanded to levels observed in OECD economies. However, productivity levels in market services have been falling behind the technology frontier, implying that the sector lacks technological dynamism. Next, we briefly outline a methodology to decompose aggregate productivity growth into growth at the sector level (the within effect) and a reallocation effect. A key finding is that the expansion of trade and distribution services after 1990 resulted in static reallocation gains, but with productivity growth in market services that was below average. This pattern of static gains but dynamic losses from resource reallocation holds for most African and Latin American countries, but not for Asia.

3.1 Sector shares of GDP and Employment

Table 2 and Table 3 show value added and employment shares by sector for Africa, Asia, and Latin America for the years 1960, 1975, 1990, and 2010.⁸ The shares are computed as unweighted regional averages. Typically most attention is paid to the size of the manufacturing sector as economic development is often thought to be closely associated with industrialization (Lewis, 1954). Two important trends emerge from Tables 2 and 3 in this respect. First, manufacturing expanded during the 1960s and early 1970s. After 1975 the share of manufacturing in aggregate GDP started to decline in most African and Latin American countries. This contrasts to the pattern observed in Asia, where the manufacturing share in value-added has held up at about 25 percent of GDP, although shares have also fallen back somewhat since the 1990s. Individual country experiences differ. For example, manufacturing employment shares increased in Botswana and Tanzania during the past decades (McMillan et al. 2013). However, most African and Latin American countries have de-industrialized in terms of a falling share in GDP since the mid 1970s. Second, for most African countries, the share of manufacturing in GDP and the labour force has never reached levels observed in either Asia or Latin America. Together, these trends suggest that de-industrialization sets in at earlier development stages and at lower employment levels in developing countries (Rodrik, 2013).

Table 2. Value added shares (current prices), 1960 -2010

	Africa				Asia				Latin America			
	1960	1975	1990	2010	1960	1975	1990	2010	1960	1975	1990	2010
Agriculture	38	29	25	22	26	21	13	8	19	14	10	7
Industry	24	30	33	28	30	35	38	36	33	38	39	37
Mining	8	6	11	9	3	4	3	3	6	7	8	12
Manufacturing	9	15	14	10	22	24	27	24	19	22	23	16
Other industry	7	9	7	9	6	7	8	8	8	9	8	9
Services	38	41	43	50	43	44	49	56	48	48	54	56
Market services	24	25	28	34	31	31	36	40	33	32	37	36
<i>Trade and distribution</i>	21	21	23	25	24	24	26	27	26	24	26	24
<i>Financial services</i>	3	5	5	9	7	7	10	14	7	8	11	11
Non-market services	14	15	14	16	13	13	13	16	14	16	17	20
<i>Governmental services</i>	11	12	12	12	7	7	7	8	4	5	7	8
<i>Other services</i>	3	3	3	4	6	6	6	8	11	11	10	12
Total economy	100	100	100	100	100	100	100	100	100	100	103	100

Notes: For some countries time series start later (BWA: 1964; ETH: 1961; KEN: 1969; MWI: 1966; MUS:1970; SEN: 1970; TZA: 1961; ZMB:1965; CHN: 1952; HKG: 1974; IDN: 1971; KOR: 1963; MYS: 1975; PHL: 71; SGP: 1970; TWN: 1963). For these countries we took the share from the most nearby year. Figures are unweighted averages across regions. Other industry includes construction and public utilities. Trade and distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services excludes real estate activities. Other services includes other community, personal and household services. Numbers may not sum due to rounding. The countries distinguished are shown in Appendix Tables I to III.

Source: Authors' calculations using the GGDC Sector Database.

Table 3. Employment shares, 1960 -2010

	Africa				Asia				Latin America			
	1960	1975	1990	2010	1960	1975	1990	2010	1960	1975	1990	2010
Agriculture	73	66	62	51	48	43	32	21	47	34	25	14
Industry	9	13	14	13	19	23	26	23	21	24	24	22
Mining	2	1	2	1	1	1	1	0	2	1	1	1
Manufacturing	5	8	9	7	15	18	19	15	14	15	15	12
Other industry	3	4	4	4	4	5	6	8	5	7	7	9
Services	18	21	24	37	33	34	42	56	32	42	51	64
Market services	9	10	13	23	20	21	28	37	16	21	27	40
<i>Trade and distribution</i>	8	9	11	20	18	18	23	28	13	17	22	31
<i>Financial services</i>	1	1	1	3	2	3	5	9	3	4	5	9
Non-market services	9	10	11	13	13	13	15	18	17	21	24	25
<i>Governmental services</i>	4	4	6	8	6	6	7	8	4	6	7	7
<i>Other services</i>	5	6	5	5	7	7	8	10	12	15	17	17
Total economy	100	100	100	100	100	100	100	100	100	100	100	100

Notes: For some countries time series start later (BWA: 1964; ETH: 1961; KEN: 1969; MWI: 1966; MUS:1970; SEN: 1970; TZA: 1961; ZMB:1965; CHN: 1952; HKG: 1974; IDN: 1971; KOR: 1963; MYS: 1975; PHL: 71; SGP: 1970; TWN: 1963). For these countries we took the share from the most nearby year. Figures are unweighted averages across regions. Other industry includes construction and public utilities. Trade and distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services excludes real estate activities. Other services includes other community, personal and household services. Numbers may not sum due to rounding. Employment in our data set is defined as 'all persons employed', thus including all paid employees, but also self-employed and family workers, see section 2.2.

Source: Authors' calculations using the GGDC Sector Database.

In employment terms, the pattern is even more striking. In 2010, only 7 per cent of the African workforce is employed in manufacturing, which compares to 15 per cent in Asia and 12 per cent in Latin America. Workers who moved out of agriculture were mainly absorbed in the (formal and informal) services sector. This employment reallocation has been strongest in Latin America where the agricultural employment share fell from 47 per cent in 1960 to 14 per cent in 2010. At the same time, services expanded from 32 to 64 per cent of the total workforce. Disaggregating the services sector suggests that the biggest employment expansion occurs in trade and distribution services, although other community, personal and household services expanded rapidly as well.

Trade and distribution services expanded to levels observed in OECD countries. Its share increased from 8 per cent of the African workforce in 1960 to 20 per cent in 2010 and in Latin America from 13 per cent to 31 per cent. This employment expansion is not matched by an expansion in output as the value added share remained roughly constant between 21 and 27 per cent of GDP (see Table 2). For comparison, the employment share of trade and distribution services is between 19 and 21 per cent in Europe, Japan, and the United States (Jorgenson and Timmer, 2011).⁹

A comparison of sector shares in Table 2 and 3 gives an indication of relative productivity differences across sectors. Labour productivity in agriculture is much lower compared to services and even lower in relation to manufacturing.. In 2010, for example, the agricultural value added share in Africa is 22 per cent while the employment share is 51 per cent. This suggests agricultural labour productivity is about half that of the total economy average. In contrast, the services value added share is 50 per cent while the employment share is 37 per cent, whilst the same shares for manufacturing are 10% and 7% respectively. Therefore, labour productivity in services is above the economy average, although still below that in manufacturing. Also, note that the productivity gap between manufacturing and services is considerably higher in Asia than in Africa. In section 3.3 we outline a methodology to quantify the contribution of these sector differences and reallocation effects in accounting for productivity growth.

3.2 An international perspective on sector performance

First we extend the national perspective on the performance of sectors by comparing with the world technology frontier. In principle the use of the SNA framework allows us to compare output across countries. Yet, to compare productivity across countries and sectors, a key issue is how to convert real value added into common currency units. Conceptually, the appropriate

rate of exchange is to use a Purchasing Power Parity exchange rate (PPP). In addition, by now it is well known that relative prices vary substantially across tradable and non-tradable sectors, such that the use of aggregate PPPs is not appropriate for productivity comparisons of disaggregated data. Therefore, we use sector-specific PPPs provided by Inklaar and Timmer (2013). Relative prices across sectors are based on price data collected by the World Bank in the 2005 International Comparison Program (ICP) round except for agriculture, which is based on unit value information from the Food and Agriculture Organization (FAO). Basic headings from the ICP round are matched to sectors that are the main producers of the good or service and PPPs are estimated using the EKS method (see Inklaar and Timmer (2013) for details).

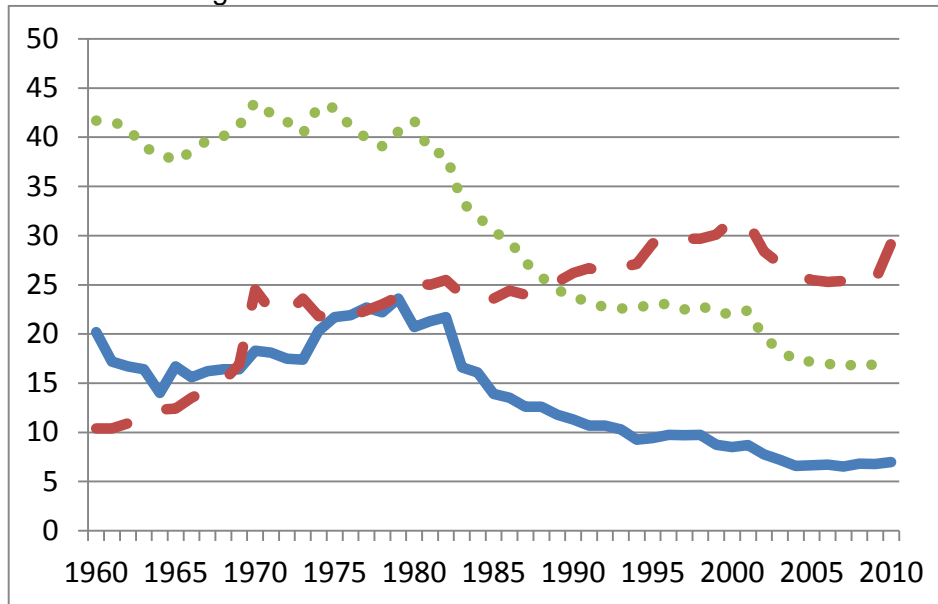
We define the United States as the frontier country and measure labour productivity relative to the frontier using sector-specific PPPs. This approach is followed for each sector and country at different points in time. Figure 1 panel A, shows the average productivity level across Africa, Asia, and Latin America for manufacturing. Values of the mean closer to the frontier correspond to a higher level of relative labour productivity.

Nowadays, the mean productivity level in Africa and Latin America lies substantially below the US productivity level. For manufacturing the sample mean is about 7 per cent in Africa, taking 2010 for comparison. This implies labour productivity of an average African manufacturing worker is about 1/14th that of an average American worker. For manufacturing, we observe productivity divergence, not convergence, in Africa and Latin America during the past fifty years.¹⁰ However, during the 1960s and 1970s, in these regions on average productivity trends were in line with growth at the US frontier as manufacturing productivity was not falling behind. This suggests that during the period 1960 to 1975 the expansion of manufacturing activity in Africa and Latin America was also a positive development when viewed from an international efficiency perspective.

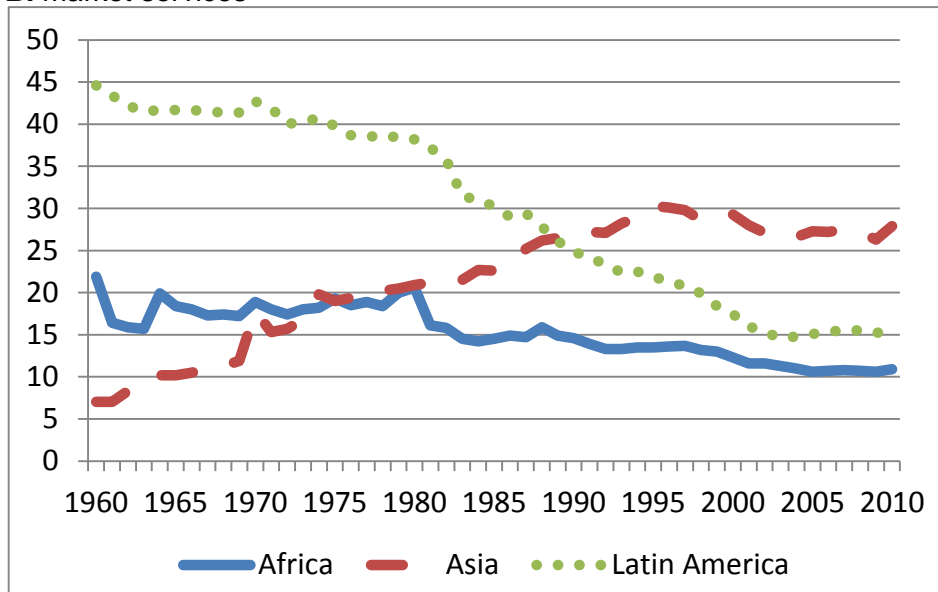
Panel B shows average productivity in market services. In the previous subsection we observed that market services expanded rapidly after 1990. Productivity growth was below the average of the total economy during that period. When viewed from an international perspective, the productivity performance of African and Latin American market services sectors since the 1990s was also not matching growth at the frontier.¹¹ Panel B in figure 1 suggest that productivity in market services fell further behind the frontier during a period in which its employment expanded rapidly. In the next subsection we will seek to quantify the contribution of structural change in accounting for productivity growth in developing countries.

Figure 1. An international perspective on productivity (USA = 100)

A. manufacturing



B. market services



Notes: unweighted averages across regions.

Sources: Authors' calculations using GGDC Sector Database, as well as sector-specific PPPs from Inklaar and Timmer (2013).

3.3 Patterns of Structural Change: Decomposition Results

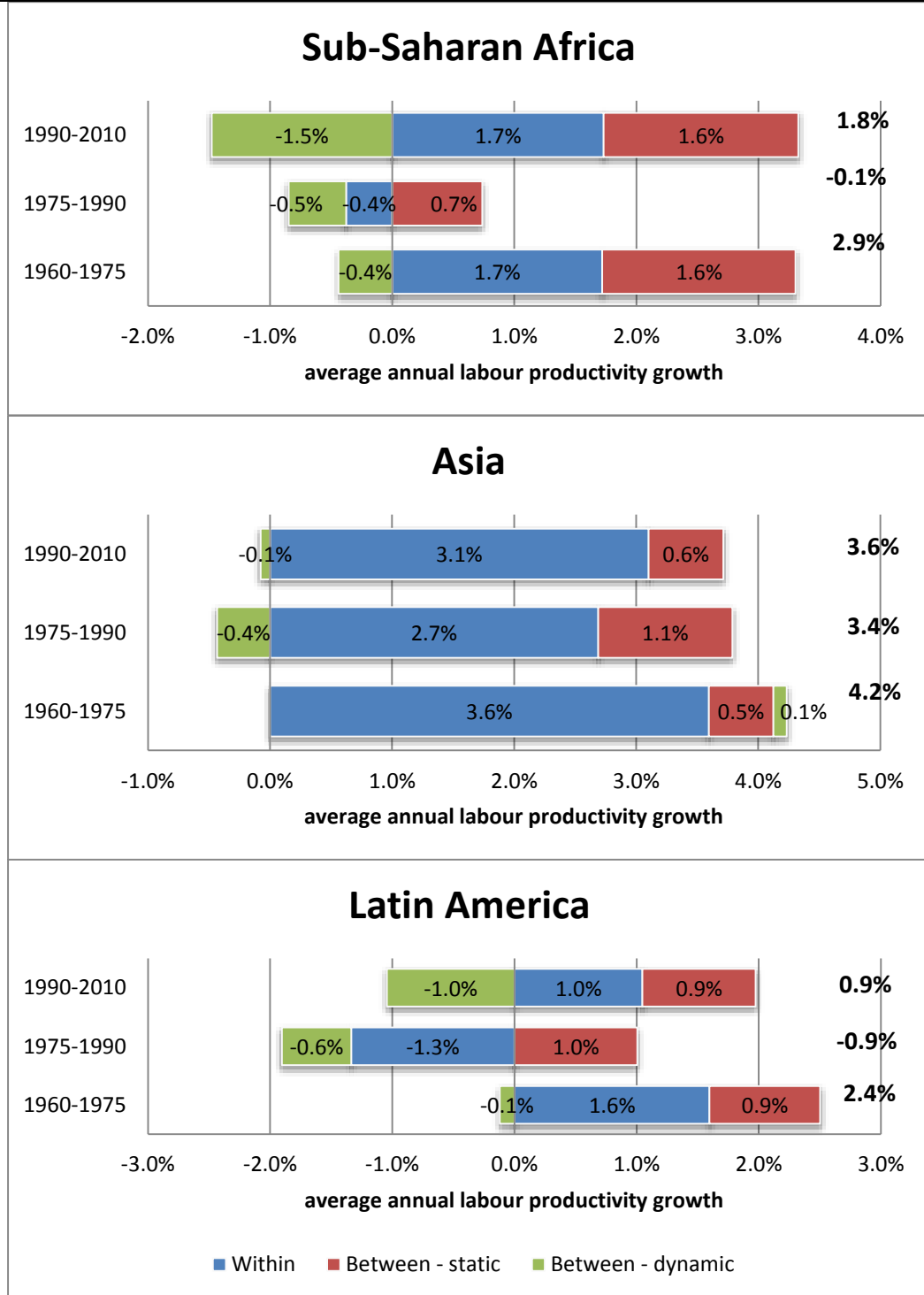
To measure the contribution to growth from the reallocation of workers across sectors of the economy, researchers typically use a variant of the canonical decomposition originating from Fabricant (1942), which we follow. The decomposition method we use here has base periods for both employment shares and productivity levels. The change in aggregate productivity can be decomposed as follows

$$\Delta P = \sum_i (P_i^T - P_i^0) S_i^0 + \sum_i (S_i^T - S_i^0) P_i^0 + \sum_i (P_i^T - P_i^0) * (S_i^T - S_i^0), \quad (1)$$

where S_i is the share of sector i in overall employment, P_i the labour productivity level of sector i , and superscript 0 and T refer to initial and final period. In equation (1), the change in aggregate productivity is decomposed into within-sector productivity changes (the first term on the right-hand side which we call the “within-effect” also known as “intra-effect”) and two other effects. The within-effect is positive (negative) when the weighted change in labour productivity levels in sectors is positive (negative). The second term measures the contribution of labour reallocation across sectors, being positive (negative) when labour moves from less (more) to more (less) productive sectors. The third term in equation (1) is known as the cross term or interaction term. It represents the joint effect of changes in employment shares and sectoral productivity growth. It is positive (negative) if workers are moving to sectors that are experiencing positive (negative) productivity growth. Hence, the second term in equation (1) measures whether workers move to above-average productivity level sectors (static reallocation effect) whereas the third term measures whether productivity growth is higher in sectors that expand in terms of employment shares (dynamic reallocation effect).

Decomposition results are shown in figure 2. We have used a periodisation that has become common in the literature on structural change (e.g. ADB, 2010; McMillan and Rodrik, 2011), namely 1960-1975, 1975-1990, and 1990-2010. The first period roughly coincides with a world-wide economic boom. Productivity growth was high across most developing countries, and the decomposition results suggest that a large part is accounted for by within-productivity growth. However, the reallocation of workers to above average productivity sectors also positively contributed to growth. The period from 1975 to 1990 is associated with a radical change in economic prospects for many African and Latin American countries. Indeed, average productivity growth during this period is close to zero. Decomposition results suggest that within-sector productivity growth accounts for a large share of the decline, but workers continued to move to above-average productivity *level* sectors. That is, the between effect is positive in both Africa and Latin America, despite low productivity growth.

Figure 2. Decomposition results for 1960-1975, 1975-1990, and 1990-2010



Notes: decomposition results using equation (1).

Sources: Authors' calculations using the GGDC Sector database. Detailed country results are available in the appendix tables.

In the period 1990 to 2010, productivity growth resumed. Our decomposition results suggest that the within-effect is positive, and also the static reallocation effect is positive. The latter

suggests that on average in developing countries positive static reallocation gains were achieved. What is striking however, is the contribution from the cross term. The cross term is substantially negative in Africa and Latin America suggesting dynamic losses. This suggests the marginal productivity of additional workers in expanding sectors was below that of existing activities. In Asia the interaction term is small, in line with findings by Timmer (2000), and earlier findings for Europe by Maddison (1987) and van Ark (1996), which may relate to a greater dynamism in manufacturing in Asia and Europe.

Overall, it seems that changes in the importance of manufacturing and market services for GDP and employment are relevant for explaining divergent patterns of growth and structural change across developing countries. However, to what extent is the expansion of trade and distribution services, discussed in section 3.1, accountable for the lack of productivity dynamics in Africa and Latin America? To properly measure the role of sectors in accounting for growth, we first have to adjust the decomposition presented in equation (1). The rationale for this adjustment is as follows. In the decomposition method presented above, all expanding sectors contribute positively to aggregate productivity, even when they have below-average productivity levels. Consider, for example, the expansion of employment in trade and distribution services at the expense of manufacturing. And assume that the productivity growth rate in distribution services is below average, while manufacturing labour productivity growth is above average. As a result of the shift in employment shares, aggregate productivity growth will become lower. Nevertheless, as measured in the traditional method, the contribution from the expansion of trade and distribution services is positive (if productivity growth is positive). In the modified method we therefore adjust the between and the cross term of an expanding sector to take into account its relative productivity level and its growth rate. To this end, we will divide sectors into expanding and shrinking based on their changes in employment shares and calculate the between-effect relative to the average productivity level of the shrinking sectors and the cross term relative to the average productivity change of the shrinking sectors. The decomposition in equation (1) is modified as follows:

$$P^T - P^0 = \sum_i^I (P_i^T - P_i^0) S_i^0 + \sum_j^K (S_j^T - S_j^0) (P_j^0 - P^{0*}) + \sum_j^J \left((P_j^T - P_j^0) - (P^{T*} - P^{0*}) \right) (S_j^T - S_j^0) \quad (2)$$

where J is the set of expanding sectors, and K is the set of shrinking sectors, and average labour productivity of shrinking sectors at time T and 0 is given by:

$$P^{0*} = \frac{\sum_k^K (S_k^T - S_k^0) P_k^0}{\sum_k^K (S_k^T - S_k^0)}$$

$$P^{T*} = \frac{\sum_k^K (S_k^T - S_k^0) P_k^T}{\sum_k^K (S_k^T - S_k^0)}$$

Table 4 shows the decomposition results from using equation (2). We decompose labour productivity growth for each country included in the GGDC Sector Database, and report the unweighted average by region for the period from 1960 to 2010. This adjusted decomposition does not affect the contributions coming from the various terms in the aggregate. Total economy results are therefore equal to those shown in figure 2. However, using equation (2) we are better able to examine the contribution of sectors in accounting for productivity growth. Table 4 suggests that the productivity growth is to an important extent accounted for by the shift of workers to above-average productivity level sectors. Across Africa, Asia, and Latin America the most important sector was services. In particular, trade and distribution services, which accounted for 0.73 percentage points of labour productivity growth in Africa.

Table 4a. Decomposition results by region, Africa, 1990-2010.

	Labour productivity growth	Component due to:		
		Within	Between	cross
Total Economy	1.85	1.73	1.59	-1.48
Contribution of:				
Agriculture		0.65	0.00	0.00
Industry		0.76	0.53	-0.43
Mining		0.17	0.04	-0.03
Manufacturing		0.15	0.19	-0.17
Other industry		0.44	0.31	-0.23
Services		0.32	1.06	-1.05
Market services		0.12	0.91	-0.86
<i>Trade and distribution</i>		<i>0.03</i>	<i>0.73</i>	<i>-0.74</i>
<i>Financial services</i>		<i>0.09</i>	<i>0.18</i>	<i>-0.12</i>
Non-market services		0.20	0.15	-0.19
<i>Governmental services</i>		<i>0.03</i>	<i>0.15</i>	<i>-0.15</i>
<i>Other services</i>		<i>0.17</i>	<i>0.01</i>	<i>-0.04</i>

Figures are unweighted averages across countries. Other industry includes construction and public utilities. Trade and distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services excludes real estate activities. Other services includes other community, personal and household services. Numbers may not sum due to rounding.

Source: Authors' calculations using the GGDC Sector Database.

Table 4b. Decomposition results by region, Asia, 1990-2010.

	Labour productivity growth	Component due to:		
		Within	Between	cross
Total Economy	3.64	3.08	0.62	-0.06
Contribution of:				
Agriculture		0.43	0.00	0.00
Industry		1.59	0.11	0.09
Mining		0.17	0.00	0.00
Manufacturing		1.27	0.04	0.12
Other industry		0.14	0.07	-0.03
Services		1.06	0.51	-0.15
Market services		0.76	0.42	-0.07
<i>Trade and distribution</i>		0.65	0.14	0.03
<i>Financial services</i>		0.11	0.28	-0.10
Non-market services		0.30	0.09	-0.08
<i>Governmental services</i>		0.12	0.06	-0.07
<i>Other services</i>		0.18	0.03	-0.02

Figures are unweighted averages across countries. Other industry includes construction and public utilities. Trade and distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services excludes real estate activities. Other services includes other community, personal and household services. Numbers may not sum due to rounding.

Source: Authors' calculations using the GGDC Sector Database.

Table 4c. Decomposition results by region, Latin America, 1990-2010.

	Labour productivity growth	Component due to:		
		Within	Between	cross
Total Economy	0.93	1.05	0.93	-1.04
Contribution of:				
Agriculture		0.34	0.00	0.00
Industry		0.74	0.33	-0.30
Mining		0.19	0.26	-0.17
Manufacturing		0.46	0.03	-0.05
Other industry		0.09	0.04	-0.08
Services		-0.04	0.59	-0.75
Market services		-0.11	0.60	-0.71
<i>Trade and distribution</i>		0.02	0.17	-0.31
<i>Financial services</i>		-0.13	0.43	-0.40
Non-market services		0.07	-0.01	-0.04
<i>Governmental services</i>		0.11	-0.01	-0.01
<i>Other services</i>		-0.04	0.00	-0.02

Figures are unweighted averages across countries. Other industry includes construction and public utilities. Trade and distribution includes transport services and distributive trade as well as hotels and restaurants. Finance and business services excludes real estate activities. Other services includes other community, personal and household services. Numbers may not sum due to rounding.

Source: Authors' calculations using the GGDC Sector Database.

Positive static reallocation gains are put into perspective in the light of the cross-term in the decomposition method. Table 4 suggests that sectors that expanded its employment shares had productivity growth rates below those of shrinking sectors, suggesting a shift away from manufacturing. Again, in particular the distribution services sector appears to account for a large part of these dynamics. The negative cross term for distribution services (-0.74 percentage points for Africa) suggests that its productivity growth was well below that observed in shrinking sectors. This finding also holds for other financial and business services in the case of Latin America.

4. Concluding remarks and directions for future research

This paper has documented development patterns across Asia, Africa, and Latin America since the 1950s. We have taken a very narrow perspective on structural change, studying changes in the sector structure over time. This parsimonious approach ignores other structural changes taking place in the economy, such as changes in savings and investment rates, urbanization, demographic transitions, changes in income inequality, and changes in culture and institutions. At the same time the narrow focus allows us to study several salient characteristics of many developing countries in detail. We have shown that current employment reallocation patterns in Africa and Latin America strikingly differs from that in earlier periods. In particular, during the 1960s and early 1970s, many developing countries took a step forward by expanding their manufacturing activities. This was related to growth enhancing structural change. In contrast, after 1990 market services activities such as retail trade and distribution services expanded. Although productivity levels in market services were above the average for the rest of the economy, productivity growth was not. Therefore, we observe static reallocation gains but dynamic losses. The overall effect was a limited role for structural change post 1990, which compares unfavourably to Africa's and Latin America's earlier period of high growth.

The analysis in this paper is based on the updated and extended GGDC Sector Database. In comparison to an earlier version presented in Timmer and de Vries (2009), the dataset has been updated to 2010. It has been extended by including China and eleven Sub-Saharan African countries. Our aim is to further extend the time and country coverage in the upcoming years. In particular, we would like to add countries from the Levantine. Also, more detailed survey data could be used to distinguish between formal and informal activities within sectors. De Vries et al. (2012) distinguish unregistered activities by sector in Brazil and India and show that it matters for the relative role of structural change. For example, formalization of economic activities in Brazil were related to positive structural change post 2000. In addition, we would like to add to the diversity of countries included in the dataset. Earlier work by Hollis Chenery and others have emphasized differences in patterns of structural change (Chenery et al. 1986; Kirkpatrick, 1987) For example, resource-rich countries may experience a delay in the shift away from agriculture and mining, and because of higher wages may choose more capital intensive resource-processing manufacturing activities. Small countries may specialize in producing a more select set of industrial products, whereas larger developing countries could have more diversified industrialization patterns. In addition, the nature of industrial policies may affect industrialization. Instead, in this paper we have closely followed the recent literature by studying averages across continents instead of accounting for much of the country heterogeneity.

Changes in the nature of economic globalization, in particular the emergence of international production networks call forth new empirical and methodological approaches to analyse structural change. Increased integration and fragmentation of production across national borders implies that a closed economy view on structural change is less relevant compared to an integrative view of structural change and comparative economic development (Matsuyama, 2009). For example, South Korea's manufacturing share in GDP has been stable, partly because it has been exploiting its comparative advantage in manufacturing activities, deeply integrating in 'factory Asia' (Sposi, 2011). Something similar might apply for other Asian countries which would explain the constant share of manufacturing in Asia observed in this paper. In particular, recent research that integrates a supply and demand perspective on structural change using input-output data is promising (Herrendorf et al. 2014). Another benefit of this approach is that it allows one to decompose gross output per worker, which is more consistent compared to current decompositions that mix a net measure (GDP) with gross flows (employment). Indeed, the analysis by Herrendorf et al. (2014) could be extended to an international setting by using world input-output tables, which might help to explain stable manufacturing shares in many Asian countries and falling shares in Africa and Latin America.

We have provided a quantitative account of structural transformation in developing countries. Our analysis suggests multi-sector models of economic growth should aim to include differential sectoral development within services activities. Indeed, an important explanation of differential productivity growth between African and Latin American countries on the one hand and Asian and OECD countries on the other lies in the nature and expansion of market services activities such as retail trade and distribution. Future research should aim to explain why these patterns occur. In addition, analysis of the role of resource reallocation for aggregate growth should be built up from the micro-level. Crucially, that would allow one to observe the marginal productivity of workers that reallocate across firms. The increasing availability of firm-level data and international input-output data opens up a promising research agenda.

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Appendix table I. Decomposition results by country, 1960-1975

Region	Time period	Component due to:			Labor productivity growth
		Within	Between - static	Between - dynamic	
Sub-Saharan Africa					
Botswana	1964-1975	3.2%	6.0%	-0.6%	8.6%
Ethiopia	1961-1975	-0.6%	1.5%	-0.6%	0.3%
Ghana	1960-1975	-0.7%	-0.1%	-0.2%	-1.0%
Kenya	1969-1975	0.6%	0.8%	-0.2%	1.2%
Malawi	1966-1975	1.2%	0.5%	-0.2%	1.5%
Mauritius	1970-1975	11.0%	2.6%	-1.8%	11.8%
Nigeria	1960-1975	4.1%	-0.2%	1.7%	5.6%
Senegal	1970-1975	-2.9%	0.9%	-0.2%	-2.2%
South Africa	1960-1975	2.1%	1.3%	0.6%	4.0%
Tanzania	1961-1975	1.2%	4.8%	-3.4%	2.6%
Zambia	1965-1975	-0.4%	-0.6%	0.1%	-1.0%
Asia					
India	1960-1975	2.0%	0.2%	-0.3%	2.0%
Japan	1960-1975	4.9%	0.7%	0.7%	6.3%
South Korea	1963-1975	2.6%	0.6%	0.5%	3.6%
Taiwan	1963-1975	4.7%	0.4%	0.6%	5.7%
Thailand	1960-1975	2.5%	1.7%	0.4%	4.6%
China	1960-1975	5.0%	-0.4%	-1.3%	3.2%
Latin America					
Argentina	1960-1975	2.6%	0.3%	-0.5%	2.4%
Bolivia	1960-1975	1.0%	2.6%	0.1%	3.6%
Brazil	1960-1975	1.9%	2.0%	0.3%	4.2%
Chile	1960-1975	2.0%	0.1%	-0.5%	1.6%
Colombia	1960-1975	1.5%	1.1%	-0.4%	2.2%
Costa Rica	1960-1975	0.9%	1.4%	-0.1%	2.2%
Mexico	1960-1975	0.9%	1.5%	0.1%	2.5%
Peru	1960-1975	2.1%	0.9%	0.3%	3.3%
Venezuela	1960-1975	1.3%	-1.6%	-0.4%	-0.6%

Appendix table II. Decomposition results by country, 1975-1990

Region	Time period	Component due to:			Labor productivity growth
		Within	Between - static	Between - dynamic	
Sub-Saharan Africa					
Botswana	1975-1990	4.3%	4.2%	-1.4%	7.1%
Ethiopia	1975-1990	-1.9%	0.2%	-0.1%	-1.7%
Ghana	1975-1990	-1.2%	0.0%	-0.1%	-1.3%
Kenya	1975-1990	-0.6%	1.5%	-0.6%	0.3%
Malawi	1975-1990	-1.0%	0.2%	-0.3%	-1.1%
Mauritius	1975-1990	0.3%	1.2%	-0.6%	0.9%
Nigeria	1975-1990	0.7%	-0.7%	-0.4%	-0.3%
Senegal	1975-1990	-3.2%	1.1%	-0.7%	-2.8%
South Africa	1975-1990	-1.0%	1.3%	-0.3%	-0.1%
Tanzania	1975-1990	-0.9%	0.9%	-0.5%	-0.5%
Zambia	1975-1990	0.3%	-1.7%	-0.3%	-1.6%
Asia					
Hong Kong	1975-1990	2.9%	2.0%	-0.1%	4.8%
India	1975-1990	1.2%	0.7%	0.1%	1.9%
Indonesia	1975-1990	0.1%	2.9%	-1.2%	1.9%
Japan	1975-1990	3.1%	0.3%	0.1%	3.5%
Korea	1975-1990	2.2%	2.3%	-0.2%	4.3%
Malaysia	1975-1990	7.5%	-0.3%	-4.0%	3.2%
Philippines	1975-1990	0.4%	0.3%	-0.4%	0.4%
Singapore	1975-1990	2.9%	0.4%	-0.1%	3.2%
Taiwan	1975-1990	4.5%	0.7%	0.1%	5.3%
Thailand	1975-1990	2.6%	1.2%	0.8%	4.6%
China	1975-1990	2.1%	1.6%	0.1%	3.8%
Latin America					
Argentina	1975-1990	-1.4%	-0.2%	-0.2%	-1.8%
Bolivia	1975-1990	-1.9%	1.2%	-1.0%	-1.6%
Brazil	1975-1990	-0.5%	1.4%	-0.5%	0.5%
Chile	1975-1990	0.2%	1.2%	-0.5%	0.8%
Colombia	1975-1990	0.6%	0.9%	-0.4%	1.1%
Costa Rica	1975-1990	-1.0%	0.6%	-0.3%	-0.6%
Mexico	1975-1990	-1.1%	1.1%	-0.4%	-0.3%
Peru	1975-1990	-3.6%	1.9%	-1.4%	-3.1%
Venezuela	1975-1990	-3.4%	0.7%	-0.4%	-3.1%

Appendix table III. Decomposition results by country, 1990-2010

Region	Time period	Component due to:			Labor productivity growth
		Within	Between - static	Between - dynamic	
Sub-Saharan Africa					
Botswana	1990-2010	4.1%	0.1%	-2.3%	1.9%
Ethiopia	1990-2010	1.2%	2.5%	-1.1%	2.6%
Ghana	1990-2010	2.3%	0.7%	-0.1%	2.9%
Kenya	1990-2010	-1.3%	2.4%	-1.6%	-0.5%
Malawi	1990-2010	-0.1%	4.7%	-3.1%	1.5%
Mauritius	1990-2010	3.1%	0.9%	-0.5%	3.6%
Nigeria	1990-2010	2.8%	-0.2%	-0.7%	1.8%
Senegal	1990-2010	2.1%	1.7%	-2.7%	1.0%
South Africa	1990-2010	2.0%	0.4%	-0.9%	1.5%
Tanzania	1990-2010	0.6%	2.8%	-1.4%	2.0%
Zambia	1990-2010	2.3%	1.6%	-1.7%	2.2%
Asia					
Hong Kong	1990-2010	2.5%	0.9%	-0.2%	3.2%
India	1990-2010	3.4%	1.4%	-0.1%	4.6%
Indonesia	1990-2010	2.0%	0.7%	0.1%	2.7%
Japan	1990-2010	1.4%	0.2%	-0.3%	1.3%
Korea	1990-2010	3.8%	0.8%	-1.4%	3.2%
Malaysia	1990-2010	2.7%	0.1%	0.2%	3.0%
Philippines	1990-2010	1.1%	0.4%	0.0%	1.5%
Singapore	1990-2010	2.5%	0.3%	-0.7%	2.1%
Taiwan	1990-2010	3.2%	0.2%	-0.1%	3.3%
Thailand	1990-2010	4.3%	1.5%	0.1%	5.9%
China	1990-2010	7.4%	0.3%	1.5%	9.3%
Latin America					
Argentina	1990-2010	2.5%	-0.1%	-0.5%	1.9%
Bolivia	1990-2010	2.1%	1.5%	-2.9%	0.7%
Brazil	1990-2010	0.7%	0.4%	-0.4%	0.7%
Chile	1990-2010	3.0%	0.6%	-0.8%	2.8%
Colombia	1990-2010	0.0%	0.6%	-0.3%	0.3%
Costa Rica	1990-2010	0.9%	1.3%	-1.1%	1.1%
Mexico	1990-2010	-0.2%	1.6%	-1.7%	-0.3%
Peru	1990-2010	1.4%	0.5%	-0.2%	1.7%
Venezuela	1990-2010	-1.0%	2.0%	-1.5%	-0.6%

Notes: authors' calculation based on the GGDC Sector Database, using equation (1).

Footnotes

1 Kuznets, 1966; Chenery et al., 1986; Harberger, 1998, Hsieh and Klenow, 2009; Herrendorf et al. 2014.

2 Various international organizations such as the World Bank, the United Nations, the Asian Development Bank, and also the Oxford Latin American Economic History Database collect sectoral data for developing countries and make it publicly available. But series are often short (starting only in the 1980s or 90s), not consistent over time and across countries, and the series sometimes lack sectoral detail. Timmer and de Vries (2009) compare the GGDC Sector database with other publicly available sectoral data sets.

3 In most developing countries a fixed-base Laspeyres volume index is used and this base is usually updated every 5 or 10 years.

4 Because of the application of fixed-base Laspeyres volume indexes by most statistical offices, linked sectoral GDP does not add up to total GDP for earlier periods. We aggregate sectoral GDP data.

5 Official population censuses data for 1950, 1960 and 1970 appear to be unreliable in Latin America. In order to remedy this problem we used the harmonized population census results published by PREALC (1982). This study makes adjustments in order for the population censuses to be reliable and comparable within and between countries (for example correcting for age limitations, reference periods, ISIC revisions, workers entering the labour market, unspecified workers and on the underestimation of agricultural workers).

6 The sources and methods document available at <http://www.ggdc.net/dseries/10-sector.html> provides a detailed discussion of the construction of the employment and value added series on a country-by-country basis.

7 Typically, imputed rents are included in the output of the financial and business services sector and frequently increase output in this sector by 50 per cent or more without any labour input equivalent. Worse, this percentage varies over time and across countries.

8 This periodisation has become common in the recent literature on structural change (see e.g. ADB 2010, McMillan and Rodrik, 2011). See section 3.3 for further discussion of these periods. See Annex Tables I to III for the countries distinguished. These countries were selected to have a relatively geographically representative sample of countries by continent. In addition, they account for the major part of the continents' GDP.

9 Jorgenson and Timmer (2011) use hours worked instead of employment to compute shares. In addition, they exclude hotels and restaurants. The shares reported by Jorgenson and Timmer (2011) will be higher if hotel and restaurant services are included and employment shares are used.

10 This finding contrast to that in Rodrik (2013b) whose finding of unconditional convergence applies only for formal manufacturing activities.

11 Faster productivity growth in U.S. market services is partly related to differences in accounting for price changes in retail output (Inklaar and Timmer, 2008). The U.S. statistical office uses a quality-adjusted price deflator, especially for the consumption of information and communication technology goods. Measured sales volumes are smaller in many developing countries, partly because they do not make use of hedonic price deflators.

